ENVIRONMENTAL IMPACT ASSESSMENT STUDY
FOR
THE PROPOSED APARTMENTS
ON L.R. NO. KJD/KAPUTEI-NORTH/94260 ALONG NAMANGA ROAD, KAJIADO COUNTY

June 2021

This Environmental Impact Assessment Study report is submitted to the National Environment Management Authority (NEMA) pursuant to the Environment Management and Coordination Act, chapter 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003

PROJECT PROPONENT

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UNDERTAKEN BY

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DECLARATION

Two Rivers Development Limited

The Environmental Impact Assessment study report submitted is based on the proposed construction of apartments on LR. NO. KJD/KAPUTEI-NORTH/94260 Along Namanga Road, Kajiado County.

That the study was conducted to the highest standards possible:

During the construction and operational phases, the developer will abide by the findings and the study's recommendations.

NAME: …….

DESIGNATION: …….

SIGNATURE: ……..

DATE……

EIA CONSULTANTS:

That the Environmental Impact Assessment study report submitted is based on the proposed apartments on LR. NO. KJD/KAPUTEI-NORTH/94260 Along Namanga Road, Kajiado County.

To my knowledge, all information contained in this document is an accurate and truthful representation of all findings relating to the proposed projects as per projects information provided by the proponent and contractor to the EIA consultant:

That the study was conducted to the highest standards possible:

NAME: **Tom Shikorire (NEMA Registration Number 2724)**

SIGNATURE……..

DATE……...

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ACRONYMS AND ABBREVIATIONS

^{O}C	Degree Celsius
CPP	Consultation and Public Participation
GHG	Green House Gas
EA	Environmental Audit
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EMP	Environmental Management/Monitoring Plan
HDPE	High Density Polyethylene
KEBS	Kenya Bureau of Standards
Km	Kilometres
KPLC	Kenya Power and Lighting Company
KVA	Kilo Volts Amperes
L.R. No.	Land Reference Number
MBBR	Moving Bed Biofilm Reactor
NEC	National Environmental Council
NEMA	National Environment Management Authority
OHSO	Occupational Health and Safety Office
PCs	Private Companies
PPE	Personal Protective Equipment
PPM	Parts Per Million
SWM	Solid Waste Management
WRMA	Water Resources Management Authority
ToR	Terms of Reference
VOC	Volatile Organic Compounds

0. EXECUTIVE SUMMARY

0.1 Introduction

The proponent proposes constructing twenty blocks of residential units, each consisting of twenty-six units of two and three bedroomed apartments. The project site is in Kitengela at -1.579913, 36.926840 Kajiado county. Project screening identified the project as one that requires an environmental impact assessment (EIA) study. The consultant undertook the according to the requirements of section 58 of the environment management and coordination act (EMCA) chapter 387. Since environmental concerns now need to be part of the planning and designing in the development process and not an afterthought, the proponent opted to undertake EIA to ensure environmental care within all the phases of the proposed development.

Upon completion, the project will have 520 units in line with the Government of Kenya goal of delivering 500,000 affordable homes under the Big Four Agenda. To achieve this dream, the government has called upon private developers to partner with them to develop these units under the ministry's wings.

A developer must undertake an environmental impact assessment (EIA) at the planning stages of the proposed undertaking under section 58(1) of the Environment Management and Coordination Act (EMCA Cap 387). This is to ensure that significant impacts on the environment are considered during such projects' phases. Therefore, in compliance with the law and to avoid unnecessary conflicts that retard development, the proponent has undertaken this EIA study and incorporated environmental concerns as required.

Environmental impact assessment (EIA) is a widely used environmental assessment tool to provide decision-makers and the concerned public with essential information to plan for environmentally sustainable economic development. In Kenya, EIA has been necessitated under the Environmental Management and Coordination Act (EMCA) chapter 387, the statutory law. In line with section 58 of EMCA chapter 387, second schedule 9 (1), and Environmental (Impact Assessment and Audit) regulation, 2003, new projects must undergo the EIA process.

0.2. Positive Impacts

The proposed project will have numerous positive impacts, as exhaustively discussed in the report. They include an increased number of affordable residential units, employment opportunities, revenue generation to the county and national governments, optimal land use and economic benefit to the proponent.

0.3. Summary of negative impacts and mitigation measures

A summary of negative impacts and proposed mitigation measures is presented in Table 1 below.

Table 1: Impacts and Mitigation Measures

Possible Impacts	Mitigation measures
Soil erosion	Control earthworks; Install drainage structures to control the flow of stormwater; Ensure management of excavation activities
Loss of vegetation	Only areas earmarked for development should be cleared; Project developmental footprint is less than 75% of the total land cover; Plant trees, shrubs and flowers on remaining open spaces
Air pollution	Stockpiles of the earth should be sprayed with water or covered during dry seasons; Provide dust masks for the personnel in dusty areas; Sensitize construction workers on pollution control measurers; Cover all trucks hauling soil, sand and other loose materials; Provide dust screen where necessary
Noise pollution	Install portable barriers to shield compressors and other small stationary equipment where necessary; Display signs to indicate construction activities; Maintain all equipment; Adhere to provisions of Noise Prevention and Control Rules 2005, Legal notice no. 24 regarding noise limits at the workplace as well as NEMA Noise and Excessive Vibration Pollution Control Regulations, 2000.
Road traffic disruption	No overloading of trucks and good driving practices to be practiced. Appropriate junction/access point to be provided. Use of proper & legible signage. Employment of formal flagmen/women to ensure public safety.
Increased generation of waste	Adopt waste minimization at source; Monitoring the fate of disposed of wastes to ensure they are legally landfilled at a recognized controlled site. Adhering to waste management regulations of 2006
Generation of wastewater	Installation of a biodigester of adequate capacity to treat the generated wastewater and adherence to the water quality regulations of 2006
Public health and occupational safety	Ensure proper solid waste disposal and collection facilities; Ensure dustbin cubicles are protected from animals, rains and are well covered; Provide suitable safety gear for all personnel; Proper treatment of wastewater; Adherence to the ministry of health guidelines on preventing the spread of the SARS-CoV-19 virus

0.4. Conclusion

1) The proposed development project is commensurate with Kenya government policies to provide affordable housing. Upon completion, there will be 520 units in line with the Government of Kenya goal of delivering 500,000 affordable homes under the Big Four Agenda as well as the Vision 2030

2) Key positive impacts resulting from the project include; growth of the economy, boosting the informal sector during the construction phase, provision of market for supply of building materials, employment generation, increase in government revenue, and optimal use of land.

3) Negative environmental impacts that will result from the establishment of the proposed project include pressure on the existing facilities, noise pollution, dust emissions, solid waste generation, increased water demand, increased energy consumption, generation of exhaust emissions, risk of workers accidents, possible exposure of workers to diseases, increased

4) The implementation of the proposed EMP can sufficiently mitigate negative impacts

0.5. Recommendations

1) The proponent to fully implement the EMP and adhere to all relevant national and international environmental, health and safety standards, policies and regulations.

2) Maximize positive impacts as much as possible as exhaustively outlined within the report. This will ensure the best possible environmental compliance and performance standards.

3) Use solar PV, especially for lighting streets and pavements as well as for heating water. This will reduce demand for fossil fuels in power generation hence curbing GHG emissions
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I. INTRODUCTION

1.1. Background

The proponent proposes constructing twenty blocks of residential units, consisting of twenty-six units of two and three bedroomed apartments on land reference number KJD/Kaputei-North/94260. The project site is in the Korompoi area at -1.579913, 36.926840 Kajiado county. Project screening identified the project as one that requires an environmental impact assessment (EIA) study. The consultant undertook the according to the requirements of section 58 of the environment management and coordination act (EMCA) chapter 387. Since environmental concerns now need to be part of the planning and designing in the development process and not an afterthought, the proponent opted to undertake EIA to ensure environmental care within all the phases of the proposed development.

Upon completion, the project will have 520 units in line with the Government of Kenya goal of delivering 500,000 affordable homes under the Big Four Agenda. To achieve this dream, the government has called upon private developers to partner with them to develop these units under the ministry's wings.

Environmental impact assessment (EIA) is a widely used environmental assessment tool to provide decision-makers and the concerned public with essential information to plan for environmentally sustainable economic development. In Kenya, EIA has been necessitated under the Environmental Management and Coordination Act (EMCA) chapter 387, statutory law. In line with section 58 of EMCA chapter 387, second schedule 9 (1), and Environmental (Impact Assessment and Audit) regulation, 2003, new projects must undergo the EIA process.

1.2. Need for the project

The right to accessible and adequate housing is provided for under the bill of rights in the Kenyan constitution (Republic of Kenya 2010). Under Vision 2030, the Kenyan government has committed to providing adequate, affordable and quality housing for all citizens, particularly the low-income groups (Government of Kenya 2007). Furthermore, the Kenyan government launched an ambitious goal of supporting the construction of at least 500,000 affordable houses by 2022. One of the critical targets of sustainable development goal 11 (SDG 11) is to ensure access to adequate, safe and affordable housing and essential services for all and upgrade slums by 2030. Kenya ratified the SDGs in 2015

1.3. Criteria for the EIA

1.3.1. Scope

The Kenya Government policy on all new projects requires the undertaking of EIA at the planning stages of the project. This is to ensure that significant impacts on the environment are considered during the project life cycle. The scope of this EIA, therefore, covered:

- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,

- Appropriate mitigation measures,
- Provision of an environmental management plan outline.

1.3.2. Terms of Reference (TOR) for the EIA Process

The terms of reference for the study were developed during the scoping exercise and approved by the licensing authority in line with part III of the EIA and EA regulations 2003. The TOR's were used as a guide for the study and appended to this report.

1.3.3. Data Collection

Data collection was carried out through questionnaires, use of checklists, observations and photography, site visits and desktop environmental studies in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.3.4. Reporting and Documentation

The EIA Project Report from the findings was compiled under the guidelines issued by NEMA for such works and was prepared for submission by the proponent for consideration and approval. The Consultant ensured regular briefing of the client during the exercise.

1.3.5. Study objectives

1. To identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
2. To generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
3. To recommend cost-effective measures to be used to mitigate against the anticipated negative impacts;
4. To prepare an Environmental Impact Assessment Study Report in compliance with the Environmental Management and Coordination Act Cap 387 and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.3.6. Methodology

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, chapter 387
- Environmental scoping that provided the critical environmental issues
- Desktop studies and interviews with project architects and engineers
- Review of relevant policies, laws, regulations, developmental frameworks as well as multilateral agreements
- Physical inspection of the site and surrounding areas
- Public participation
- Reporting of study findings

II. PROPOSED PROJECT DESCRIPTION

2.1. Project site location

The proposed site is in the Korompoi area along the Namanga Road in Kitengela, as shown in **Error! Reference source not found.** below. The GPS coordinates to the site are -1.579913, 36.926840.

Figure 1: Proposed project site

2.2. Design of the project

The design consists of twenty blocks of residential apartments, consisting of twenty-six units, two and three bedroomed flats. Each block will be four floors above ground. An artistic impression of the proposed apartments is in Plate 1 below.

Plate 1: An artistic impression of the proposed apartments

2.2.1. Electrical system

Construction power will be from the Kenya Power and Lighting Company (KPLC). The various components of the electrical system shall comprise a single and twin socket outlet, lockable meter board with glass view panel, gate lights and security alarm panel outlet and CCTV connection system. The relevant guidelines and precautionary measures relating to the use of electricity shall apply.

2.2.2. Water supply

Water for construction will be from vendors, while a borehole will be constructed to supply the apartments during the operational phase[1]. There will be water storage tanks to increase water capacity at the project site to the required amount.

2.2.3. Wastewater, solid waste

The proponent will install a biodigester to treat wastewater from the apartments. This technology allows for complete removal of solids, reduced sludge production and enhanced process stability. The developer considered several options for effluent management. That is:

1) Septic tank is cheap, easy to construct, and durable, but it is prone to clog and only used in low to medium scale housing projects with low rates of wastewater generation.
2) Moving bed biofilm reactor is a biological (MBBR) wastewater treatment process, meaning it is a natural process that uses biofilm to remove waste from wastewater. Microorganisms attached to media in the water consume unwanted junk, leaving the water cleaner. However, it requires expansive space to install, constant manual monitoring, and some insects, like sewage flies, mosquitoes and red worms, will be attracted to it since the wastewater is exposed.

Compared to traditional septic tanks, the biodigester does not need frequent exhausting, making it a better option for dealing with sewer. Additionally, it doesn't require too much space, and it is underground, preventing insects' attraction, unlike the MBBR. The

[1] The proponent will undertake a separate EIA for the borehole

management will use treated water for watering flower gardens and cleaning paths, access roads, and transport excess to designated sites.

