ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

THE PROPOSED RESIDENTIAL APARTMENT ON PLOT NO. No. KISII MUNICIPALITY/BLOCK 313, KISII COUNTY.

Project site GPS Coordinates: SO 40380, E.34.34360 ALT. 1774A.S.L

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CERTIFICATION

This Environmental Impact Assessment Study Report was prepared in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental (Impact Assessment and Audit) Regulations 2003, which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA).

The following EIA Expert(s) conducted the study and prepared this report.

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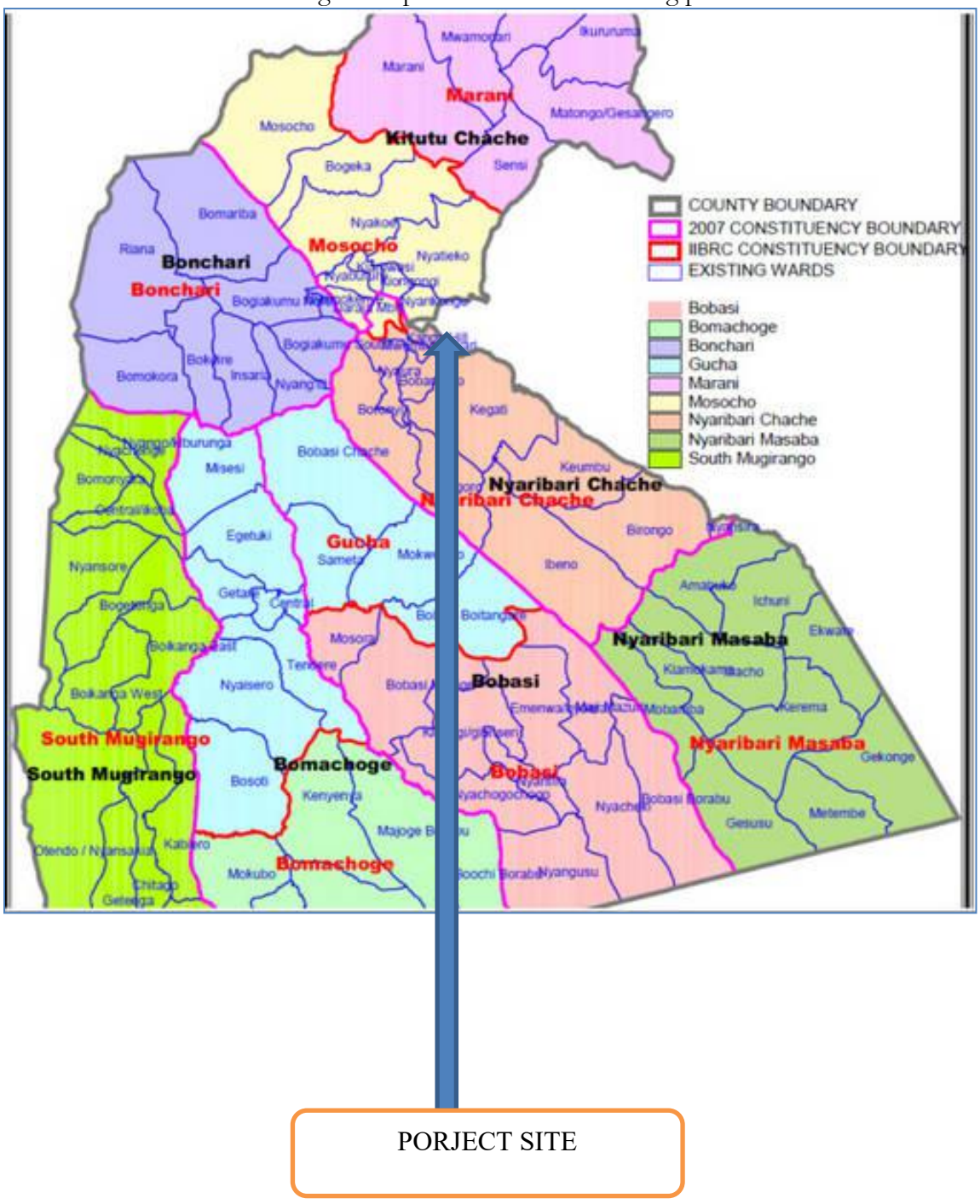

