

**ENVIRONMENTAL IMPACT ASSESSMENT STUDY  
FOR  
THE PROPOSED AFFORDABLE HOUSING UNITS DEVELOPMENT  
ON L.R. NO. 22/365 (WITHIN THE TWO RIVERS DEVELOPMENT)  
ALONG THE NORTHERN BY-PASS,  
NAIROBI COUNTY**

November 2020

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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**DECLARATION**

**Two Rivers Development Limited**

That the Environmental Impact Assessment study report submitted is based on the proposed affordable houses on plots LR. NO. 22/365 within the Two Rivers Development along the Northern By Pass Road, Nairobi County.

That the study has been conducted to the highest standards possible:

That during construction and operational phases, the developer will abide by the findings and the recommendations of the study.

NAME: .....

DESIGNATION: .....

SIGNATURE and Stamp:

DATE.....

**EIA CONSULTANTS:**

That the Environmental Impact Assessment study report submitted is based on the proposed affordable houses on plots LR. NO. 22/365 within the Two Rivers Development along the Northern By Pass Road, Nairobi County;

To my knowledge, all information contained in this document is an accurate and truthful representation of all findings as 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: **Vincent O. Oduor (NEMA Registration Number 346)**

SIGNATURE.....

DATE.....

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## ACRONYMS AND ABBREVIATIONS

°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, Two Rivers Development Limited, proposes to construct affordable home units within the Two Rivers Development. The project, dubbed Mzizi Court will include fourteen (14) blocks of seventeen (G+16) floors each. The proposed units shall entail one, two and three bedroom apartments. The development will be on several sub-plots measuring approximately 6.7 acres bordering the on-going River bank housing project and separated by Road 4 to the North West boundary all the way to the Northern Bypass road. The project shall be served by Road 4 within the main development complex and upon completion will have an exit on the Northern Bypass road.

Upon completion, Mzizi Court will have 1,650 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) must be undertaken at the planning stages of the proposed undertaking pursuant to section 58(1) of the Environment Management and Coordination Act (EMCA Cap 387). This is to ensure that significant impacts on the environment are taken into consideration during all the phases of such projects. 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 one of the environmental assessment tools widely used 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, which is 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 EIA process.

### **0.2. Positive Impacts**

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

<b>Possible Impacts</b>	<b>Mitigation measures</b>
Soil erosion	Control earthworks; Install drainage structures to control flow of storm water; 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 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 measures; 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. Suitable junction/access point to be provided. Use of appropriate & legible signage. Employment of formal flagmen / women in order to ensure the public safety.
Water sources	Observe, protect and conserve the riparian reserve in compliance with the water Act 2016 and water reserve management rules 118(1);
Increased generation of waste	Adopt waste minimization at source; Monitoring the fate of disposed wastes to ensure they are legally land filled at a recognized controlled site. Adhering to waste management 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 waste water ; Adherence to the ministry of health guidelines on preventing 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, Mizizi will have 1,650 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 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.

- 3) 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
- 4) Negative impacts can be sufficiently mitigated by implementation of the proposed EMP

### **0.5. Recommendations**

- 1) The proponent to fully implement the EMP as well as adhering 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

## **I. INTRODUCTION**

### **1.1. Background**

The proponent, Two Rivers Development Limited, proposes to construct affordable home units within the Two Rivers Development. The project, dubbed 'Mzizi Court will include fourteen (14) blocks of seventeen (G+16) floors each. The proposed units shall entail one, two and three bedroom apartments. The development will be on several sub-plots measuring approximately 6.7 acres bordering the on-going River bank housing project and separated by Road 4 to the North West boundary all the way to the Northern Bypass road. The project shall be served by Road 4 within the main development complex and upon completion will have an exit on the Northern Bypass road.

Upon completion, Mzizi will have 1,650 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.

The proposed site has adequate space for the proposed development, while the existing and proposed service infrastructure such as water and power supply, waste management and wastewater disposal to accommodate the proposed amenities. The screening process revealed that the project requires an EIA study in line with the second schedule of the environment management and coordination Act chapter 387.

Environmental impact assessment (EIA) is one of the environmental assessment tools widely used 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, which is 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 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 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. 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 the constitution and government and policy. 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. To achieve this dream, the government has called upon private developers to partner with them to develop these units under the ministry's wings.