The main waste from construction activities will be excavated soil. Excavated soils will be used to backfill and landscape after decommissioning of construction activities. During the occupation, large amounts of solid waste will emanate from the residential blocks. Each residential unit will have its waste bin. Tenants will be required to deposit their waste at a designated point on certain days of the week. From here, a licensed waste handler will transport the waste to the designated waste treatment site.

2.3. Description of the project's construction activities

2.3.1. Excavation and foundation works

Excavation will be carried out to prepare the site for the construction of foundations, pavements and drainage systems. This will involve a combination of earthmoving machinery such as bulldozers and wheel loaders and manual labour.

2.3.2. 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 quotas. Materials such as cement, paint and glasses among others will be stored in temporary storage structures built for this purpose.

2.3.3. Masonry, concrete work and related activities

The construction of the building walls, foundations, floors, pavements, drainage systems, and swimming pool, among other project components, involves a lot of masonry work. General masonry includes stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing fresh concrete surfaces. These activities are known to be labour intensive and are supplemented by machinery such as concrete mixers.

2.3.4. Structural steelworks and plumbing

The apartment blocks will be reinforced with structural steel for stability. Structural steelworks involve steel cutting, welding and erection. Installation of pipe-work will be done to connect sewage from the five apartment blocks to the biodigester described in section 2.2.3 above. Plumbing will also be done for the drainage of stormwater from the rooftop into the peripheral stormwater harvesting tanks. Plumbing activities will include metal and plastic pipe cuttings, adhesives, metal grinding, and well drilling.

2.4. Description of the project's operational activities

2.4.1. Solid waste and wastewater management

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 the designated sites. Sewage generated from the building will be discharged

into a sewer biodigester while stormwater from the building's roof will be channelled into rainwater harvesting tanks to avoid wastage and surface runoff.

2.4.2. Cleaning

The proponent will be responsible for ensuring regular washing and cleaning of the pavements, the car park area, staircases etc. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents.

2.4.3. General repairs and maintenance

The apartments 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 electrical gadgets, painting and replacement of worn out materials among others.

2.5. Description of the project's decommissioning activities

2.5.1. Demolition works

Upon decommissioning, the project components including buildings, pavements, drainage systems and associated facilities will be demolished. This will produce a lot of solid waste, which will be re-used for other construction works or if not re-usable, disposed of appropriately by a licensed waste disposal company.

2.5.2. 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 the equipment to other building owners or contractors or donation of this equipment to schools, churches and charitable institutions.

2.5.3. 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.

III. BASELINE ENVIRONMENTAL AND SOCIO-ECONOMIC INFORMATION

3.1. Physical Environment

3.1.1 Geology

The geology of the project area has evolved over time. There are several formations that characterize the region regarding the weathering that has taken over the area over time. There is a wide range of metamorphic rocks which have been subjected to several stages of deformation but the recent rift volcanics are relatively undeformed. The surface rocks exclusively comprise of pleistone and tertiary volcanic material. The geology of the area is rocks mainly comprising of a succession of lavas and pyroclastics of Cainozoic age overlying a foundation of folded precambarian schists and gneisses of the Mozambique Belt. The stratigraphic succession of these rocks is as follows: Kerichwa Valley Springs; Nairobi Trachytes; Nairobi Phonolites; Upper Athi Series (consisting of sediments lake beds and Athi Tuffs); Kapiti Phonolite and basement system rocks (consisting mainly of gneisses and schists).

3.1.2 Topography

The area is generally flat. Drainage is naturally inclined to flow towards the gently sloppy area of the site. The area is not served by the local authority drainage system and the project proponent intends to connect the generated waste drainage into a waste management system.

3.1.3 Climate

The project area enjoys a warm climate with temperatures ranging between 12°C and 18.7°C (Figure 2). The rainfall aggregate for the county is 800 mm per annum. June and July rank as the coldest months while January-March and September-October are the hottest months.

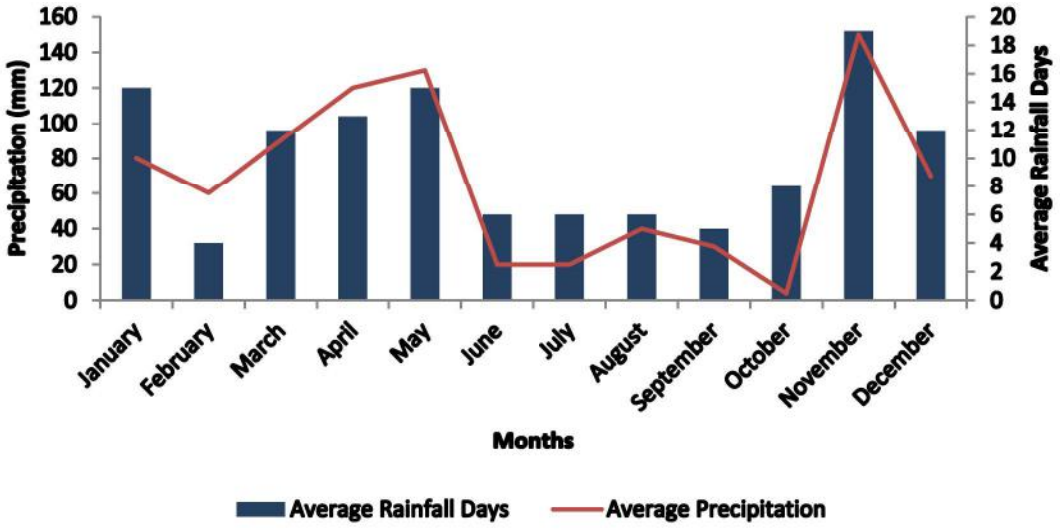

Figure 2: Average rainfall and precipitation in Kajiado County

Generally, temperatures of the project area are high. The temperature patterns usually follow the general trends in the tropics where diurnal changes are greater than annual temperatures. The mean

monthly temperatures of the project area are in the range of 23- 28°C, the mean minimal lie around 12 – 15°C and the mean maxima are 26– 28°C. The coolest months are June and July while February, March and October are the hottest months as shown in Figure 4 below.

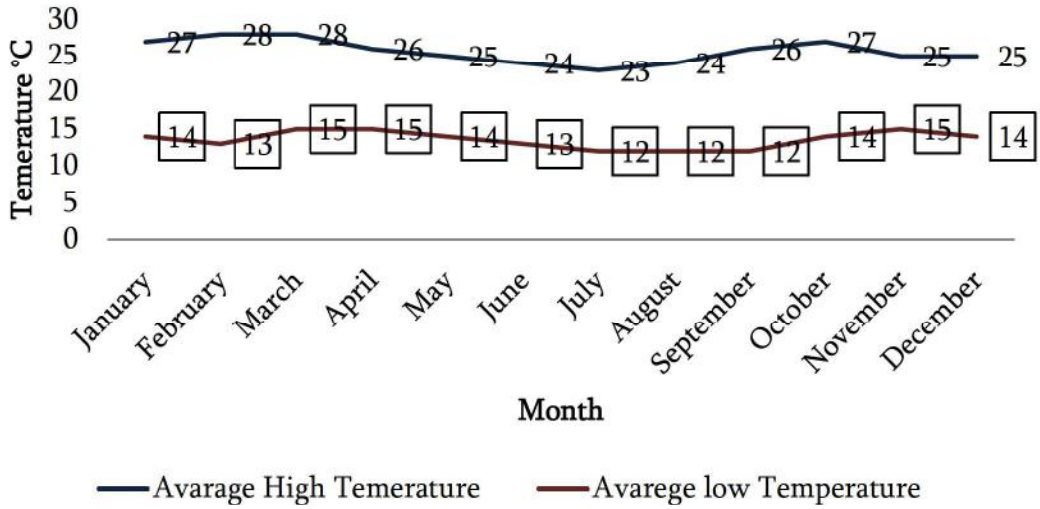

Figure 3: Average monthly low and high Temperature

3.1.4 Soils

The project area is rich with highland soils coupled with favourable climatic conditions thus making agriculture very viable. Loam soil is the dominant kind of soil in the project area. This soil has good water holding capacity as well as all the major nutrients required by the crops for optimal growth. The gentle slopes and ever green ground cover helps to prevent soil erosion.

Generally, soils of Kajiado can be classified into three broad categories i.e. highland, low land and rift valley bottom soils.

3.1.4.1. Highland Soils

The soils are of medium fertility, moderately clay and vulnerable to erosion Figure 11. Most intensive cultivation and dairy farming takes place within the 400m strip around the forest reserve. The valley bottoms are deep alluvials of high clay with water retention capacity hence intensive horticultural activities.

3.1.4.2. Lowland soils

The soils mainly consist of alleyic vertisols overlaying a basement rock. The soils are of medium fertility and well-differentiated hence prone to waterlogging during the wet season. These soils are common where rain-fed crop farming, irrigated commercial farming and rangeland ranching is practiced.

3.1.4.3. Rift valley bottom

The valley bottoms have vertisol, while some areas have lithic soils, which are relatively weathered. These soils are found on the hill's western side where the hill steeply deepens into the rift valley. The soils are of poor fertility and inadequate water retention capacity. Pastoralism is predominant in this area with small-cultivated plots. The main vegetation on these soils is wooded grassland suitable for livestock and other animals.

3.1.5. Topography

Plains and occasional volcanic hills characterize the general topography of Kajiado County. The land rises from about 500 meters above sea level around Lake Magadi to about 2,500 meters above sea level in the Ngong Hills area. The district can be divided into four topographic areas: The Rift Valley, Athi Kapiti Plains, Central Broken Ground and the Amboseli Plains. The Rift Valley is a low depression on the west side of the district which runs from north to south. The depression has important features such as Mount Suswa and Lakes Magadi and Natron. Both lakes have substantial deposits of soda ash but commercial exploitation is going on in Magadi only.

On the far western Nguruman Escarpment, there are three main rivers: Oloibortot, Entasopia and Sampu which support significant irrigation agriculture. The Athi Kapiti Plains consist mostly of open rolling land. The area also includes the Ngong Hills with an altitude of 2,460 meters above the sea level and is the source of Athi River. The river is fed by its major tributaries Mbagathi and Kiserian both of which are permanent rivers. The Central Broken Ground comprises a 20 to 70-kilometer-wide stretch from the North-eastern border to the south west. There are endless water sources draining this area. This area is also crisscrossed by many dry river beds which are essential sources of sand for building and construction industry in Nairobi and the district itself. The Amboseli Plains are characterized by undulating plains with deep reddish-brown clay loamy soils and flat sedimentary plains with poorly drained cotton soils.

3.1.6. Hydrology and Hydrogeology

3.1.6.1. Surface-water Resources

Seasonal streams which form a radial pattern from the hill are widely scattered to vary considerably both in size and location. The distribution of all wetlands, however, was strongly influenced by the local topography, soil and geological characteristics. Rivers and springs are shrinking with some of the tributaries drying up completely. The only permanent river from the Ngong Hills is the Mbagathi, which originates from elevation of 2459m. This river supplies water into River Athi, one of Kenya's two major rivers that drain into the Indian Ocean. Mbagathi River is also important water and only water source for the Nairobi National Park. Plans to dam the river to meet the local water supply have met resistance from conservationists.

3.1.6.2. Groundwater resources

Aquifers in the area are replenished by part of the precipitation that infiltrates underground. The aquifers are tapped through boreholes and constitute an essential source of water supply in the area. Lithological variations coupled with varied degree of weathering and fracturing attribute a high degree

of homogeneity in the hydro geological characteristics of different aquifers. This inhomogeneous character causes aquifer yields to vary over a continuous area. Aquifers in the area are classified into four types.

1. Sands and sediment deposits intercalated in tuff, in which case, Saggerson (1991) and Gevaerts (1964) concur that most aquifers are either fluviatile or lacustrine deposits intercalated in most formations.
2. Rock formations with an appreciably good porosity and permeability. These types of aquifers occur in formations such as weathered basalt, trachytes and tuffs. Contact between two rock formations such as basalt and tuffs or sands and sediments intercalated in weathered tuff. These contacts are the old land surfaces reported by Saggerson (1991) and Gevaerts (1964).
3. Fractured aquifers in different rock formations

Underground water yields vary from 0.01 to 35.77m^3 per hour. In areas close to wetlands the underground water table is shallow and hence shallow wells provide adequate water supply for families and their livestock. The people use the water for their own consumption and for household and farm (e.g. drinking by livestock) needs. There is a general decline in ground water yield due to unregulated abstraction.

3.2. Biological Environment

3.2.1 Flora

The area is characterized by several highland vegetation due to the favourable climate that is suitable for plant growth and development with several planted species of indigenous trees. Predominant vegetation in the area consists of grass other vegetation such as eucalyptus, pine, avocado trees, Nandi Flame, palms and grevellia species among many others. There are several tree species which the proponent has endevoured to plant so as to enhance the environmental aspect of the area.