ABBREVIATIONS

EA	Environmental Audit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMCA	Environmental Management and Coordination Act
CAP	Chapter of Laws of Kenya
CEAP	County Environment Action Plan
KPC	Kenya Power Company
NEMA	National Environment Management Authority
NEAP	National Environment Action Plan
OHSA	Occupational Health Safety Act
Km	Kilometer
mm	Millimeters

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NON TECHNICAL SUMMARY

Environmental Impact Assessment is a tool for environmental management and has been identified as a key component in new project implementation. To ensure sustainable development the Kenyan government policy on all new projects, programmes or activities requires that an Environmental Impact Assessment be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during planning stages. The project proponent purchased the piece of land in Kisii Township and she intends to construct a ten storey building. The plot is registered as Plot **No. kisii municipality/block 313**

Preliminary designs and site plans for proposed project have been completed and approvals by relevant authorities have been granted. To comply with EMCA, 1999 the proponent has contracted an EIA expert to conduct an Environmental Impact Assessment for the proposed project and compile a report for submission to National Environment Management Authority (NEMA) for review and necessary approval before commencement.

Project objective

The overall objective of the proposed project is to construct residential units to provide accommodation especially to the locals in Kisii County and business people given its proximity to the project site, and other residents of town.

EIA 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 Second Schedule of EMCA, 1999
- Environmental scoping that provided the key environmental issues.
- Desktop studies and interviews
- Physical inspection of the site and surrounding areas
- Public participation through the use of questionnaires and interviews
- Reporting.

Potential impacts

There are both positive and negative impacts associated with the proposed project. These are identified for the three phases namely: Construction Phase, Operational Phase and Decommissioning Phase.

In general, the following positive impacts are associated with the proposed development: -

- Source of income for the proponent
- Creation of Employment opportunities
- Gains in the local and national economy
- Provision of market for supply of building materials and green grocers around the area
- Increased housing units

The negative Impacts associated with the proposed project are:

- Noise pollution
- Increased water demand
- Dust emissions
- Increased solid waste generation
- Generation of exhaust emissions
- Soil erosion
- water quality degradation
- Workers accidents and hazards during construction
- Increased energy consumption
- Loss of vegetation

Proposed Mitigation measures

- Construction work will only be undertaken during the day to ensure no disturbance of the residents at night,
- Noise will be minimized through machinery maintenance,
- The contractor will provide the employees with appropriate Personal Protective Equipment (PPE) and ensure they are utilized at all times during work.
- Ensuring that all water taps are turned off when water is not in use
- Drainage facilities will be provided in view of the potential sub-surface water at the site.

- The building will be provided with appropriate solid waste collection facilities in all the floors/units.
- The contractor shall compact any loose soils and rehabilitate the degraded environment within the area.
- The proponent should ensure the toilets are connected to the sewerage line. The sewerage line should be kept free from non-degradable materials like plastic to enhance natural wastewater treatment. This way, the sewerage does not need emptying. Regular inspection should be done to check blockages/ damages and fix them appropriately.
- Firefighting equipment should be located at strategic points within the building,
- Solid wastes should be disposed regularly and at designated dumpsites. Resource recovery, re-use and recycling will be encouraged,
- Provide a well-equipped Aid Kit on site for the workers and have a person trained to handle emergencies,
- Provide safety signage within and around the site,

Conclusion

From the study it is evident that the proposed project will have both positive and negative impacts. If the proposed project is constructed and operated taking into account the proposed mitigation measures, most of the negative impacts are considered minor against the projected short and long term benefits that will accrue from its establishment and operation. It is expected that the Environmental Management Plan developed will be fully integrated in the project during the construction as well as during the operation phase.

CHAPTER ONE:

INTRODUCTION

1.1 Background and rationale of the Environmental Impact Assessment

The Kenyan government recognizes housing projects as an important vehicle towards economic recovery, poverty reduction and provision of shelter. The project developer, Ms. Jemima Nyangara Machogu, purchased the piece of land at Kisii, Plot **No. kisii municipality/block 313 Kisii** County. This is approximately within the CBD 200 Kisii – Migori - Kisumu road opposite Dados Hotel. Preliminary designs and site plans for proposed project have been completed and approvals by relevant authorities have been done. The proposed project will have sixty housing units in total.