### **1.3. Criteria for the EIA**

#### **1.3.1. Scope**

The Kenya Government policy on all new projects requires undertaking of EIA at the planning stages of the project. This is to ensure that significant impacts on the environment are taken into consideration 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 requirements of part III of the EIA and EA regulations 2003. The TOR's were used as a guide for the study and are 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 in accordance with the guidelines issued by NEMA for such works and was prepared for submission by the proponent for consideration and approval. The Consultant ensured constant 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:

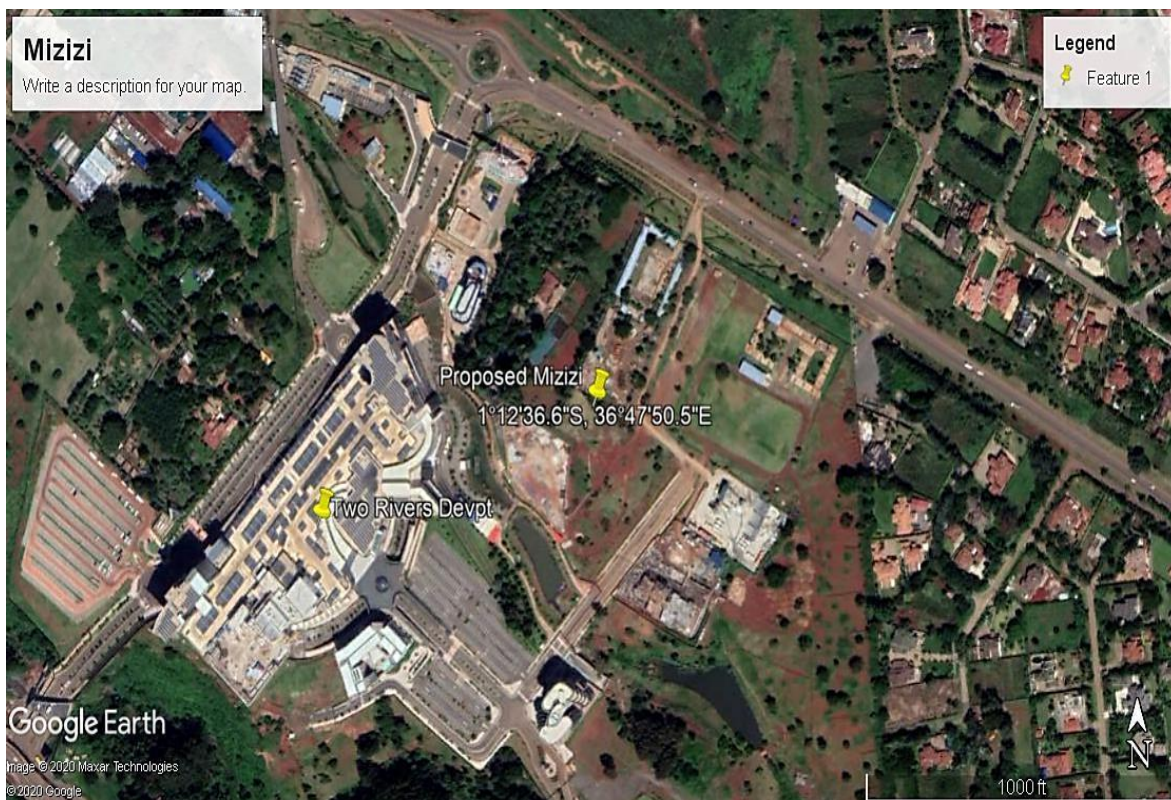
- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, chapter 387
- Environmental scoping that provided the key environmental issues
- Desktop studies and interviews with project architects and engineers
- Review 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 property, L.R. No. 22/365 located within the Two Rivers Development is located along the boundary of the Northern Bypass Road within the Ruaka/Runda neighbourhood, Nairobi County and measures approximately 6.7 acres gross. The proposed site borders Riverbank Housing complex development to the Northwest, separated by Road 4 and the Northern Bypass Road.

The proposed development shall be connected into the existing Two Rivers infrastructural developments including treated water, Sewer treatment plant trunk-line and electricity among others. The proposed site for the earmarked development is on site coordinates; 1°12'36.6"S, 36°47'50.5"E (-1.210175, 36.797372) as presented in Figure 1 and Plate 1 below.



**Figure 1: Proposed project site**

### 2.2. Design of the project

The project would be established on an 6.7 acres piece of land. The project will consist of fourteen (14) blocks of seventeen (G+16) floors each. The proposed units shall comprise of one, two and three bedroom units. Other supporting infrastructure such as waste water treatment plant, parking lots, flower grades and roadways. An artistic impression of the project is presented in Plate 1 below. Refer to attached architectural drawings or finer details.



### 2.2.1. Electrical system

Construction power will be from the Kenya Power and Lighting Company (KPLC). The project will utilize permanent power from Two Rivers. The various components of the electrical system shall comprise 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 be adhered to.



**Plate 1: A- project area of influence; B- Artistic impression of proposed project**

### 2.2.2. Water supply

Water for construction will be from Two Rivers recycled waste water network. In addition, water extracted from a borehole will be used to supplement this source especially where cleaner water will be required. There will be water storage tanks to increase water capacity at the project site to the required amount.