3.2.2 Fauna

Major type of animals found in the area is mostly domestic animals majorly cows, sheep and goats that are majorly grazed by on a commercial basis. The area also has other wide varieties of rodents such as rats, reptiles, birds, insects (butterflies, grasshoppers, and ants) should also be present in the vicinity.

3.3. Socio-economic environment

3.3.1. Population

The Maasai as the indigenous tribe predominantly occupied the project area, although migration and intermarriage has increased the proportion of other tribes considerably over the last four decades. Kenya Government censuses have documented a 10-fold increase in human population in Kajiado County from 85,903 in 1969 through 406,054 in 1999 to 687,312 by 2009. The annual population growth rate in the County of over 4% exceeds the national average of about 3.1% (Ntiati, 2002). The current proportion is not known, but one can infer from previous statistics that the Maasai population in the district is becoming increasingly larger mostly due to immigration of other ethnic groups from Nairobi. (Marira J.K. 2006). Results of Kenya's population census estimates that the population density has increased from 5 persons per square kilometer in 1969 to about 41 persons per square kilometer in 1999 (**Error! Reference source not found.** above)

3.3.2. Agriculture

a) Crop production
In Ngong Division, the parcels are small with farmers practicing mixed farming. Rain-fed agriculture has the potential to reduce the insecurity associated with livestock monoculture. Crop production is done around the Ngong Hills outside the Forest reserve boundary and to some extent within the 400m strip, which was set aside for resettlement. Horticultural crops are also grown along valleys. Some of the crops include onions, tomatoes, brinjals, chillies, okra, maize, beans etc.

b) Pastoralism
Pastoralism is still the major economic activity in Ngong and supports the major livelihood system of the Maasai community Ngong Hills provides dry season grazing sites for the community around. This production mode is, however, on the decline as a considerable number of people adopt an agro-pastoral lifestyle. The growing commercialization of the pastoral economy has encouraged livestock production for the market rather than pure subsistence. The major livestock types are cattle and goats and sheep though the donkey is increasingly becoming popular for its use as a means of transportation.
Livestock production is increasingly being done with the markets in mind – rather than for subsistence. This commercial orientation enables people to build alternative livelihood options especially in trade.

3.3.3. Energy

A significant concern in energy is that demand for wood fuel exceeds supply. The scarcity of wood fuel and the impact of its escalating prices are more acute at the household level because of poverty and limited alternatives. A practical example of this impact can be explained by a situation in Ngong town, where the escalating prices in fuelwood and poverty have led to plastic waste as a source of energy. The government has been promoting energy-saving stoves and other alternative energy sources, including biogas, wind and solar power. The area enjoys long periods of sunshine and windy conditions suitable for solar and wind energy generation. However, communities lack the capital to purchase solar PV modules that would best be used as an alternative to kerosene lamps.

3.5.4. Roads

The roads in Ngong sub-County are better developed than the rest of the Kajiado County due to its proximity to Nairobi. The east-west axis road network has hindered communication. The only tarmacked roads in the whole County are Nairobi-Namanga (153km), Nairobi – Magadi Roads that pass through Ongata Rongai, Kiserian or Ngong (102km) and the Kiserian-Isinya road (130km).

IV. LEGISLATIVE AND REGULATORY FRAMEWORK

4.1. Constitutional and Legal Framework

4.1.1. Constitution of Kenya (2010)

***Article 42-Environment*;** Indicates that every person has the right to a clean and healthy environment, which includes the right to –

- Have the environment protected for the benefits of present, future generations through legislative and other measures, particularly those contemplated in Article 69, and
- Have obligations relating to the environment fulfilled under Article 70 [2].

Article 43-Economic and social Rights

Indicate that every person has the right to accessible and adequate housing and to reasonable standards of sanitation.

4.1.2. The Environmental Management and Coordination Act chapter 387

The Environmental Management and Coordination Act (EMCA) chapter 387, and its Attendant Environmental (Impact Assessment and Audit) Regulations of 2003 Provides for the establishment of an appropriate legal and institutional framework for the management of environment in Kenya. The Act introduces two important aspects of urban environmental management, which are directly related to the proposed project: environmental impact assessment (EIA) and environmental audit (EA).

Section 58 (1) has underscored that any person being a proponent of a project Shall before financing, commencing or proceeding with submit an EIA report to the National Environmental Management Authority (NEMA) of Kenya[3].

Section 68 (1) gives NEMA the mandate for carrying out all environmental audits of all activities that are likely to have significant impacts on the environment. It authorizes environmental inspectors, as appointed by NEMA to enter in any premise and determine how far the activities carried out conform to statements in EIA study.

Compliance with EMCA

- The proponent has undertaken an EIA as per the requirements of Section 58 (1) of EMCA chapter 387 awaiting approval prior to the commencement of the project.
- The proponent will implement the proposed EMP and adhere to the conditions set in the license of the proposed project.
- The proponent will adhere to subsequent EMCA legislations such as the noise and waste regulations throughout the cycle of the project.
- The proponent shall undertake Environmental audits for the project and submit the reports to NEMA as per the EIA/EA guidelines

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[2] LAWS OF KENYA, *The Constitution of Kenya, 2010* (Attorney General Nairobi, 2010), http://www.wipo.int/edocs/lexdocs/laws/en/ke/ke019en.pdf.

[3] George M. Wamukoya and Francis DP Situma, *Environmental Management in Kenya: A Guide to the Environmental Management and Coordination Act* (Centre for Research and Education on Environmental Law, 2000).

4.2. Other relevant laws, policies and regulations

Other relevant regulations, policies and regulations and their relation to the proposed project are presented in Table 2 below.

Table 2: Legislative, policy and regulatory frameworks

No.	Legislation, Policy and regulations	Environmental requirements	Relationship with the proposed projects
		Legislative frameworks	
1.	The constitution of Kenya	***Article 42-Environment***; Indicates that every person has the right to a clean and healthy environment, which includes the right to – • Have the environment protected for the benefits of present, future generations through legislative and other measures, particularly those contemplated in Article 69, and • Have obligations relating to the environment fulfilled under Article 70[4]. ***Article 43-Economic and social Rights*** Indicate that every person has the right to accessible and adequate housing and to reasonable standards of sanitation.	The proposed project is consistent with article 43 as it will enhance access to affordable housing The undertaking of EIA before the commencement of activities is commensurate with article 42.
2.	Environmental Management and Coordination Act (EMCA), chapter 38	Prohibiting and controlling the introduction of alien species into natural habitats; Controlling and prevention of environmental pollution; Carrying out EIA for all proposed projects with a potential for adverse impacts; Carrying out environmental audit and monitoring of all activities that are	Proponent has undertaken the EIA as required under this law. Proponent is further advised to adhere to licensing conditions and improvement orders issued by the authority
4.	The Water Act 2016	36. A permit is required for any of the following; purposes- (a) any use of water from a water resource.	The proposed project will require large amounts of water during construction and operation. Currently there is adequate water abstracted from a borehole.

[4] LAWS OF KENYA, *The Constitution of Kenya, 2010* (Attorney General Nairobi, 2010), http://www.wipo.int/edocs/lexdocs/laws/en/ke/ke019en.pdf.

		Section 38 sets out penalties for offenders (1) A person who- (a) without a permit, constructs or employs works for a purpose for which a permit is required; or (b) being the holder of a permit, constructs or employs any such works in contravention of the conditions of the permit, commits an offence.	Additionally, treated wastewater from the biodigester shall be used for construction.
5.	Public Health Act, Cap 242,	Article 129: Supporting the protection of public water supplies; Article 117: Supporting the prevention or remedy danger to health from unsuitable activities including dust and noise	The proponent should ensure that all construction operation and decommissioning activities do not in any way interfere with public water supply systems and remedy project effects that may impact on public health. In addition, the contractor and all work force on the project is advised to adhere to the ministry of health's SARS-Cov-2 guidelines
6.	The Occupational Health and Safety Act, 2007	The purpose of this Act is to secure the safety, health and welfare of persons at work, and protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work. It applies to all workplaces where any person is at work, whether temporarily or permanently.	Failure to comply with the OSHA, 2007 attracts penalties of up to KES 300,000 or 3 months jail term or both or penalties of KES 1,000,000 or 12 months jail term or both for cases where death occurs and is in consequence of the employer
7.	Land Act No 6 Of 2012	Section 56 gives the land owner the Power to lease land; 56. Subject to the provisions of this Act, the owner of private land may— (a) Lease that land or part of it to any person for a definite period or for the life of the lessor or of the lessee or for a period which though indefinite, may be terminated by the lessor or the lessee; and (b) Subject the lease to any conditions that may be required by this Act or any other law or that the lessor may impose.	The proposed project site is private land belonging to the proponent. It was originally agricultural land. A change of use process to commercial was undertaken pursuant to this and the physical planning and land use laws

8.	Physical Planning and Land Use Planning Act, 2019	Section 57 (1) A person shall not carry out development within a county without a development permission granted by the respective county executive committee member. (2) A person who commences any development without obtaining development permission commits an offence and is liable on conviction to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding two months or to both. Section 59 (1) A person applying for development permission shall ensure that any documents, plans and particulars that are provided to the respective county executive committee member while applying for development permission have been prepared by the relevant qualified, registered and licensed professionals.	Proponent will ensure that the proposed project is in line with the existing goals in the regions of project area of influence. They will further ensure that all disturbed areas are immediately restored after decommissioning of construction activities Relevant permits required under this law shall be obtained prior to commencement o works
9.	The Antiquities and Monuments Act, 1983, Chapter 215	The Act aims to preserve Kenya's national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums of Kenya is the custodian of the country's cultural heritage	There are no existing antiques, monuments, natural sites near or within the proposed project site.
10.	The penal Code Chapter 63	Section 191 - States that if any person or institution that voluntarily corrupts or foils water from public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence; Section 192 – States that a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons /institution, dwelling or business premises in the neighbourhood or those passing along public way, commit an offence.	The proponent will implement the proposed environment management and monitoring plan as well as the licensing conditions and any other improvement notices issued by NEMA during the course of implementing the proposed project
11.	The Agriculture, Fisheries and Food Authority (AFFA) Act, 2013	Control over soil conservation, land preservation and land development are mainly controlled within this	Provisions have to be made to ensure that implementation of the proposed projects does not

		Act, and many of the provisions can be largely applied beyond those lands suitable for agriculture	accelerate or initiate soil erosion and pollution of River Riurwaka near the proposed site
12.	The county government Act 2012	This law operationalized the county governments as stipulated in the constitution of Kenya 2022. Counties are in charge of among others waste management; regulating noise and excessive vibrations as well as physical planning	The proponent will obtain relevant permits and approvals such as approval of architectural plans, building permit. They shall further contract a waste transportation company that is licensed by the county government and dispose their waste to approved waste treatment sites
Policy and regulatory frameworks			
1.	The water quality regulations, 2006	These regulations are aimed at protecting water resources from pollution. It requires that proponents of projects in areas with no municipal sewers deploy adequate measures that will ensure safe disposal of waste water from their activities.	The proponent will instal a biodigester that will treat wastewater from the proposed development and obtain an EDL.
2.	The Noise and excessive vibrations pollution control regulations	Section 13(1) states that no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations	The proponent shall ensure that equipment used during construction and operation is muffled to control noise and vibrations.
3.	The Waste management regulations of 2006	The regulations requires a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities.	Proponent shall apply an integrated solid waste management protocol and ensure that generated waste is disposed in a manner prescribed under these regulations.
4.	The Draft National Policy on Wetlands Conservation and Management ,2013	Policy Statement 2: Ensuring that any alteration of a wetland for public interest will be subject to Environmental Impact Assessment (EIA), cost benefit analysis, and wide stakeholder consultations	Proponent will ensure that implementation of the proposed project does not adversely affect wetlands in its area of influence.
5.	Sessional Paper No. 6 of 1999 on Environment and Development	Regulating urban development to only those areas which are suitable, avoiding ecologically fragile areas; Encouraging sustainable use of resources and ecosystems; Undertaking EIA for all private and	Public consultation an awareness was undertaken during the EIA process

		public projects Increase public awareness on environment	
6.	The National gender and development policy of 2000	Considering the needs and aspirations of all Kenyan men, women, boys and girls across economic, social and cultural lines and ensuring the empowerment of women	Implementation of the proposed project will create employment and business opportunities. The proponent is advised to ensure that there is equal opportunity across gender. They are further advised (applying the principles of sustainable development) not to discriminate against people with disabilities.
7.	The National HIV Policy (GoK, 1997)	Ensuring that new development projects encourage preventive and responsible behaviour both for the workers involved in such projects and also the local people within which projects are taking place as a goal towards curtailing the spread of the disease	The proponent is advised to put in place adequate measures so as to ensure that implementation of the proposed project does not heighten the spreads of HIV and AIDS
8.	The National Environmental Sanitation and Hygiene Policy (2007)	4.3: Sanitation and the environment Protection of the environment from pollution and its negative effect on human health; Ensuring use of technologies that uphold the right of present and future generations to a healthy and pollution-free environment; Ensuring the use of sanitation systems that are environmentally sound; Preventing environmental pollution from liquid and solid waste; Setting of clear standards and guidelines for environmental sanitation; Increasing environmental sanitation awareness across the country	The proponent is advised to ensure that high standards of hygiene and sanitation are maintained throughout the proposed projects' cycle.
Key National Strategic Plans			
1.	The National Climate Change Response Strategy, 2012	The first of its kind in Kenya and sets out an ambitious plan for climate change mitigation and adaptation. Among the plans is to improve transportation so as to reduce resultant GHG emissions and supporting communities to adopt to the effects of climate change e.g. drought	Existing projects near the site (e.g. mall) are powered by solar. The current project shall also be powered by solar during occupation. This will largely reduce grid emissions given that 30% of Kenya's grid electricity is produced from thermal power plants
2.	The Kenya Vision 2030	Kenya's economic blue print for the year 2008 -2030. Sets out an ambitious strategy to improve infrastructure and foster economic development.	The proposed project once implemented will enable Kenya achieve the goals of the Vision 2030. That is to increase the availability of affordable housing