According to section 58 of the Environmental Management and Coordination Act (EMCA), 1999 all new projects listed in the second schedule of the same Act are expected to undergo an Environmental Impact Assessment (EIA) and a report filed to the National Environment Management Authority (NEMA) for review and necessary approval before commencement. EIA is a tool for ensuring new projects and programmes incorporate appropriate measures to mitigate adverse impacts to the environment and peoples' health and safety as well as enhancing sustainable operations with respect to environmental resources and co-existence with other socio-economic activities in their neighborhood. This development falls under this category and the proponent has contracted the EIA expert to conduct an Environmental Impact Assessment and compile a report for submission to NEMA.

This EIA report provides relevant baseline information of the project area, anticipated impacts to the environment and social aspects, appropriate mitigation measures necessary for incorporation in the project implementation, as well as an environmental management plan. Approval will be sought on the grounds that environmental performance will be assured from the construction works and occupation of the building upon commissioning, through the development of appropriate environmental management actions and monitoring programs.

1.2 Scope and objective

Scope

The scope of this Environmental Impact Assessment, therefore, covered:

- Background and Rationale of the Environmental Impact Assessment
    - Description of the proposed project
    - The baseline environmental conditions of the area
    - Legislative and institution framework
    - Identification of potential negative and positive impacts of the project,
    - Appropriate mitigation measures,
    - Environmental management plan for all phases of the project.

Project Objective

The overall objective of the proposed project is to construct residential units to provide accommodation to residents of Kisii county and from outside the county given its proximity to the project site, and other residents

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Purpose and terms of reference

The purpose for this study is to assess the impacts that may arise during the construction, operational and decommissioning phase of the proposed development. These are the impacts of noise, dust and smoke onto the natural environment. Other impacts include accidents, occupational hazards, health and safety aspects that may also arise at any phase of the development.

The terms of reference for this study covered the following; -

- The objectives of the project
- Describe to details the baseline condition of the project area
- Give a detailed outline of regulatory and legislative framework related to the project
- To describe the potential impacts that may occur during both construction and occupation phase;
- The impact imposed on existing infrastructure;
- The demand put on natural resources;
- To describe the potential effects of the development on both the natural and human environment taking into account health and safety matters;
- Propose suitable mitigation measures for identified impacts;
- Develop a comprehensive environmental management plan;
- Provide a decommissioning plan

1.3 The EIA Methodology Approach

The approach to this exercise was structured such as to cover the requirements under the EMCA, 1999 as well as the EIA regulations as stipulated under the Gazette Notice No. 56 of 13th June 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical inspection of the site and the surrounding areas, interviews with a sample of surrounding community members, questionnaires, observations and discussions with the client.
The key activities undertaken during the assessment were:

(i) Continuous discussions with the Client and other sources of information on the proposed project details, the site planning and implementation plan.
(ii) Thorough physical inspections of the proposed site and interviews with the immediate neighborhood. A questionnaire was circulated to the residents to obtain their honest opinion regarding the project (samples have been annexed to this report).
(iii) Evaluation of the activities around the site and the environmental setting of the wider area. This was achieved through existing information, literature and physical observations.
(iv) Review of available documentation.
(v) Reporting, review and submissions.

Below is an outline of the basic EIA steps that were followed during this assessment:

Step 1: Environmental Screening

This was the first stage when the proposed project was evaluated guided by EMCA, 1999.Residential buildings of this size requires an EIA before commencement.

Step 2: Environmental Scoping

Scoping, a result of a preliminary physical assessment of the site and its surroundings, helped narrow down to the most critical environmental and social issues requiring attention for detailed evaluation. Among the significant issues identified included:

(i) The physical environmental aspects in the area.
(ii) Noise and dust to the neighborhood during construction.
(iii) General land use trends in the area.
(iv) Social issues especially concerning the immediate neighborhood, amenities and safety.

Step 3: Desk Study

Documentation review was a continuous exercise that involved review of available documents on the project, including approved building plans, land ownership certificates, project documents environmental legislation and regulations, project designs, etc.

In addition to the information on construction issues that was provided by the client, specific information was also obtained from legal statutes and policies in the building sector.