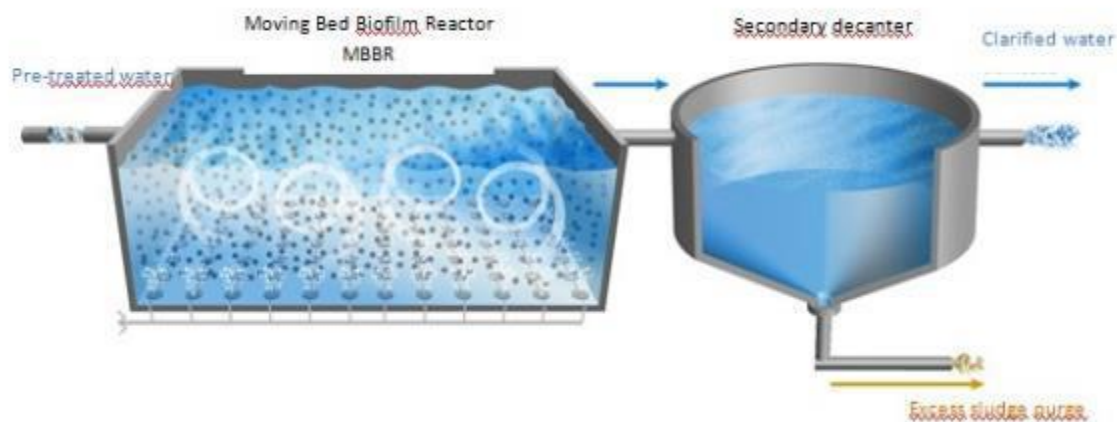


### 2.2.3. Waste water, solid waste

Foul water drainage from the project site will be connected to an existing moving bed biofilm reactor (MBBR). The MBBR combines two different processes (attached and suspended biomass) by adding biofilm small high density polyethylene (HDPE) carrier elements. This technology allows for complete removal of solids, reduced sludge production and enhanced process stability. The waste water treatment plant is designed with 5 key components. That is:

- a) pre-treatment,
- b) primary treatment
- c) biological treatment i.e. anaerobic and aerobic
- d) secondary treatment and
- e) tertiary treatment.

Treated waste water will be used for watering lawns, flower beds and cleaning of pavements. All storm water drainage will be channelled into open storm water drain systems. However, harvesting of water from the rooftops will help reduce the quantity and speeds of surface water runoff.



**Figure 2: A schematic MBBR**  
Source: (Condorchem envitech 2017)

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 occupation, large amounts of solid waste will emanate from the residential blocks. Each residential unit will have its own 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 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 construction of foundations, pavements and drainage systems. This will involve a combination of earthmoving machinery such as bulldozers and wheel loaders as well as 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, swimming pool among other components of the project involves a lot of masonry work and. General masonry include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and are supplemented by machinery such as concrete mixers.

### **2.3.4. Structural steel works and plumbing**

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

## **2.4. Description of the project's operational activities**

### **2.4.1. Solid waste and waste water 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 treatment plant while storm water from the building's roof will be channelled into rainwater harvesting tanks to avoid wastage and surface run off.

### **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. Introduction**

The proposed project site is within Two Rivers Development along the boundary of the Northern Bypass Road within the Ruaka/Runda neighbourhood in Nairobi County. The proposed site borders Riverbank Housing complex development to the Northwest, separated by Road 4 and the Northern Bypass Road.

#### **3.2. Physical environment**

##### **3.2.1. Climatic Conditions**

The climate in Nairobi is warm and temperate. There is a great deal of rainfall in Nairobi, even in the driest month. This climate is considered to be Cfb according to the Köppen-Geiger climate classification. The temperature here averages 18.8°C. In a year, the average rainfall is 962 mm<sup>1</sup>. The average annual temperatures of the area range from 18 to 20°C, with average minima and maxima of 12–14 and 24 – 26°C, respectively. The warmest period occurs from January to March. Average potential evaporation is between 1,550 and 2,200 mm per year.

##### **3.2.2. Average Daily Temperatures**

The average daily temperature throughout the year varies slightly from month to month with average temperatures of around 17°C during the months of July and August to about 20°C in March. But, the daily range is much higher, with the differences between maximum and minimum temperatures each day around 10°C in May and up to 15°C in February. Between the months of June to September, southeast winds prevail in the coastal parts of Kenya and last up to several days without a break. The clouds cause day temperatures to remain low and most times the maximum temperature stay below 18°C. The minimum temperatures also remain low during cloudy nights, usually hovering around 8°C and sometimes even reaching 6°C. Clear skies in January and February also bring colder nights. The highest temperature ever reached in Nairobi was 32.8°C and the lowest was 3.9°C.