3.	The National Biodiversity Strategy and Action Plan, 2000	Protection of sites of high biological diversity outside the protected area system because they may be habitats for unique endemics; Adopting best practices in conservation and management of natural resources	Design and implementation of the proposed project should not in any way result I long term impacts on the biodiversity in its areas of influence
Key Multilateral Environmental Agreements			
1.	The EAC Climate Change Policy (EACCCP) (EAC,2011)	Among other obligations, the EACCP requires that climate change be integrated in all planning, design and implementation of infrastructure projects across the region. This will not only enhance adaptation to effects of climate change but also mitigation.	Existing projects near the site (e.g. mall) are powered by solar. The current project shall also be powered by solar during occupation. This will largely reduce grid emissions given that 30% of Kenya's grid electricity is produced from thermal power plants
2.	The United Nations Convention on biological diversity (CBD), 19992	Article 8 - In-situ conservation (d) Promoting protection of ecosystems, natural habitats and maintenance of viable populations of species in natural surroundings (j) Respecting, preserving and maintaining knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application; Article 13 - Public education and awareness etc.	Design and implementation of the proposed project should not in any way result I long term impacts on the biodiversity in its areas of influence
3.	The United Nations Framework Convention on Climate Change (UNFCCC), 1992	This convention set out the framework for combating climate change and is also a key guide in formulation of policies and agreements aimed at climate change mitigation and adaptation. Parties to the UNFCCC are required under Article 6, to foster education and awareness on climate change	Existing projects near the site (e.g. mall) are powered by solar. The current project shall also be powered by solar during occupation. This will largely reduce grid emissions given that 30% of Kenya's grid electricity is produced from thermal power plants
4.	Sustainable development goals (SDGs)	One of the key targets of sustainable development goal 11 (SDG 11) is to ensure access to adequate, safe and affordable housing and basic services for all and upgrade slums by 2030. Kenya ratified the SDGs in 2015	The proposed project is consistent with targets set for SDG 11 - Make cities and human settlements inclusive, safe, resilient and sustainable. It will increase availability of affordable houses.

4.3. Environmental safeguards for funding agencies

In addition to the NEMA Guidelines outlined in section 3.5 above, this study will conform to the International Finance Corporation (IFC) performance standards on environment and social sustainability (IFC 2012). The Performance Standards provide direction on how to identify risks and impacts. They are intended to aid in avoidance, mitigation, and management of risks and impacts as a way of doing business in a sustainably. This includes stakeholder engagement and disclosure obligations of the proponent in relation to project-level activities (IFC 2012). The standards are briefly discussed below.

4.3.1. Assessment and Management of Environmental and Social Risks and Impacts

Performance standard 1 emphasises the significance of managing a project's environmental, social risks and impacts in a structured way on an ongoing basis (IFC 2012). It further calls for community engagement throughout the project implementation cycle. For the current project, this standard was applied by undertaking an environmental impact assessment. In doing so, the consultant incorporated (i) policy-in section 4; (ii) identification of risks and impacts – in section 6; (iii) management programs-section 7 and 8; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement – in section 5; and (vii) monitoring and review-in section 9.

4.3.2. Labour and Working Conditions

Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental1 rights of workers (IFC 2012). The requirements set out in this Performance Standard have been in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN)[5].

The main objectives of this performance standard are:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labour laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers and
- To avoid the use of forced labour.

The proponent is advised to implement the project by appointing a reputable contractor. The contractor must be made aware of the high standards of labour and working conditions that must be maintained. Central to this will be non-discrimination, proper wages and

[5] These conventions are:
ILO Convention 87 on Freedom of Association and Protection of the Right to Organize
ILO Convention 98 on the Right to Organize and Collective Bargaining
ILO Convention 29 on Forced Labour
ILO Convention 105 on the Abolition of Forced Labour
ILO Convention 138 on Minimum Age (of Employment)
ILO Convention 182 on the Worst Forms of Child Labour
ILO Convention 100 on Equal Remuneration
ILO Convention 111 on Discrimination (Employment and Occupation)

compensation, a mechanism for resolving work related conflicts, adherence to occupational health and safety laws among others.

4.3.3. Resource Efficiency and Pollution Prevention

Performance standard 3 requires that the proponent apply appropriate measures and technologies to sustainably use resource, prevent pollution emission of greenhouse gases (GHG) (IFC 2012). The main objectives of performance standard 3 are:

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce project-related GHG emissions (IFC 2012).

There are various opportunities in the proposed project to achieve these objectives. The key target areas are wastewater management, sourcing of materials, water and energy use. Consequently, wastewater from the residential blocks will also be treated and reused, reducing pressure on municipal effluent management resources. The entire project will be powered by solar energy during the occupation, thus reducing grid emissions[6].

4.3.4. Community Health, Safety, and Security

Performance Standard 4 addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups (IFC 2012). Its core objectives are:

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out following relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Through the EIA process, the proponent has identified risks and impacts and proposed mitigation measures that are commensurate with their nature and magnitude. These measures will favour the avoidance of risks and impacts over minimization. The building plans have been designed and will be constructed by competent professionals and certified by government lead agencies such as the National Construction Agency and the physical planning department.

4.3.5. Land Acquisition and Involuntary Resettlement

Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use (IFC 2012).

[6] Approximately 30% of Kenya's grid electricity is generated from thermal power plants

The proposed project site is private land owned by the proponent. Thus implementation of the project will not result in displacement nor resettlement.

4.3.6. Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 6 identifies that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development (IFC 2012). The main objectives of performance standard 6 are:

- To protect and conserve biodiversity.
- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources by adopting practices that integrate conservation needs and development priorities (IFC 2012).

The other notable indirect impact is material extraction in rural areas to benefit urban dwellers. An example of indirect effects on biodiversity in Nairobi is charcoal sourced from forests in the rural forests (a classic case of urban ecological footprint).

4.3.7. Indigenous Peoples

Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population (IFC 2012). Its key objectives are:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present (IFC 2012).
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

The proposed project' are of influence is highly built up. There are no communities of Indigenous Peoples within the project area of influence who may be affected by the project.

4.3.8. Cultural Heritage

Performance Standard 8 recognizes the importance of cultural heritage for current and future generations (IFC 2012). Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that proponents protect cultural heritage in the course of their project activities. In addition, the

requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity (IFC 2012). Objectives for this performance standard are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

Cultural heritage under this standard refers to

a) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values;
b) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and
c) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

At the proposed site, there aren't any tangible, intangible nor unique natural features that may be classified under cultural heritage as defined above. The closest tangible cultural heritage site near the property is Karura forest which is approximately 2.5km away.

4.3.9. Project activities triggering IC performance standards

The Table 3 below justifies the degree to which the IFC performance standards relate to the execution of the proposed project.

Table 3: Project activities triggering IFC performance standards

Performance Standard	Criteria Yes/No	Remarks
1.	Yes	The project components will trigger Assessment and Management of Environmental and Social Risks and Impacts. The neative impacts are site-specific and mitigation measures can be designed more readily
2.	Yes	The proponent is advised to implement the project by appointing a reputable contractor. The contractor must be made aware of the high standards of labour and working conditions that must be maintained. Central to this will be non-discrimination, proper wages and compensation, a mechanism for resolving work related conflicts, adherence to occupational health and safety laws among others.
3.	Yes	There are various opportunities in the proposed project to achieve these objectives. The key target areas are in wastewater management, sourcing of materials, water and energy use. Treated wastewater will be used for construction, thereby reducing pressure on water resources. Consequently, wastewater from the residential blocks will also be treated and reused, reducing pressure on municipal effluent management resources. The entire

		project will be powered by solar energy during occupation thus reducing grid emissions
4.	Yes	Through the EIA process, the proponent has identified risks and impacts and proposed mitigation measures that are commensurate with their nature and magnitude. These measures will favour the avoidance of risks and effects over minimization. The building plans have been designed and will be constructed by competent professionals and certified by government lead agencies such as the National Construction Agency and the physical planning department.
5.	No	The proposed project site is private land owned by the proponent. Thus implementation of the project will not result in displacement nor resettlement.
6.	Yes	The other notable indirect impact is material extraction in rural areas to benefit urban dwellers. An example of indirect effects on biodiversity in cities is charcoal sourced from forests in the rural forests (a classic case of urban ecological footprint).
7.	No	The proposed project' are of influence is highly built up. There are no communities of Indigenous Peoples within the project area of influence who may be affected by the project.
8.	No	At the proposed site, there aren't any tangible, intangible nor unique natural features that may be classified under cultural heritage as defined above. The closest tangible cultural heritage site near the property is Karura forest which is approximately 2.5km away.

4.4. Institutional Framework

The environmental impact assessment for the proposed development is influenced by interest of several stakeholders and lead agencies, either exclusively or concurrently. Some of these stakeholders and lead agencies include:

- National Environmental Management Authority (NEMA)
- Director of Physical Planning
- The County Government of Nairobi
- The Ministry of Housing
- The ministry of Environment and Natural resources

4.5. Development Policy Framework

The overall development policy framework for the proposed project is captured in various local authority and government documents. The development of this project has been benchmarked against UN and International guidelines.

4.5.1. The World Commission on Environment and Development

The commission commonly referred to as "the Brundtland Commission" is focused on the environmental aspects of development. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. Social sustainable development maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and wellbeing, adequate nutrition, shelter, cultural expression, and political involvement [7].

4.5.2. The Rio Declaration on Environment and Development

The Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nation Conference on Environment and Development, known as the earth summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992. Under Agenda 21, Principle No. 10 of the declaration underscores that environmental. Issues are best handled with participation of all concerned citizens at all relevant levels. At the national level, each individual shall have appropriate access to information concerning environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy shall be provided.

The foregoing discussion is relevant to the proposed development because Kenya legislation demands that public must be involved before any development project that is likely to have adverse impacts to the environment is initiated by a project proponent. The environment Act has further established public complaints committee (PCC) where the issues raised by the public in regard to any proposed development can be addressed[8].

4.5.3. Kenya Vision 2030

Under the Vision 2030, the Kenyan government has committed to provide adequate, affordable and quality housing for all citizens, particularly the low income groups (Government of Kenya 2007). Furthermore, the Kenyan government launched an ambitious goal of supporting the construction of at least 500,000 affordable houses by the year 2022. Additionally, Kenya aims to be a nation that has a clean, secure and sustainable environment by 2030.The goals for 2030 are: (i) to increase forest cover from less than 3% at present to 4%; and (ii) to lessen by half all environment-related diseases.

Specific strategies will involve promoting environmental conservation in order to provide better support to the economic pillar flagship projects and for the purposes of achieving the sustainable Development Goals (SDGs); improving pollution and waste management through the design and application of economic incentives; and the commissioning of public-private partnerships (PPPs) for improved efficiency in water and sanitation delivery. Kenya will also enhance disaster preparedness in all disaster-prone areas and improve the capacity

[7] Gro Harlem Brundtland, *Report of the World Commission on Environment and Development:" Our Common Future."*(United Nations, 1987).