Step 4: Site Assessment

With the background obtained from the above preliminary visits, discussions and documentation, the proposed project site was aasly evaluated and the immediate neighborhood interviewed while the environmental and social setting of the area was undertaken.

The expert visited the proposed site at least four times during the assignment period. The main objective of the site visits was to:

(i) Establish the physical status of the site with respect to the hydrology and drainage, geology and soils, access to water and power etc.

(ii) Establish the social and economic aspects including the nature of neighborhood, land use, income generating activities etc.

Step 4: Interviews

Interviews were undertaken such as to establish the opinion of the residents around the site. The major issues included the suitability of the proposed development and the perceived impacts to the social welfare if any.

Step 5: Reporting

This report was prepared for submission to NEMA as required by the law. This report comprises of the following sections:

(i) A non-technical summary,

(ii) Introduction,

(iii) Project description,

(iv) Baseline condition of the project area

(v) Anticipated Impacts and Mitigation Measures,

(vi) Environmental Management Plan outline, (EMP)

(vii) Legal and Compliance Issues,

(viii) Conclusions and Recommendations,

(ix) Annexes.

(x) Appendices

a) Approved plans

b) Bill of quantity

c) KRA pin

d) National ID

e) Land ownership

CHAPTER 2: PROJECT DESCRIPTION

2.1 Site location

The proposed development will be located at Kisii town Kisii – Migori/Kisumu off Road approximately 800m from the Road on Plot **No. Kisii municipality/block 313** Township, Kisii County. The proposed project site is surrounded by residential/Commercial buildings and is about 200m away from Kisii – Migori/Kisumu road. The area is in conformity with the proposed project.

2.2 Nature of the project

The proposed development will be ten {10} - storey residential development **PROPOSED 97 NO. TWO BEDROOMAND 28 NO.ONE BEDROOM APARTMENTS** After completion the project will have a total of 135 housing units. The provision of key services such as clean water, electricity and security will be retained within the developer's remit. The proposed development will incorporate environmental, health and safety standards during all phases of the project (construction, occupation and decommissioning phases).

2.3 Project Justification

Total area is approximately within the Kisii Town which is rapidly growing due to its economic potential and administrative functions. The town has also attracted many colleges and university campuses including Kisii Level six Hospital which is located about 200m from the proposed project site. This has therefore led to rapid population growth of the area hence high demand for accommodation thus attracting potential investors. The proposed development is therefore intended to provide affordable housing units to people in the area and more so students from these colleges and residents of Kisii County, considering its proximity to the proposed project site. It will create employment opportunities during construction phase and it will enhance income generation to the owner upon commissioning.

2.4 Site Ownership

The plot belongs to the proponents (Ms. Jemima Nyangara Machogu. It is registered under the Land Act (Cap. 300) Refer to Annex

2.5 Design of the project

The proposed residential development will be a ten (10) - storey residential building.

Refer annex (plan)

Electrical system

The building will be connected to the Kenya Power Company (KPC) electricity main line which will be used in all phases of the project. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

Water reticulation system

The proponent intends to get water from Kisii Water and Sanitation Company. Other alternatives include rain water harvesting. Water storage tanks will be installed upon commissioning to reduce wastage and runoffs.

Waste/Sewerage

Waste water from the building will be disposed to the existing sewage liine that is on the site. Solid waste management will be the responsibility of the proponent. The proponent will provide waste bins for waste collection and later on the waste will be disposed through the Kisii county government waste disposal programme. Disposal will be done appropriately and at designated dumpsites.

Storm water run-off

All storm water drainage will be channeled into storm water drains that will be constructed at the site.

2.6 Description of the project's construction activities

Excavation and foundation works

Excavation will be carried out to prepare the site for construction of foundations, pavements and drainage systems. This will involve the use of Machines and human labour so as to create employment to the local residents especially the youths.

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, paints and glasses among others will be stored in temporary storage structures built for this purpose.

Masonry, concrete work and related activities

The construction of the building walls, foundations, floors, pavements, drainage systems involves a lot of masonry work and related activities. General masonry and related activities include concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. All these activities will be done by people employed at the construction site.

Structural steel works

The building will be reinforced with structural steel for stability. Structural steel works involve steel cutting, welding and erection.