##### **3.2.3. Average Humidity**

Because of the area's location just south of the equator in combination with humid air pumped in from the Indian Ocean, the humidity values for each day are generally on the higher end. This is not to say that values are always high, since the easterly winds coming off the Indian Ocean tend to keep the temperatures standard throughout the country; therefore the “warm sticky” feeling is usually not associated with Nairobi as much as one would think. In the summer to autumn months of January to April, relative humidity values have been known to plummet to anywhere from 10% to 20%. The typical day, humidity-wise, starts off with nearly saturated in the morning hours, and steadily decreases throughout the remainder of the day.

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<sup>1</sup> <https://en.climate-data.org/africa/kenya/kiambu/kiambu-54317/> - Accessed 18<sup>th</sup> October 2020

### **3.2.4. Average Rainfall**

With these routinely high relative humidity figures, it is not surprising that the Nairobi climate is one that produces much rain annually. In fact, from the past 50 years, the expected amount of rain could be anywhere in the range of 500 to 1500 mm, with the average ringing in at 900 mm. The majority of these rainfall figures crash down in Nairobi in one major and one minor monsoon seasons respectively. The major monsoon season occurs within the months of March to May, and is called the “Long Rains” by the locals. The minor monsoon seasons emerges within the October to December Months, and is called the “Short Rains”. That is what the meteorologists as a whole know about the monsoon seasons. What they do not know is exactly when these seasons will start. There is usually not an indication of when these rainy seasons will start, since it is difficult to determine when one starts and when the other finishes. Consequently, one may think there is only one rainy season when looking at the annual rainfall amounts

### **3.3.5. Average Winds**

Winds along the surface are predominantly easterly throughout the entire year. They are shifted to northeast between October and April, and they are shifted southeast between May and September. Right before the “Long Rains” season, the strongest winds occur, reaching speeds of 20 to 25 miles per hour. During the rest of the year, winds are usually at speeds of 10 to 15 miles per hour. During the night, the winds are calm.

### **3.3.6. Average Sunshine**

Early mornings in the area are often cloudy, but the sun peeks through by mid-morning. Throughout the year, there is an average of seven hours of sunshine per day. Thirty per cent more sunlight reaches the ground during the afternoon than in the morning. Of course, there is more sun shine during the summer months, when the sun is more overhead in the southern hemisphere. Infrequently during the rainy season the sun never show through the clouds. Even in August, the cloudiest month, there is an average of four hours of sunshine.

### **3.3.7. Hydrology**

The main hydrological features in the area are River Riuruaka, River Gichii, River Rueru and Kandakomu spring. The two rivers drain their water in Nairobi River. Other rivers in the river include Kagongo River which drains its water into Karura River. Manmade boreholes and wells are also other major sources of water in the area. Availability of water in the area shows that there is great potential to serve the increasing population.

Gichii River crosses the site draining from west to east. The proponent has contacted the water resource management authority to mark the riparian reserve. Construction activities will thus not affect the course of the river but the water quality may be affected especially during construction.

### **3.3.8. Infrastructure**

The proposed site is along Limuru road. It shall be accessible from the Two Rivers development. Additionally, it is served by the Northern bypass road and will soon be linked to the western bypass road that is under construction. This will be convenient for

ferrying of supplies to the site during construction and transportation for tenants during occupation. In general, Nairobi city and nearby satellite towns are well served with good communication and transport network such as air, road, and railway. It is centrally located to serve the Eastern African Countries. Bus and train stations are within an easy walk of the City Centre. The main Railway line runs from Mombasa through Nairobi to Malaba. The Network facilitates transportation of agricultural products from Western Kenya to the Coast. The city is a hub of road transport connection other major towns in the country. On air transport Jomo Kenyatta International Airport makes it easy to transport goods from all over the world into the country and vice versa.

### **3.3. Socio-economic environment**

#### **3.3.1. Population**

The project site although administratively located in Nairobi County, it is largely influenced by the populations in Nairobi and Kiambu County. The 2019 census revealed that Kiambu County had a population of 2.418 million people (Kenya National Bureau of Statistics 2019). On the other hand, Nairobi County had a population of 4.397 million people being the most populous county in Kenya. The human development index for Kiambu was estimated at 0.56 and that of Nairobi was 0.64<sup>2</sup> which are above the national average. This goes to show that the counties within the projects area of influence have achieved above average development in health, education and income.

#### **3.3.2. Land use**

Nairobi County has had a marked change in land use over the years. For example a study by (K'Akumu and Onyango 2007) revealed that the area of the city under urban built-up, open and transitional land cover have increased from 73.08 km<sup>2</sup> in the year 1988 to 228.65 km<sup>2</sup> in the year 2015. While agricultural, grass, secondary growth and riparian vegetation which occupied 126.82 km<sup>2</sup> of the city in the year 1988 have marginally increased to 189.73 km<sup>2</sup> in the year 2015; forest cover have shown mixed gains and loss. In the year 1988, the area of the city under the forest cover was 59.63 km<sup>2</sup> (K'Akumu and Onyango 2007).