[8] L. Hens, "The Rio Declaration on Environment and Development," *Regional Sustainable Development Review: Africa. Oxford, UK, Eolss Publishers*, 2005, http://www.eolss.net/sample-chapters/c16/E1-48-43.pdf.

for adaptation to global climatic change. In addition, the country will harmonize environment-related laws for better environmental planning and governance[9].

4.5.4. Sustainable development goals (SDGs)

Kenya ratified the sustainable development goals in august 2015. The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

The proposed project will be guided by targets and indicators espoused in the following sustainable development goals. Whereas the time frame for achieving the SDGs has been set for year 2030, achievement for certain targets for the current project will be immediately during construction and occupation.

- SDG 6 – clean water and sanitation. The proponent will be required to provide clean drinking water for workers during construction and occupiers during operational phase.
- SDG 10 – Reduced inequality. Equal opportunity for employment across gender must be given throughout the project cycle
- SDG 11 – Sustainable cities. The development offers opportunities to achieve this goal. Construction of multistoried buildings it is possible to reduce both the direct and indirect demand of built-up and bio productive areas correspondingly. Onsite treatment of waste water from the apartments will further enhance sustainable use of land and water resources.
- SDG 13 – Climate action. Incorporating solar PV for lighting and solar water heating will reduce grid emissions thereby mitigating against climate change.

[9] Kenya Vision, "2030: A Globally Competitive and Prosperous Kenya (2007)," *Ministry of Planning and National Development and the National Economic and Social Council (NESC), Government of Kenya, Nairobi (GOK, 2007)*, n.d.

V. PUBLIC PARTICIPATION

5.1. Objectives of the consultation and public participation

The objective of the Consultation and Public Participation (CPP) as required in EMCA chapter 387 was to:-

1. Disseminate and inform the public and other stakeholders about the proposed project with particular reference to its essential components, location and expected impacts.
2. Create awareness among the public on the need for the EIA for the proposed project.
3. Gather comments, concerns and suggestions of the interested and would be affected/interested parties.
4. Ensure that the concerns of the interested and would be affected/interested parties were known to the decision-making bodies and the proponent at an early phase of project development planning.
5. Establish a communication channel between the interested, would be affected/interested parties, the team of consultants and the Government.
6. Incorporate the information collected in the project by EIA Experts.

The purpose of such a process was to identify the positive and negative impacts of the project and subsequently suggest mitigation measures.

5.2. Methodology used in the CPP

The Consultation and Public Participation (CPP) Process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA Cap 387 section 58, on Environmental Impact Assessment to achieve the fundamental principles of sustainable development[10].

5.3. Public consultation meeting

5.3.1. Introduction

In consultation with the proponent and the area chief, the consultant organized a public meeting at the project site on 5th June 2021. Attendees to the forum discussed the project components and associated impacts. Minutes of the meeting and a list of attendants are attached to this report.

5.3.2. Emerging issues

In general, the neighbours welcomed the project and appreciated its benefits, such as contributing to low-cost housing and creating jobs. They believed that the project would succeed if adequately managed and would improve the aesthetics of the area. However, they voiced some concerns, which the proponent and the project engineer addressed as outlined below.

1) Damage to the access road – neighbours were concerned that trucks delivering material to the site would damage the access road. The proponent committed to regularly improving the road during construction and paving it before the occupation of the proposed apartments.

[10] Adapted from "Introduction" in McKeown, Rosalyn. Education for Sustainable Development Toolkit, Version 2, Centre for Geography and Environmental Education, University of Tennessee, July 2002.

2) Biodigestor would attract disease-bearing insects like mosquitoes – some attendees sought to know how the biodigester would work, fearing that portions of untreated wastewater would be exposed hence attracting insects. All components of the biodigester would be underground, as is standard practice. One attendee and the project engineer gave examples of projects in the area that had functioning biodigesters.
3) Security – attendees sought to know how the proponent would manage safety in the project area. The proponent reported that they would install CCTV and employ a reputed firm to guard the property.
4) Employment of non-local people – the proponent assured attendees that the project would only hire personnel from the area except for skilled professionals that may not found nearby.
5) Traffic congestion – attendees were concerned that the project would cause traffic congestion during the occupation. The project engineer revealed that there would be different entry and exit gates to the site and acceleration lanes on each path to ease traffic movement.
6) Flooding of neighbouring property – neighbours were concerned that the project would cause flooding of their property if they did not implement adequate drainage systems. The project engineer revealed sufficient plans to construct drainage systems directing stormwater to the municipal drainage, and there would be no flooding.
7) Increased dust generation – attendees were concerned that the project would generate dust during construction, interfering with their everyday lives. The proponent assured the neighbours that they would enforce sufficient measures to prevent dust pollution. These measures will include sprinkling water on excavated soils and access road, covering stockpiles and using nets to contain dust particles from falling on neighbouring property.

VI. POTENTIAL ENVIRONMENTAL IMPACTS

6.1. Positive Impacts during Construction

6.1.1. Employment Opportunities

One of the main positive impacts during the projects construction phase is employment opportunities, especially to casual workers and several other skilled workers such as building and construction engineers. Employment opportunities are of benefit both economically and socially.

Several workers, including casual labourers, masons, carpenters, joiners, electricians, and plumbers are expected to work on the site during the construction phase. Apart from casual labour, semi-skilled, unskilled labour and formal employees are also expected to obtain gainful employment during the period of construction. Generally, employment during the construction phase will lead to multidimensional development in the area and improve several people's living standards.

6.1.2. Optimal use of land

In Africa the UN predicts that the current 400 million urban citizens will exceed 750 million by 2030 and will reach 1.2 billion by 2050[11]. It is also plausible to note that while urban population increases the size of land available for development will continue to decrease. The effect of this trend has been the reduction of farmland and encroachment into animal habitats and migration routes. Thus, it is highly recommended that land being a finite resource must be optimally utilized.

The proposed project will see conversion of idle land into a housing estate for 400 households. The new design of 15 levels above ground apartments will also make it easier for provision of services such as waste management, piped water and electricity. It is important to underline that the 15-storey apartment blocks are able to annually accommodate a greater number of dwellers by means of the wider housing surface as compared to single dwelling/ detached houses. It is reported that detached houses have a larger ecological footprint than storied houses (Bastinoni, et al. 2006). Thus, through the construction of multistoried buildings it is possible to reduce both the direct and indirect demand of built-up and bio productive areas correspondingly.

6.1.3. Economic Growth

Through the use of locally available materials during the construction phase e.g. cement, concrete and ceramic tiles, timber, sand, ballast electrical cables and others; the project will contribute towards growth of the country's economy by contributing to the gross domestic product. The consumption of these materials, oil, fuel and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

[11] Pieterse, E. (2009). African cities: Grasping the unknowable. *Inaugural Lecture, University of Cape Town, August, 26.*

6.1.4. Improvement of the Informal Sector

There are usually several informal businesses, which come up during the construction periods of such projects. These include food vendors who benefit directly from the construction workers buying food and other commodities from them. This will promote the informal sector in securing some temporary revenue and hence improve their livelihood.

6.1.5. Market for Supply of Building Materials

The project will require supply of large quantities of building materials most of which will be sourced locally in within Nairobi and the surrounding areas. This provides ready market for building material suppliers such as quarrying companies and hardware shops.

6.2. Negative Impacts during construction

6.2.1. Noise pollution

The construction works will most likely be a noisy operation due to the moving machines (mixers, tippers, communicating workers) and incoming vehicles to deliver construction materials and workers to the site. Workers are most likely to be affected since noise beyond some level is itself a nuisance if not maintained within acceptable levels.

6.2.2. Disposal of excavated soil

Site excavations shall be done to the satisfaction of the Principal Consultant's specification hence some materials shall be rejected as waste for disposal. Improper disposal of this category of waste may have adverse impacts on the receiving environment.

6.2.3. Soil Erosion

The excavation and construction activities are likely to loosen the soil particles making them prone to soil erosion. Such problems become serious when the topsoil is left bare and agents of erosion become active. Soil erosion is an important problem both at its source and downstream of the development site. Lost soil will be deposited somewhere, and the location of the deposition could alter downstream hydrology and increase chances of flooding. It may also pose a water quality issue directly as a result of siltation and indirectly from contaminants carried with or attached to soil particles.

6.2.4. Dust Emissions

Particulate matter pollution is likely to occur during the site clearance, demolitions, excavation and loading and transportation of the construction waste. There is a possibility of PM_{10} suspended and settle-able particles affecting the site workers and even neighbours health.

6.2.5. Increased Water Demand

Both the workers and the construction works will create an increased demand for water in addition to the existing demand. Water will be mostly used in the creation of aggregates for

construction works and for wetting surfaces for softening or hardening after creating the formworks.

6.2.6. Generation of Exhaust Emissions

Exhaust emissions are likely to be generated during the construction period by the various construction machinery and equipment. Motor vehicles used to mobilise the work force and materials for construction would cause a potentially significant air quality impact by emitting pollutants through gaseous exhaust emissions.

6.2.7. Building Materials and Energy Consumption

The main sources of energy that will be required for construction of the project will include mains electricity and fossil fuels (especially diesel). Electricity will be used for welding, metal cutting/grinding and provision of light. Diesel will run material transport vehicles and building equipment/machinery. The proponent should promote efficient use of building materials and energy through proper planning to reduce economic and environmental costs of construction activities.

6.2.8. Generation of solid wastes

During construction solid waste will be generated. These include papers used for packing cement, plastics and timber remains among others. Dumping around the site will interfere with the aesthetic status of the area. This has a direct effect to the surrounding community. Disposal of the same solid wastes off-site could also be a social inconvenience if done in the wrong places. The off-site effects could be aesthetic, pest breeding, pollution of physical environment, invasion of scavengers and informal recycling communities.

6.2.9. Risk of accidents

During construction, it is expected that workers are likely to have accidental injuries as a result of accidental occurrences, handling hazardous waste, lack or neglect of the use of protective gear etc. All necessary health and safety guidelines should be adhered to so as to avoid such circumstances.

Workers are also likely to be exposed to diseases from contact with potentially harmful building materials. It is therefore recommended that before the construction activities, materials should be thoroughly inspected and harmonised to the occupational health and safety standards.

6.2.10. Oil spills

The machines on site may be containing moving parts which will require continuous oiling to minimise the usual corrosion or wear and tear. Possibilities of such oils spilling and contaminating the soil and water on site are real. Likewise, moving vehicles on site may require oil change. But these dangers are curbed by maintaining the machinery in specific areas designed for this purpose.

6.2.11. Increased energy consumption

The project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil fuel is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. The project will use electricity supplied by KPLC for construction while permanent power will be from Two Rivers. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. Approximately32% of electricity in Kenya is generated from thermal sources[12]. Thus it should be prudently used e.g. by installing occupational sensing lights, use of energy saving bulbs and supplementing with solar PV and solar for water heating systems. Such initiatives will lower grid emissions and the overall project carbon footprint.

6.3. Positive Impacts during occupation Phase

6.3.1. Increased national housing stock

There is currently a high demand for housing in Nairobi and other cities and towns in Kenya. It has also been projected that 60% of the world population will live in cities by 2050[13]. The growing urban population calls for affordable housing. The proposed project is geared towards filling the existing housing stock gap by availing an extra 400 units. This will add to the supply of housing which is currently a major socio economic problem for Kenya and especially in Nairobi.

6.3.2. Employment Opportunities

Employment opportunities are one of the long term impacts of the proposed project that will be realised after construction and during the operation and maintenance of the building. These will involve other sources of employment of many skilled and semi-skilled people to work in the proposed commercial building.

6.3.3. Incorporation of proper Waste Management System

The project is designed such that there will be provision of a well-planned strategic waste management system. The wastes will thus be collected from the site in bulk and as one unit such that the careless disposal leading to proliferation of wastes within the surrounding areas will be curbed.

6.3.4. Increased Revenue generation

Revenues paid to the national and county government in form of taxes will increase once the project is complete. The value of the plot will increase leading to increased land rates payable to the County government.

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[12] https://energypedia.info/wiki/Kenya_Energy_Situation - Accessed 14th October 2020

[13] Heilig, G. K. (2012). World urbanization prospects: the 2011 revision. *United Nations, Department of Economic and Social Affairs (DESA), Population Division, Population Estimates and Projections Section, New York.*

6.4. Negative Impacts during operation

6.4.1. Increased Pressure on Infrastructure

The main access to the proposed project shall be from the Two Rivers Development while alternative service access shall be from Limuru Road. During construction there shall be increased use of these roads to ferry material and equipment. Further pressure will be experienced during occupational phase where approximately 400 households will be using the roads to access their apartments.

6.4.2. Water use

Domestic consumption of water during the operation phase of the project will involve the use of large quantities of water that will take place due to the increased number of households in the area.