This increased to 122.41 km<sup>2</sup> in the year 1995 and thereafter declined by approximately 50% reaching 63.63 km<sup>2</sup> in the year 2000. The decline is attributed to the indiscriminate extraction of forest resources and clearance of the same for urban developments which characterized the periods between the years 1995 to 2002. This situation was reversed in the year 2003 when the new government re-emphasized and re-energized strategies geared towards increasing the forest cover in the country. Such strategies included the degazettement and clearance of illegal structures within the forest reserves. This has since made the area of the city under forest cover to gradually increase from 63.63 km<sup>2</sup> in the year 2000 to 93.44 km<sup>2</sup> in the year 2015 (K'Akumu and Onyango 2007).

### **3.4. Biological environment**

The site is approximately 2km from Karura forest. The forest was gazetted in 1932 and is managed by the Kenya Forest Service in conjunction with the Friends of Karura Forest Community Forest Association. Karura Forest is 1,041 ha (2,570 acre) consisting of three

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<sup>2</sup> <https://data.humdata.org/dataset/dbd29b92-99aa-452b-bde1-704058328ae2/resource/b46703cc-196f-4e40-860f-e1dd1709d81c/download/kenya-human-development-index-hdi-per-county.xlsx> - Accessed 19th October 2020

parts separated by Limuru and Kiambu roads. The large middle portion is ca. 710 ha (1,750 acres); the Sigria salient to the west is 250 ha (620 acres). As of mid-2016, 36% of the forest contains indigenous upland forest tree species. The forest is home to some 200 species of bird as well as suni, Harveys Duiker, bushbucks, bush pigs, genets, civets, honey badgers, bush babies, porcupines, Syke's monkeys, bush squirrels, hares, fruit bats, and various reptiles and butterflies. Karura now has over 50 km of trails for visitors to walk, run or bike<sup>3</sup>.

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<sup>3</sup> <http://www.kenyaforestservice.org/index.php/2016-04-25-20-16-21/2014-11-26-08-43-45/2014-11-26-08-56-51/karura-forest> - Accessed 15th October 2020

## 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 <sup>4</sup>.

#### **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<sup>5</sup>.

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

<sup>5</sup> 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
<b>Legislative frameworks</b>			
1.	The constitution of Kenya	<p><b>Article 42-Environment;</b> Indicates that every person has the right to a clean and healthy environment, which includes the right to –</p> <ul style="list-style-type: none"> <li>• Have the environment protected for the benefits of present, future generations through legislative and other measures, particularly those contemplated in Article 69, and</li> <li>• Have obligations relating to the environment fulfilled under Article 70<sup>6</sup>.</li> </ul> <p><b>Article 43-Economic and social Rights</b> Indicate that every person has the right to accessible and adequate housing and to reasonable standards of sanitation.</p>	<p>The proposed project is consistent with article 43 as it will enhance access to affordable housing</p> <p>Undertaking of EIA before commencement of activities is commensurate with article 42. Additionally public consultation has been a key facet off the Two Rivers Development. Proponent is advised to continue engaging the public especially in the project area of influence throughout the life cycle of the project</p>
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.

<sup>6</sup> 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 waste water from the installed waste water treatment plant 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	Section 57 (1) A person shall not carry out	Proponent will ensure that the proposed project is in

	Planning Act, 2019	<p>development within a county without a development permission granted by the respective county executive committee member.</p> <p>(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.</p> <p>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.</p>	<p>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</p> <p>Relevant permits required under this law shall be obtained prior to commencement o works</p>
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 Act, and many of the provisions can be largely applied beyond those lands suitable for agriculture	Provisions have to be made to ensure that implementation of the proposed projects does not accelerate or initiate soil erosion and pollution of Gichii River 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
<b>Policy and regulatory frameworks</b>			
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 to deploy adequate measures that will ensure safe disposal of waste water from their activities.	The proponent has installed an effluent treatment plant that will treat waste water from the proposed development. Furthermore, they have obtained an effluent discharge license for the waste water treatment plant as required under these regulations
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 require 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 projects Increase public awareness on environment	Public consultation and awareness was undertaken during the EIA process
6.	The National gender and development	Considering the needs and aspirations of all Kenyan	Implementation of the proposed project will create

	policy of 2000	men, women, boys and girls across economic, social and cultural lines and ensuring the empowerment of women	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.
<b>Key National Strategic Plans</b>			
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	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

		in conservation and management of natural resources	
<b>Key Multilateral Environmental Agreements</b>			
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), 1992	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 on-going 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 fundamental 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)<sup>7</sup>.

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

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<sup>7</sup> 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)

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.

#### **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 in waste water management, sourcing of materials, water and energy use. The proponent has already installed a waste water treatment plant serving existing facilities. Treated waste water will be used for construction thereby reducing pressure on water resources. Consequently, waste water from the residential blocks will also be treated and reused thereby reducing pressure on municipal effluent management resources. The entire project will be powered by solar energy during occupation thus reducing grid emissions<sup>8</sup>.

#### **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 in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

The proponent through the EIA process 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 as well as 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.

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<sup>8</sup> Approximately 30% of Kenya's grid electricity is generated from thermal power plants



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).

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 through the adoption of practices that integrate conservation needs and development priorities (IFC 2012).

One of the direct threats to biodiversity from cities is the pollution of rivers passing through them. The other notable indirect impact is material extraction in rural areas to benefit urban dwellers. An example of indirect impact on biodiversity in Nairobi is the use of charcoal sourced from forests in the rural forests (a classic case of urban ecological footprint). The proponent has direct control over preventing pollution of the River Gichii passing near the proposed site. Pollution prevention mechanisms are already in place. They include waste water treatment and proper solid waste management. These mitigation measures are discussed in section 6 and 7.

#### **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 on-going 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' area 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 negative 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 waste water management, sourcing of materials, water and energy use. The proponent has already installed a waste water treatment plant serving existing facilities. Treated waste water will be used for construction thereby reducing pressure on water resources. Consequently, waste water from the residential blocks will also be treated and reused thereby reducing pressure on municipal effluent management resources. The entire project will be powered by solar energy during occupation thus reducing grid emissions
4.	Yes	The proponent through the EIA process 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 as well as 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	One of the direct threats to biodiversity from cities is the pollution of rivers passing through them. The other notable indirect impact is material extraction in rural areas to benefit urban dwellers. An example of indirect impact on biodiversity in Nairobi is the use of charcoal sourced from forests in the rural forests (a classic case of urban ecological footprint). The proponent has direct control over preventing pollution of the Gichii River passing near the proposed site. Pollution prevention mechanisms are already in place. They include waste water treatment and proper solid waste management. These mitigation measures are discussed in section 6 and 7.
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.
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#### 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<sup>9</sup>.

##### 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 3<sup>rd</sup> to 14<sup>th</sup> 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

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<sup>9</sup> Gro Harlem Brundtland, *Report of the World Commission on Environment and Development: “Our Common Future.”* (United Nations, 1987).

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<sup>10</sup>.

#### **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 for adaptation to global climatic change. In addition, the country will harmonize environment-related laws for better environmental planning and governance<sup>11</sup>.

#### **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

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<sup>10</sup> 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>.

<sup>11</sup> Kenya Vision, "2030: A Globally Competitive and Prosperous Kenya (2007)," *Ministry of Planning and National Development and the National Economic and Social Council (NESCC), Government of Kenya, Nairobi (GOK, 2007)*, n.d.

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.

## 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 special reference to its key 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 for 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 for the purpose of achieving the fundamental principles of sustainable development<sup>12</sup>.

The proponent has previously consulted neighbours and other project affected persons on various occasions most recently in May 2020. Other occasions where the public was consulted were:

- During the change of use process from agriculture to mixed commercial use
- During the strategic environmental impact assessment process – where the entire master plan for all the projects (mall, hotel, offices, amusement parks and housing developments) were presented to the public
- During the EIA licensing process for individual projects in the master plan that are now completed or under construction. These include the mall, hotel, office block, and apartments

In essence the most if not all project affected persons are aware of projects within the Two Rivers development land. A public meeting<sup>13</sup> is being planned to present the current proposal to neighbours and other project affected persons. During the meeting, the project details including design, waste water and solid waste management plans, associated impacts and proposed mitigation measures among others will be disclosed.

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<sup>12</sup> Adapted from “Introduction” in McKeown, Rosalyn. Education for Sustainable Development Toolkit, Version 2, Centre for Geography and Environmental Education, University of Tennessee, July 2002.

<sup>13</sup> Ministry of Health guidelines to stop the spread of SARS-Cov-19 virus will be adhered to

Participants will have an opportunity to comment on different aspects of the project. All comments shall be written and included in the final EIA report. Minutes of the meeting shall also be compiled and presented to the authority. The draft EIA report shall then be disclosed to the public by the authority pursuant to the EIA and Audit regulations of 2003.



## VI. POTENTIAL ENVIRONMENTAL IMPACTS

### 6.1. Positive Impacts during Construction

#### 6.1.1. Employment Opportunities

One of the main positive impacts during projects construction phase is the availability of 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<sup>14</sup>. 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 1,650 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.