6.4.3. Solid Waste Generation

It is envisaged that substantial amounts of solid wastes will be generated from the proposed development once it is complete. The bulk of the solid waste produced during the operation of the project will entail paper, plastic, glass, metal, textile and organic wastes. Such wastes can be harmful to the environment through obstruction of drainage systems, clogging of water bodies and negative impacts on animal health. Some of these waste materials especially the plastic/polythene are not biodegradable hence may cause long-term effects to the environment. Even the biodegradable ones such as organic wastes may be harmful to the environment because as they decompose, they produce methane gas, a greenhouse gas known to have a high warming potential.

6.4.4. Increased storm water flow

The building roofs and pavements will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the units. This will lead to increased amounts of storm water entering the drainage systems, resulting in overflow and damage to such systems in addition to increased erosion or water logging in the Neighbouring areas.

6.5. Positive Impacts during decommissioning

6.5.1. Rehabilitation

Upon decommissioning of the proposed project, rehabilitation of the project site will be carried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation, which will lead to improved visual quality of the area.

6.5.2. Employment Opportunities

Employment opportunities will be created for the demolition staff during the demolition phase of the proposed project.

6.6. Negative Impacts during decommissioning

6.6.1. Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas. This will be because of the noise and vibration that will be experienced as a result of demolishing the proposed project.

6.6.2. Generation of Solid Waste

Demolition works will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment.

6.6.3. Increased dust emission

Large quantities of dust will be generated during demolition works. This will affect demolition workers as well as the neighbors and plants in the area.

6.6.4. Loss of all occupational phase benefits

Decommissioning of the project will result in loss of all the positive impacts accrued during occupation of the apartments. These impacts have been discussed in section 6.3 above.

6.7. Climate change impacts

The proposed project construction and operational activities will have an impact on climate change. It is important to study the climate impacts of construction, operation and decommissioning of construction process. Such studies will guide project proponents and policy makers in allocating resources for mitigation. Here we only highlight the foreseen impacts but a detailed life cycle analysis of the project will give a clearer data and results.

The project' impact on climate will largely depend on energy consumption, material extraction, water use and waste water treatment, food waste and other wastes generated, type of solid waste treatment among others. Consumption of fossil fuels to power machinery and vehicles will lead to direct emission of greenhouse gases (GHGs) to the atmosphere. Anaerobic and aerobic treatment of waste water will generate methane- a potent GHG with a global warming potential that is 28-36 times that of carbon dioxide. If methane is not recovered from the process its impact to climate will be significant.

Another source of methane will be decomposition of food waste in landfills and waste treatment sites. About 11% of all the greenhouse gas emissions that come from the food system could be reduced if we stop wasting food[14]. When we waste food, we also waste all the energy and water it takes to grow, harvest, transport, and package it. And if food goes to

[14] https://www.worldwildlife.org/stories/fight-climate-change-by-preventing-food-waste - Accessed 15th October 2020

the landfill and rots, it produces methane. Thus, it will be essential to advise incoming occupiers of the apartments to reduce food waste and or donate leftovers.

The project will also be impacted by climate change. For example, excessive surface temperatures may affect construction workers and machinery performance. High temperatures will also lead to increased electricity consumption since more people will use fans and air conditioners. The result will be increased grid emissions exacerbating the climate crisis. Increased rainfall occasioned by global warming may also cause flooding in the area, thus negatively impacting the apartment complex. Flooding may also provide breeding grounds to disease vectors such as mosquitoes, thereby increasing cases of malaria.

In designing the project, these impacts have been incorporated with the aim of adaptation and mitigation of climate change impacts. For example use of solar PV for lighting and solar water heating will reduce the demand for energy hence reducing grid emissions. However, it might not be easy to convince occupiers to reduce food wastage, but it is essential that they are informed.

VII. MITIGATION MEASURES AND MONITORING PROGRAMMES

7.1. Mitigation of Construction Related Impacts

7.1.1. 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 (greenhouse gases, and diesel related particulate matter) that would occur in the exhaust from heavy equipment are also included. The proponent is committed to implementing measures that shall reduce air quality impacts associated with construction.

All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained regarding the minimization of emissions during construction. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips and minimize idling of engines.
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 daily (with physical sweepers) all paved access roads, parking areas and staging areas at construction sites.

7.1.2. Minimize the Effects of Noise Emitted from the Site

Significance of noise impacts depends on whether the project would increase noise levels above the existing ambient levels by introducing new sources of noise. Noise impacts would be considered significant if the project would result in the following:

a) Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
b) Exposure of persons to, or generation of, excessive ground-borne vibration or ground-borne noise levels.
c) A substantial permanent increase in ambient noise levels (more than five decibels) in the project vicinity above levels existing without the project.
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The proponents shall put in place several measures that will mitigate noise pollution arising during the construction phase. The following noise-suppression techniques will be employed to minimise the impact of temporary construction noise at the project site.

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Establishment of noise buffer, for example waterfalls to mask the traffic noise.
- Use quiet equipment (i.e. equipment designed with noise control elements).

- Co-ordinate with relevant agencies regarding all substation construction activities in the residential areas.
- Install sound barriers for pile driving activity.
- 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.
- Construction/Demolition works should be done during the day when people are away and also the outside environment is also noisy.
- Adhere to the provisions of Noise Prevention and Control Rules 2005, Legal notice no. 24 regarding noise limits at the workplace.

7.1.3. Minimise the Effects of Exhaust Emission

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

a) Vehicle idling time shall be minimized
b) Alternatively fuelled construction equipment shall be used where feasible
c) Equipment shall be properly tuned and maintained

This will also be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road.

7.1.4. Hydrology and Water Quality Degradation

Soil sampling and trial holes digging will be conducted before construction begins and soil information will be provided to construction crews to inform them about soil conditions and potential hazards. If hazardous substances are unexpectedly encountered during trenching, work will be stopped until the material is properly characterised and appropriate measures are taken to protect human health and the environment. If excavation of hazardous materials is required, they will be handled in accordance with applicable regulations. If suspected contaminated groundwater is encountered in the depths of the proposed construction areas, samples will be collected and submitted for laboratory analysis of petroleum hydrocarbons, metals, volatile organic compounds and semi-volatile organic compounds. Appropriate personal protective equipment will be used and waste management will be done in accordance with applicable regulations. Oil absorbent material and storage drums will be used to contain and control any minor releases of engine and other equipment oil.

7.1.5. Worker Accidents and Hazards when Handling Hazardous Wastes

Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided. In addition the proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act, 2007. In this regard, the proponent is committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers as outlined in the EMP.

7.1.6. Increase of disease Vectors

Disease vectors such as rats, flies, and cockroaches increase where refuse is exposed or uncollected and can be a hazard. Complete refuse collection and handling service will be

provided by the proponent so that this is not a hazard in compliance with the Public Health Act and as also required in the Occupational Safety and Health Act, 2007 regarding hygiene at the workplace.

7.1.7. Possible Exposure of Workers to Diseases

Possible exposure of workers to diseases from building materials at construction site shall be mitigated by occupational health and safety standards enforcement as required in the OSHA, 2007.

7.1.8. Worker Accidents during Construction and Operation

Workers accidents especially in deep trenching operations and from gas accumulation in sewers and other confined spaces shall be mitigated by enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.

7.1.9. Reduction of Impacts at Extraction Sites and Efficient Use of Raw Materials

The proponent will source building materials such as sand, ballast and hard core from registered quarry and sand mining firms, whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated.

To reduce the negative impacts on availability and sustainability of the materials, the proponent will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.

In addition to the above measures, the proponent shall consider reuse of building materials and use of recycled building materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

7.1.10. Minimization of Run-off and Soil Erosion

The proponent will put in place some measures aimed at minimizing soil erosion and associated sediment release from the project site during construction. These measures will include terracing and levelling the project site to reduce run-off velocity and increase infiltration of rain water into the soil. In addition, construction vehicles will be restricted to designated areas to avoid soil compaction within the project site, while any compacted areas will be ripped to reduce run-off.

7.1.11. Minimization of Construction Waste

It is recommended that demolition and construction waste be recycled or reused to ensure that materials that would otherwise be disposed as waste are diverted for productive uses. In

this regard, the proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed. Furthermore, damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or home owners.

The proponent shall put in place measures to ensure that construction materials requirements are carefully budgeted and to ensure that the amount of construction materials left on site after construction is kept minimal. It is further recommended that the proponent should consider the use of recycled or refurbished construction materials. Purchasing and using once-used or recovered construction materials will lead to financial savings and reduction of the amount of construction debris disposed of as waste.

Additional recommendations for minimization of solid waste during construction of the project include:-

a) 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
b) Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements
c) Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
d) Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
e) Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.1.12. Reduction of energy consumption

The proponent shall ensure responsible electricity use at the construction site through sensitization of staff to conserve electricity by switching off electrical equipment or appliances when they are not being used. In addition, proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the proponent shall monitor energy use during construction and set targets for reduction of energy use.

7.1.13. Minimization of Water Use

The proponent shall ensure that water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use. The proponent will install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff.

7.1.14. Controlling Oil Spills during Construction Phase

The proponent will control the dangers of oil, grease and fuel spills during construction by maintaining the machinery in specific areas designed for this purpose. Machinery site repair will be discouraged and repair work restricted to approved garages to avoid pollution from oil, grease and fuel.

7.1.15. Public Health, Safety and Awareness

a) The contractor should provide a small section of the construction site with a shed and a water stand where the food can be served to the construction workers to promote hygiene and health of the employees.
b) A fully equipped first aid kit should be provided at the site.
c) The contractor must have workmen's compensation cover as required by law (The Workmen's Compensation Act), as well as relevant ordinances, regulation and union's agreements.
d) The workers, immediate neighbour and other stakeholders should be sensitized on the dangers and risk associated with the construction works for enhanced self-responsibility on personal safety.
e) The proponent should ensure that the completed buildings are fitted with safety facilities including fire detectors, firefighting equipment, fire exits, adequate access and buffer between the residential premises.
f) Disabled access features and safety signage should be placed strategically around and within the buildings.
g) Appropriate sanitation conveniences should be provided at the site as required in the OSHA, 2007 and echoed in the Public Health Act.

7.2. Mitigation of Impacts during Operation Phase

7.2.1. Ensuring Efficient Solid Waste Management

The proponent will be responsible for efficient management of solid waste generated by the project during its operation. In this regard, the proponent will provide waste handling facilities such as waste bins and skips for temporarily holding domestic waste generated from the apartments. Moreover, the proponent will ensure that such waste is regularly and appropriately disposed.

An integrated solid waste management system is recommended. First, the 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. Recycling, reuse and compositing 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 Nairobi City. 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. The proponent will adhere to the Environmental Management and Coordination (Waste Management), Regulations 2006.

7.2.2. Wastewater Management

The proponent will ensure that there are adequate means for handling the large quantities of sewage generated from the facility. Measures are already in place; that is, biodigester since there is no municipal sewer line in the area.

The treated wastewater samples shall be regularly analysed according to the fourth schedule of the water quality regulations 2006. It will also be essential to ensure that sewage pipes are not blocked or damaged so that the waste can be directed to the sewer line since such vices can lead to the release of the effluent, resulting in land and water contamination. Such blockages or damages will be fixed expeditiously. Wastewater shall be disposed of in compliance with the Environmental Management and Coordination (Water Quality), Regulations 2006.

7.2.3. Ensure Efficient Energy Consumption

Tenants will be sensitized to ensure energy efficiency in their domestic operations. Hot water solar heating equipment will be installed. Use of solar will reduce the overall electricity consumption. Furthermore, security lights that have to be kept on throughout the night will be powered by solar. Incandescent bulbs will be highly discouraged.

7.2.4. Ensure General Safety

A competent security firm will be engaged to ensure general safety and security at all times. The installation of an electric fence will enhance the existing perimeter wall. The proponent is also advised to install CCTV cameras at strategic zones within the compound.

7.2.5. Ensure Efficient Water Use

The proponent will install water-conserving automatic taps and toilets. Moreover, any water leaks through damaged pipes and faulty fixtures will be fixed promptly by qualified staff. In addition, the occupants of the facility will be sensitized to use water efficiently.

7.3. Mitigation of Impacts during Decommissioning Phase

7.3.1. Efficient solid waste management

Solid waste resulting from demolition or dismantling works will be managed as described in Section 7.2.1.

7.3.2. Reduction of Dust Concentration

High levels of dust concentration resulting from demolition or dismantling works will be minimized as described in Section 7.1.1.

7.3.3. Minimization of Noise and Vibration

Significant impacts on the acoustic environment will be mitigated as described in Section 7.1.2.

7.4. Compliance with national and international labour laws and policies

The proposed project will comply with the Kenya laws that protect labour standards and the employment guidelines stipulated in the Labour Relations Act (2012) and the Employment Act (2012).