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<sup>14</sup> 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. Potential 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<sub>10</sub> 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. Approximately 32% of electricity in Kenya is generated from thermal sources<sup>15</sup>. 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<sup>16</sup>. The growing urban population calls for affordable housing. The proposed project is geared towards filling the existing housing stock gap by availing an extra 1,650 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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<sup>15</sup> [https://energypedia.info/wiki/Kenya\\_Energy\\_Situation](https://energypedia.info/wiki/Kenya_Energy_Situation) - Accessed 14th October 2020

<sup>16</sup> 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. Potential 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 1,650 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<sup>17</sup>. 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

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<sup>17</sup> <https://www.worldwildlife.org/stories/fight-climate-change-by-preventing-food-waste> - Accessed 15th October 2020

to the landfill and rots, it produces methane. Thus, it will be important 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. It may also cause drying and or reduced volume of water in Gichii River due to excessive evaporation. However, since construction water shall be sourced from Two Rivers recycled waste water, construction works will not be affected. High temperatures will also lead to increased consumption of electricity 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 on 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 important 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.

Since the development is within proximity of the Gichii River, the proponent is advised to:

- 1.1 Protect the riparian by ensuring that no works interfere with the river to a minimum of 6 meters and a maximum of 30meter on either side based on the highest recorded flood levels pursuant to regulation 6c of the water quality regulations 2006.
- 2.1 Observe, protect and conserve the riparian reserve in compliance with the water Act 2016 and water reserve management rules 118(1)

### **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, an effluent treatment plant is installed since there is no municipal sewer line in the area. Waste water will be treated through a series of processes. The MBBR consists of five main unit operations i.e.

- a) pre-treatment,
- b) primary treatment
- c) biological treatment i.e. anaerobic and aerobic
- d) secondary treatment and
- e) tertiary treatment

Samples of the treated waste water shall be regularly analysed pursuant to the fourth schedule of the water quality regulations 2006. It will also be important 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 release of the effluent, resulting in land and water contamination. Such blockages or damages will be fixed expeditiously. Waste water shall be disposed in compliance with the provisions of 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 the general safety and security at all times. The existing perimeter wall will be enhanced by installation of electric fence. 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 taps 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
<b>1. Curb project associated conflicts and Lost Time Injuries (LTI) e.g. land ownership disputes.</b>				
<b>Project implementation disputes</b>	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/Governm ent 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
<b>2. Minimize extraction site impacts and ensure efficient use of raw materials in construction</b>				
<b>High Demand of Raw material</b>	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
<b>3. Minimize vegetation disturbance at and or around construction site</b>				
<b>Vegetation disturbance</b>	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

Foreseen Impacts	Proposed Mitigation Measures	Responsibility For Implementation	Time Frame	Monitoring indicators
<b>4. Reduce storm-water, runoff and soil erosion</b>				
<b>Increased storm water, runoff and soil erosion</b>	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; Number of complaints received from neighbours; Turbidity of the adjoining Gichii River
	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	-
<b>5. Minimize solid waste generation and ensure efficient solid waste management during construction</b>				
<b>Increased solid waste generation</b>	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;
	Private waste disposal company to be contracted to transport and dispose the solid waste from site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	Waste transport licenses from the waste handler; number of waste related complaints received from tenants, homeowners and neighbours
	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
<b>6. Reduce dust emissions</b>				
<b>Dust emission</b>	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	
<b>7. Minimization of exhaust emissions</b>				
<b>Exhaust emission</b>	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
<b>8. Minimization of noise and vibration</b>				
<b>Noise and vibration</b>	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
<b>9. Minimization of energy consumption</b>				
<b>Increased energy consumption</b>	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
<b>10. Minimize water consumption and ensure more efficient and safe water use</b>				
<b>High water demand</b>	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	-
<b>11. Minimize release of liquid effluent</b>				
<b>Generation of wastewater</b>	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
<b>12. Minimize occupational health and safety risks</b>				
<b>Approval of building plans</b>	Ensure that all building plans are approved by the Local Authority and the local Occupational Health and Safety Office	Proponent	One-off	-
<b>Incidents, accidents and dangerous occurrences.</b>	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	-
<b>Insurance</b>	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
<b>Health and safety committee</b>	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	-
<b>Sanitary conveniences</b>	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
<b>Medical examination</b>	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
<b>Machinery/equipment safety</b>	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
<b>Storage of materials</b>	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	-
<b>Safe means of access and safe place of employment</b>	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
<b>Emergency preparedness and evacuation procedures</b>	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 is 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
<b>First Aid</b>	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
<b>13. Ensure the general safety and security of the site and surrounding areas</b>				
<b>Increased Pressure on Infrastructure</b>	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

	Upgrade existing infrastructure and services, where feasible.	Architect, Project Manager, Contactor and the Developer	Continuous	
<b>Insecurity</b>	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	
<b>14. Environmental monitoring of the project</b>				
<b>Environmental concern during the construction phase</b>	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
<b>1 Minimization of solid waste generation and ensuring more efficient solid waste management</b>				
<b>Increased generation of solid waste</b>	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

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
<b>2 Minimise risks of liquid waste release into environment</b>				
<b>Liquid waste release into the environment</b>	Proper use of the installed effluent treatment plant	Proponent/Property Managers	During construction phase	Analytical reports of the treated waste water
	Develop an operational environmental management plan (OEMP) for the waste water treatment plant in line with EDL licensing conditions	Proponent/Property Managers	After obtaining an EDL	OEMP for the MBBR
	Conduct regular inspections of the MBBR 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 waste water 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
<b>3 Minimize energy consumption</b>				
<b>Energy Use</b>	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; 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

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
	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
	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
<b>4 Minimize water consumption and ensure more efficient and safe water use</b>				
<b>Water management</b>	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

Foreseen Negative impacts	Proposed Mitigation Measures	Responsible Party	Time Frame	Monitoring indicators
<b>5 Minimization of health and safety impacts</b>				
	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
<b>6 Ensure the general safety and security of the premises and surrounding areas</b>				
	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
<b>7 Control of informal activities around the project site</b>				
	Mushrooming of Informal Settlement	Sub County Administration	Continuous	-number of kiosks around the project perimeter fence
<b>8 Ensure environmental compliance</b>				
	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
<b>1. Demolition waste management</b>				
<b>Demolition waste</b>	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
	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
<b>2. Rehabilitation of project site</b>				
<b>Site degradation</b>	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 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 so as 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 Court will have 1,650 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.

## REFERENCES

### REFERENCES

- Bastinoni, S, A Galli, V Niccolucci, and M Pulselli. 2006. "Ecological footprint of building construction." *Urban Regeneration and Sustainability* 345-357.
- Baker, B. H., J. G. Mitchell, and L. A. J. Williams. "Stratigraphy, Geochronology and Volcano-Tectonic Evolution of the Kedong–Naivasha–Kinangop Region, Gregory Rift Valley, Kenya." *Journal of the Geological Society* 145, no. 1 (1988): 107–16.
- Brundtland, Gro Harlem. *Report of the World Commission on Environment and Development: "Our Common Future."* United Nations, 1987.
- Condorchem envitech. 2017. *Aerobic digestion reactors (ADR) for biological wastewater treatment.* 20 February. Accessed October 18, 2020. <https://blog-en.condorchem.com/aerobic-reactors-for-biological-wastewater-treatment/#.X42YhRLivIU>.
- Government of Kenya. 2007. *Vision 2030.* Policy document, Nairobi: Government of the Republic of Kenya.
- Hens, L. "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>.
- IFC. 2012. *IFC Performance Standards on Environmental and Social Sustainability.* Washington DC: World Bank Group.
- K'Akumu, O, and O Onyango. 2007. "Land Use Management Challenges for the City of Nairobi." *Urban Forum.*
- Kenya National Bureau of Statistics. 2019. *2019 KENYA POPULATION AND HOUSING CENSUS. POPULATION BY COUNTY AND SUB-COUNTY - Volume 1,* Nairobi: Government of Kenya.
- Republic of Kenya. 2010. *Constitution of Kenya.* Nairobi: National Council for Law Reporting.
- KENYA, LAWS OF. *The Constitution of Kenya, 2010.* Attorney General Nairobi, 2010. <http://www.wipo.int/edocs/lexdocs/laws/en/ke/ke019en.pdf>.
- MacDonald, Jamie P. "Strategic Sustainable Development Using the ISO 14001 Standard." *Journal of Cleaner Production* 13, no. 6 (2005): 631–43.
- Satterthwaite, David, Hannah Reid, and Stephen Bass. *Reducing Poverty and Sustaining the Environment: The Politics of Local Engagement.* Routledge, 2013.
- The Republic of Kenya. "Building Code." Kenya law reports, 1997. [www.kenyalaw.org](http://www.kenyalaw.org).



- . “The Environmental (Impact Assessment and Audit) Regulations, 2003,” 2003. [www.nema.go.ke](http://www.nema.go.ke).
- . “The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.,” 2009. [www.nema.go.ke](http://www.nema.go.ke).
- . “The Environmental Management and Co-Ordination (Waste Management) Regulations, 2006.,” n.d. [www.nema.go.ke](http://www.nema.go.ke).
- . “The Environmental Management and Coordination, (Water Quality) Regulations 2006.,” 2006. [www.nema.go.ke](http://www.nema.go.ke).
- . “The Factories and Other Places of Work Act Chapter 514.” Kenya law reports, 1951. [www.kenyalaw.org](http://www.kenyalaw.org).
- . “The Local Government Act Chapter 265,” 2010. [www.kenyalaw.org](http://www.kenyalaw.org).
- . “The Physical Planning Act Chapter 286.” Kenya law reports, 2009.
- . “The Public Health Act Chapter 242.” Kenya law reports, 2012.
- Vision, Kenya. “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)*.
- Wamukoya, George M., 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.