1. **The Labour Relations Act (2012)** – An Act of Parliament to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratization of trade unions and employers organizations or federations, to promote sound labour relations through the protection and promotion of freedom of association, encouragement of effective collective bargaining and promotion orderly and expeditious dispute settlement, conducive to social justice and economic development.
2. **The Employment Act (2012)** – An Act of Parliament to declare and define the fundamental rights of employees, to provide basic conditions of employment of employees and to regulate employment of children. In this regard, the proponent will comply with the legal conditions set to protect the rights of employees with special attention to gender equality and representation; all forms of discrimination, employee entitlement to normal leave, maternity leave and sick leave; sexual harassment; forced/compulsory and child labour and working hours.

The project will also be in conformity with the International Finance Corporation (IFC) policies on labour especially forced labour and child labour. IFC will not support projects that use forced labour or harmful child labour as defined below.

1. **IFC Policy on Child Labour** - Employment of children that is economically exploitive, or is likely to be hazardous to, or interfere with the child's education, or harmful to the child's health, or physical, mental, spiritual, moral and social development.
2. **IFC Policy on Forced Labour** - All work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty.

In addition the project will comply with labour norms based on standards set by international conventions and the International Labour Organization (ILO).

7.5. Action Plan for Occupational Health and Safety

During the construction, occupation and decommissioning phases of the proposed project, the project developer will mainly adopt the IFC environmental health and safety (EHS) guidelines in the prevention of accidents, containment of health hazards and management of security among other contingencies in the project area.

7.5.1. Prevention of accidents

Implementation of the project will definitely increase volume of human and motor traffic in the area. The increase in human and motor traffic will be aggravated by the transportation of construction materials and different sizes of water pipelines. This is likely to result in a higher risk of accidents occurring in the area of operation. Since accidents could result in loss of work time, different levels of disability and fatalities, the project proponent should put in place mechanisms to reduce the number of accidents among the project workers (whether directly employed or subcontracted) to a rate of zero. The project proponent should design and implement safety measures for the prevention of accidents.

Project workers need to be educated on the use of unfamiliar machinery, equipment and tools that may cause a danger to the users. In addition, the workers should be provided with safety instruction manuals and other essentials to contain accidents. Workers should be provided with protective clothing (nose and mouth masks, ear muffs, overalls, industrial boots and gloves) and helmets. Manholes should be covered after construction; trenches dug should be backfilled and barriers warning signs put around them.

In addition to the above measures, the following precautions should be taken to minimize the impacts of accidental oil leakages and spills, if they ever occur during the course of project implementation. Proposed precautions include:

1. Establishment of an appropriate preparedness program;
2. Training of relevant personnel; and
3. Provision of relevant spill mitigation equipment including adsorbent material, leakage plugging devices, foam cover spraying equipment and water spraying equipment among other measures to contain accidents.

7.5.2. Health issues

During the construction, operation and de-commissioning phases of the proposed project, attention must be focused on the health of workers in order to attain health conditions that will permit them to lead socially and economically productive lives. Proper disease control, disease prevention and treatment and methods of raising awareness must be employed among the project workers in order to minimize disease incidences and reduce morbidity.
Of particular importance to the project workers are health issues relating to SARS-Cov-19, HIV/AIDS in the project area. AIDS (Acquired Immuno-deficiency Syndrome) was first diagnosed in Kenya in 1984 and now has become a serious health and economic problem in the country.

The project workers and the surrounding local community must be educated on the strategies of minimizing the risk of contracting HIV/AIDS including the use of condoms. To enhance health conditions in the project area, the proponent will liaise with the medical department of the County government, for provision of medical services where needed.

In addition the project developer should provide a conducive working environment including integrity of workplace, adequate lavatory facilities, potable water supply, clean eating areas, lighting, appropriate access, first aid among other facilities as recommended in the IFC Environmental, Health and Safety (EHS) Guidelines (Mundial, 2007; IFC, 2012). The developer should put in place mechanisms for the provision of adequate health care for

workers, safety of workers and compensation to employees for work related injuries and diseases contracted in the course of their employment, consistent with laws of Kenya and as stipulated in the Public Health Act (2012), Occupational Safety and Health Act (2007) and Work Injury Benefits Act (2012).

7.5.3. Security

The proponent should take precautions to beef up the security of the construction sites especially where equipment and material are left on site. The proponent will hire services of a reputable security firm. Even more imperative, the project proponent should cultivate harmonious co-existence between itself and the local communities in the project area.

7.5.4. Other measures to enhance occupational health and safety

Other measures to enhance occupational health and safety in the project area include:

1 Provision of a fully equipped first aid kits in the project area during the project construction and operational phases ;
2 Provision of medical cover for all staff in order to enhance health standards at the wind park facility;
3 The health staff, environmental manager and other relevant workers should be well trained to act as Safety Officers after acquiring adequate knowledge and experience on first aid training and excellent knowledge of safety regulations;
4 The Contractor should have Workmen's Compensation Cover for the workers;
5 The project should conduct health and safety audits regularly for all the workers on an annual basis;
6 Take measures against risks of electrical shock;
7 Conduct environmental monitoring and auditing for the project in accordance to the requirements of NEMA;
8 Conduct training programs covering several aspects of safety, customer care, defensive driving, first aid, HIV/AIDS, environmental awareness, swimming and lifesaving activities among other training aspects.
9 Adherence to the Ministry of Health guidelines on preventing the spread of the SARS-Cov-19 virus

VIII. ANALYSIS OF PROJECT ALTERNATIVES

8.1. Relocation Option

Relocation option to a different site is an option available for the project implementation. At present the landowner/developer does not have an alternative site. This means that he has to look for the land. Searching for a new site may take long with no guarantees for a suitable find. This would also lead to a situation like No Project Alternative option. The other consequence of this is that it would discourage private/local investors especially in the housing sector. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

8.2. No Project Alternative

The No Project option 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. This option will however, involve several losses both to the landowner and the community as a whole. The landowner will continue to pay rent for the plot while the plot remains idle hence no income to the owner. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors among others:

- It may lead to further land use change (especially agricultural to housing) elsewhere
- It will jeopardize the goal of creating more housing units for the increasing urban population
- No employment opportunities will be created for thousands of Kenyans who will work in the proposed project area and the nearby towns

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the proponent, local people, and the government of Kenya.

8.3. The proposed development alternative

Under the proposed development alternative, the developer will be issued with an EIA License. In issuing the license, NEMA will approve the proponent's proposed development. The proponent will be required to implement the project in line with the licensing conditions and the proposed environment management plan.

8.4. Analysis of Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. 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 re-enforced concrete roofs because they are good in heat insulation with minimal iron sheet roofs. 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 construction methods and technologies to be used will require very little timber.

IX. ENVIRONMENTAL MANAGEMENT/MONITORING PLAN

9.1. Introduction

An environmental management/monitoring plan has been developed to assist the proponent in mitigating and managing environmental impacts associated with the life cycle of the project. It is noteworthy that key factors and processes may change through the life of the project and considerable provisions have been made for dynamism and flexibility of the EMP. As such, the EMP will be subject to a regular regime of periodic review.

Table 4**,** Table 5 and Table 6 form the core of this EMP for the construction, operational and decommissioning phases of the proposed project respectively. In general, the Tables outline the potential safety, health and environmental risks associated with the project and detail all the necessary mitigation measures, their financial costs, as well as the persons responsible for their implementation and monitoring. The EMP will be used as checklist in future environmental audits.

9.2. Construction Phase Environmental Management Plan

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase the proposed project are outlined in Table 4.

9.3. Cost of mitigation

Using best practices in other parts of the world, the costs of the mitigation measures and of the institutional and training requirements to implement them will be estimated with a ceiling budget of approximately **2.5% of the total project cost.** A comprehensive work program, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measure will be prepared based on this budget guideline.

9.4. EMP for construction phase

The necessary objectives, activities, mitigation measures, responsibilities and monitoring indicators pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the proposed project are outlined in Table 4 below

Table 4: EMP for Construction Phase

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
1. Curb project associated conflicts and Lost Time Injuries (LTI) e.g. land ownership disputes.				
Project implementation disputes	Sufficient planning for adequate resources required i.e. financial, personnel and equipment	Proponent & Contractor	Project planning phase	Monetary and material Resources allocated for the project
	Land transfer agreements should be formalized before the project start as per the laws of the land	Proponent/Government of Kenya	Project planning phase	Land ownership documents
	Community support mobilization and sensitization through consultative forums or questionnaire methods	Proponent & EIA Experts	Project planning phase	Public meetings and interviews conducted
	Change of use to residential and commercial use	Proponent & County government	Project planning phase	Change of use certificate obtained
2. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High Demand of Raw material	Source building materials from local suppliers who use environmentally friendly processes in their operations	Project Manager & Contractor	Throughout construction period	Number of complaints received from material sources e.g. stone quarries
	Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered	Project Manager & Contractor	Throughout construction period	-
	Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Project Manager & Contractor	Throughout construction period	Quantity of damaged material

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Project Manager & Contractor	Throughout construction period	Quantity of recycled material e.g. steel used
3. Minimize vegetation disturbance at and or around construction site				
Vegetation disturbance	Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor, Civil engineer & Project Manager	During construction phase	Percentage of area left undisturbed by development Percentage of area covered by vegetation
	Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage	Civil Engineer, Architect and Project Manager	During construction phase	-
	Designate access routes and parking within the site	Civil Engineer, Architect and Project Manager	During construction phase	-
	Introduction of vegetation (trees, shrubs and grass) on open spaces and their maintenance	Architect & Landscape specialist	Monthly to Annually	Number of trees planted and % of area covered by vegetation
	Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction	Architect & Landscape specialist	2 months	Percentage of area landscaped
4. Reduce storm-water, runoff and soil erosion				

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
Increased storm water, runoff and soil erosion	A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed	The Civil Engineer, Mechanical Engineer and Project Manager	1 month	Types of soil erosion control measures in place;
	Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.		1 months	
	Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site		Throughout construction period	
	Ensure that any compacted areas are ripped to reduce run-off.		2 months	
	Open drains all interconnected will be provided on site	Civil Engineer	Throughout construction period	-
5. Minimize solid waste generation and ensure efficient solid waste management during construction				
Increased solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion 5. Sanitary land filling	Project Manager & Contractor	Throughout construction period	Quantity of wastes removed from the site; Quantity of recycled and reused waste

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed rather than cutting them to size, or having large quantities of residual materials	Project Manager & Contractor	During construction phase	Inventory of material used
	Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed.	Project Manager & Contractor	During construction phase	Inventory of unused material
	Ensure that damaged or waste construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects	Project Manager & Contractor	During construction phase	Inventory of damaged material
	Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or homeowners.	Project Manager & Contractor	During construction phase	Quantity and type of donated material
	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	Project Manager & Contractor	Throughout construction period	-
	Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Project Manager & Contractor	During construction phase	-

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Purchase of perishable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials.	Project Manager & Contractor	Throughout construction period	Inventory of unused material
	Use building materials that have minimal or no packaging to avoid the generation of excessive waste	Project Manager & Contractor	Throughout construction period	Quantity and type of packaging
	Use construction materials containing recycled content when possible and in accordance with accepted standards.	Project Manager & Contractor	Throughout construction period	Inventory of recyclable material such as steel
	Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	Quantity and type of reused material
	Dispose waste more responsibly by dumping at designated waste treatment sites or landfills only.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	Quantity of disposed wastes; Number of waste Tracking documents filled
	Waste collection bins to be provided at designated points on the site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	Number of waste Tracking documents filled; Waste transport licenses from the waste handler; number of waste related complaints received from tenants, homeowners and neighbours
	Private waste disposal company to be contracted to transport and dispose the solid waste from site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	
	Running an educational campaigns amongst employees, e.g. through use of posters, to encourage reuse or recycling of the solid waste	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
6. Reduce dust emissions				
Dust emission	Ensure strict enforcement of on-site speed limit regulations	Project Manager & Contractor	Throughout construction period	Dust emission levels measured
	Avoid excavation works in extremely dry weathers	Project Manager & Contractor	Throughout construction period	
	Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles	Project Manager & Contractor	Throughout construction period	
	Personal Protective equipment to be worn always when at work place	Project Manager	Throughout construction period	
7. Minimization of exhaust emissions				
Exhaust emission	Vehicle idling time shall be minimized	Project Manager & Contractor	Throughout construction period	-
	Alternatively fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained	Project Manager & Contractor	Throughout construction period	Type and quantity of fuel used' number of trips and distance per truck and other vehicles
	Sensitise truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off vehicle engines at these points	Project Manager & Contractor	Throughout construction period	Number of training sessions for drivers
8. Minimization of noise and vibration				
Noise and vibration	Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager & Contractor	Throughout construction period	Number of training sessions with truck drivers

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Sensitise construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals	Project Manager & Contractor	Throughout construction period	-
	Ensure that construction machinery are kept in good condition to reduce noise generation	Project Manager & Contractor	Throughout construction period	Noise levels measured at the site
	Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels	Project Manager & Contractor	Throughout construction period	Noise levels measured at the site
	The noisy construction works will entirely be planned to be during daytime when most of the neighbours will be at work.	Project Manager & all site foremen	Throughout construction period	Number of noise complaints received
	Comply with the provisions of Noise Prevention and Control Rules 2005, Legal notice no. 24 regarding noise limits at the workplace	Project Manager & all site foremen	Throughout construction period	Noise levels measured during construction activities; Number of noise complaints received
9. Minimization of energy consumption				
Increased energy consumption	Ensure electrical equipment, appliances and lights are switched off when not being used	Project Manager & Contractor	Throughout construction period	-
	Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Project Manager & Contractor	Throughout construction period	Number of energy saving lights used

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts by using feasible short routes	Project Manager & Contractor	Throughout construction period	Quantity of fuel consumed
	Monitor energy use during construction and set targets for reduction of energy use.	Project Manager & Contractor	Throughout construction period	Quantity of fuel consumed
10. Minimize water consumption and ensure more efficient and safe water use				
High water demand	Install water conserving taps that turn-off automatically when water is not being used	Project Manager & Contractor	One-off	Number of water conservation taps installed
	Promote recycling and reuse of water as much as possible	Project Manager & Contractor	Throughout construction period	-
	Install a discharge meter at water outlets to determine and monitor total water usage	Project Manager & Contractor	One-off	Quantity of water used
	Promptly detect and repair water pipe and tank leaks	Project Manager & Contractor	Throughout construction period	Number of recorded leaks and repairs
	Sensitise staff to conserve water by avoiding unnecessary water use	Project Manager & Contractor	Throughout construction period	Number of trainings done on water conservation
	Ensure taps are not running when not in use	Project Manager & Contractor	Throughout construction period	-
11. Minimize release of liquid effluent				
Generation of wastewater	Use portable chemical toilets where there is no viable alternative	Mechanical Engineer & Project Manager	During construction	-

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Conduct regular checks for pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies	Mechanical Engineer & Project Manager	Throughout construction period	Number of repairs done and complains received
	Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated	Mechanical Engineer & Project Manager	Throughout construction period	Analytical report for effluent
12. Minimize occupational health and safety risks				
Approval of building plans	Ensure that all building plans are approved by the Local Authority and the local Occupational Health and Safety Office	Proponent	One-off	-
Incidents, accidents and dangerous occurrences.	Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	Project Manager, Developer & Contractor	Continuous	Number of accidents occurring during construction; Type of PPEs used by workers
	Enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.	The Contractor, Project Manager& Site Safety Officer	Continuous	-
Insurance	Ensure that the premises are insured as per statutory requirements (third party and workman's compensation)	Developer	Annually	Number of insured workers and vehicles

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
Health and safety committee	Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer/contractor and the workers are represented	Project Manager	Continuous	-
Sanitary conveniences	Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers	Project Manager	Continuous	Type of sanitary facilities provided; number of complaints received
Medical examination	Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment	Project Manager, Developer & Contractor	Continuous	Frequency of medical examination
Machinery/equipment safety	Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded	Project Manager, Developer & Contractor	Continuous	Number of accidents recorded; Types of PPEs provided
	Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain	Project Manager, Developer & Contractor	Continuous	–
	All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury	Project Manager	Continuous	–
	Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Project Manager	Continuous	Number of training sessions done

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued	Project Manager	Continuous	Frequency of inspection of fire extinguishers
	Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register	Project Manager	Continuous	Number of reports
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	Project Manager	Continuous	-
	Ensure that items are not stored/stacked against weak walls and partitions	Project Manager	Continuous	_
Safe means of access and safe place of employment	All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained	Project Manager & Contractor	Continuous	_
	Securely fence or cover all openings in floors	Project Manager & Contractor	Continuous	_
	Provide all staircases within the premises with suitable handrails on both sides	Project Manager & Contractor	Continuous	
	Ensure that construction workers are not locked up such that they would not escape in case of an emergency	Project Manager & Contractor	Continuous	_
	All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained	Project Manager & Contractor	One-off	_

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency	Project Manager & Contractor	One-off	Evacuation procedures and trainings done
	Such procedures must be tested at regular intervals	Project Manager & Contractor	Every 3 months	
	Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers	Project Manager & Contractor	One-off	
	Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site	Project Manager & Contractor	One-off	
	Provide measures to deal with emergencies and accidents including adequate first aid arrangements	Project Manager & Contractor	Continuous	Number of workers trained on first aid
First Aid	Well stocked first aid box which is easily available and accessible, should be provided within the premises	Project Manager & Contractor	One-off	Number of first aid kits provided
	Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Project Manager & Contractor	One-off	Number of workers trained as first aiders; ratio of first aiders to rest of workers
13. Ensure the general safety and security of the site and surrounding areas				
Increased Pressure on Infrastructure	Coordinate with other planning goals and objectives for the region	Architect, Project Manager, Contactor and the Developer	Continuous	Approvals from county government and other agencies

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
	Upgrade existing infrastructure and services, where feasible.	Architect, Project Manager, Contactor and the Developer	Continuous	
Insecurity	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site.	Security Officer, Project Manager & Police	Continuous	Number of recorded site intrusions
	Body-search the workers on entry, to avoid getting weapons on site, and leaving site to ensure nothing is stolen.	Security Officer	Continuous	
	Ensure only authorised personnel get to the site	Security Officer	Continuous	
	Security alarms will be installed	Security Officer	Continuous	
14. Environmental monitoring of the project				
Environmental concern during the construction phase	Due to the magnitude of the project the proponent will liaise with the environmental consultants throughout the construction phase and ensure that the conditions of approval are adhered to.	Proponent, Contractor and Consultant	Throughout construction phase	Number of environmental related complaints received from workers and neighbours

9.5. EMP for operational phase

The necessary objectives, activities, mitigation measures, responsibilities and monitoring indicators pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the operational phase of the proposed project are outlined in **Table** 5 below

Table 5: EMP for Operation Phase

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
1 Minimization of solid waste generation and ensuring more efficient solid waste management				
Increased generation of solid waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion 5. Sanitary landfilling.	Proponent/Property Managers	During the life of the project	Quantity of recycled, composted & land filled waste Number of tenants/homeowners segregating their waste
	Provide solid waste handling facilities such as waste bins and skips	Proponent/Property Managers	Continuous	Type and number of waste bins and skips provided
	Ensure that solid waste generated is regularly disposed appropriately at authorised waste treatment sites	Proponent/Property Managers	Continuous	Frequency of waste collection Quantity of waste collected
	Donate redundant but serviceable equipment to charities and institutions	Proponent/Property Managers	Continuous	Types and quantity of equipment and material donated
	Comply with the provisions of Environmental Management and Co-ordination (Solid Waste) Regulations 2006	Proponent/Property Managers	Continuous	Number of waste tracking documents filled Waste transport licenses from the waste handler Quantity of segregated wastes
2 Minimise risks of liquid waste release into the environment				
Liquid waste release into the environment	Proper use of the biodigester	Proponent/Property Managers	During construction phase	Analytical reports of the treated waste water

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
	Develop an operational environmental management plan (OEMP) for the biodigester in line with EDL licensing conditions	Proponent/Property Managers	After obtaining an EDL	OEMP for the biodigester
	Conduct regular inspections of the biodigester and plumbing and make adjustments and or repairs promptly	Proponent/Property Managers	Continuous	Number of recorded complaints from neighbours, homeowners and tenants
	Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated effluent discharge rules and standards are not violated	Proponent/Property Managers	Continuous	Analytical reports of the treated wastewater versus the recommended limits
	Comply with the provisions of Environmental Management and Co-ordination (Water Quality) Regulations 2006	Proponent/Property Managers	Continuous	Level of compliance with the EDL conditions
3 Minimize energy consumption				
Energy Use	Installation and use of solar PV for lighting pavements and roads; Installation and use of solar water heating systems	Proponent	Continuous	Number of solar street lights installed; the number of solar water heating systems installed; savings made on electricity bills due to use of solar technology
	Switch off electrical equipment, appliances and lights when not in use	Proponent/Property Managers	Continuous	Savings (electricity bills) made when compared to a business as usual scenario
	Install occupation sensing lighting at various locations such as the parking areas which are not in use all the time	Proponent/Property Managers	One-off	Number of occupational sensing lights installed

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
	Install energy saving fluorescent tubes at all lighting points within instead of bulbs which consume higher electric energy	Proponent/Property Managers	One-off	Savings (electricity bills) made when compared to if incandescent bulbs were used
	Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent/Property Managers	Continuous	Targets set and met
	Sensitise workers on how to use energy efficiently	Proponent/Property Managers	Continuous	Number of advice notices on energy saving
4 Minimize water consumption and ensure more efficient and safe water use				
Water management	Promptly detect and repair water pipe and tank leakages	Proponent/Property Managers	Continuous	Number of repairs done
	Workers/visitors to conserve water e.g. by avoiding unnecessary toilet flushing	Proponent/Property Managers	Continuous	-
	Ensure taps are not running when not in use	Proponent/Property Managers	Continuous	-
	Install water conserving taps that turn-off automatically when water is not being used	Proponent/Property Managers	One-off	Number of water conservation taps installed
	Install a discharge meter at water outlets to determine and monitor total water usage	Proponent/Property Managers	One-off	Quantity of water used per month
5 Minimization of health and safety impacts				
Implement all necessary measures to ensure health and safety of workers and the general public during operation of the offices as stipulated in the Occupational Safety and Health Act,2007		Proponent/Property Managers	Continuous	Number of occupational accidents recorded per year
6 Ensure the general safety and security of the premises and surrounding areas				

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises		Proponent/Property Managers	Continuous	Number of security complaints received
7 Control of informal activities around the project site				
Mushrooming of Informal Settlement		Sub County Administration	Continuous	-number of kiosks around the project perimeter fence
8 Ensure environmental compliance				
Undertake an environmental audit within 12 months after operation commences as required by law		Consultant	12 months after operation commences	Number of improvement notices and or compliance letters obtained

9.6. Decommissioning Phase

In addition to the mitigation measures provided in Table 4 and **Table** 5, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in Table 6 below.

Table 6: EMP for Decommissioning Phase

Foreseen Negative Impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
1. Demolition waste management				
Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	One month	Quantity of waste generated

Foreseen Negative Impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Project Manager & Contractor	During decommissioning	Quantity of recovered material that can be recycled
	All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Project Manager & Contractor	During decommissioning	
	Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Project Manager & Contractor	During decommissioning	Quantity of material recycled or sold for recycling
	Donate reusable demolition waste to charitable organizations, individuals and institutions	Project Manager & Contractor	During decommissioning	Quantity of material donated
2. Rehabilitation of project site				
Site degradation	Implement an appropriate re-vegetation programme to restore the site to its original status	Project Manager & Contractor	During decommissioning	Area of and that has been re-vegetated
	Consider the use of indigenous plant species in re-vegetation	Project Manager & Contractor	During decommissioning	Number of indigenous trees planted
	Trees should be planted at suitable locations to interrupt slight lines (screen planting), between the adjacent area and the development.	Project Manager & Contractor	During decommissioning	-

X. CONCLUSION AND RECOMMENDATION

10.1. Conclusions

5) The proposed development project is commensurate with Kenya government policies to provide affordable housing. Upon completion, Mzizi will have 1,600 units in line with the Government of Kenya goal of delivering 500,000 affordable homes under the Big Four Agenda as well as the Vision 2030

6) Key positive impacts that will result from the project include; growth of the economy, boosting of the informal sector during the construction phase, provision of market for supply of building materials, employment generation, increase in government revenue and optimal use of land.

7) Negative environmental impacts that will result from establishment of the proposed project which include pressure on the existing facilities, noise pollution, dust emissions, solid waste generation, increased water demand, increased energy consumption, generation of exhaust emissions, risk of workers accidents, possible exposure of workers to diseases, increased

8) Negative impacts can be sufficiently mitigated by implementation of the proposed EMP

10.2. Recommendations

1) The proponent to implement the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

2) Maximize positive impacts as much as possible as exhaustively outlined within the report. This will ensure the best possible environmental compliance and performance standards.

3) Additionally, use solar PV especially for lighting streets and pavements as well as for heating water. This will reduce demand for fossil fuels in power generation hence curbing GHG emissions.

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APPENDICES