Roofing works

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

Electrical work

Electrical work during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

Plumbing

Installation of pipe-work will be done to connect water to the building and sewage from the ablution blocks to a sewage line. Plumbing will also be done for drainage of storm water. Plumbing activities will include metal and plastic pipe cuttings, the use of adhesives, metal grinding and wall drilling among others.

2.7 Description of the project's operational activities

Solid waste and waste water management

The proponent will provide facilities for handling solid waste generated within the building. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at the designated sites by the County Government of Kisii. Sewage generated from the building will be disposed to the existing sewage line while roof catchment from the building roof will be channeled into rainwater harvesting tanks to avoid wastage and surface run off.

Cleaning

This will involve regular washing and cleaning of the housing units, pavements, staircases etc. Cleaning operations will involve the use of substantial amounts of water, disinfectants and detergents. This will be done by the occupants of the housing units.

General repairs and maintenance

The building 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.

2.8 Description of the project's decommissioning activities

Demolition works

Upon decommissioning, the project components including building, pavements and drainage systems 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.

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 the equipment to schools, churches and charitable institutions.

Site restoration

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

2.9 Input Materials

The building will be constructed using common construction materials and construction procedures that are not expected to compromise the safety of the neighboring communities as well as the general environment. Among the following inputs will be required for construction:

- Raw materials e.g. sand, cement, blocks, bricks, hard core, iron sheets, gravel and ceramic tiles.

- Reinforcement steel bars of various sizes depending the parts of the building
- Timber (e.g. doors and frames, fixed furniture, etc.)
- Glass panes for various sections of the building.
- Pipes (steel and plastics) for plumbing and waste conduits.
- Water.
- Paints, solvents, white wash, etc.
- Machinery (concrete mixers etc.)
- Labor force (of both skilled and unskilled workers).

2.10 Project Budget

The project is estimated to cost **Kshs. 25,000,000 (Twenty-five million Kenya shillings) and 0.1% will be paid to NEMA as fee.**

CHAPTER 3: BASELINE CONDITIONS

3.1 Environmental setting

3.1.1 Climatic conditions

The climate in Kisii County is warm and temperate. It receives an average rainfall range of between 500 to 1500mm per annum. Long rains are often experienced during the months of March and April while short rains occur from September to November. The driest month is January and Februay, with 22mm of rain. The high altitude of the county is expected to lower temperatures. The average temperature in Kisii is 25^0C. March is the warmest month of the year. The temperature in March averages 18.5^0C. July is the coldest month with temperatures averaging 15.5^0C.

The prevailing weather conditions are suitable for both crop farming and livestock keeping. Crops mainly grown include maize, wheat, barley and Irish potatoes. Horticultural farming under irrigation is practiced along permanent rivers. Livestock reared in the county include goats, sheep and cattle.

3.1.2 Geology and soils.

Soils in Kisii are loamy with high contents of the entire major plant nutrients such as calcium and magnesium. In order to fully utilize the soil farmers, have to implement certain soil management practices to improve soil fertility for agricultural purposes. For instance, use of ammonium and phosphatic fertilizers when planting maize results in higher crop yield.

3.1.3 Hydrology and drainage.

There is a permanent river Nyakomisaro and its tributaries flowing along the project area. Floods are experienced in some parts of the county which are low lying and generally flat. Also extensive flooding is experienced in Mosocho town. However, this only happens during the heavy rainy seasons. The drainage system will be provided within the site for efficient flow of surface run off.

3.1.4 Water sources.

Sources of water in the area include harvested rainwater and piped water from the Gusii Water and Sewerage Company. The proponents intend to source for piped water from the Gusii water and sewerage company. They also plan to set up storage containers to harvest rainwater.

3.1.5 Flora and Fauna

Due to the high temperatures experienced in the county, most of the plant species are exotic and other nappier grass and natural grass which is common in the area.

At the proposed project site, there is nappier which will be cleared to allow development to take place. There is no wildlife at or near the site, only domesticated animal such as cattle, goats, donkeys and sheep found near the project environ.

3.2 Social and economic baseline information.

3.2.1 Population distribution.

According to the results of 2019 national housing and population census conducted by the Kenya National Bureau of Statistics (KNBS), the population of Kisii County is 2.7 million persons and the area is 1.3327square kilometres. The population density is therefore being 958 people per square km.

3.2.2 Economic activities

The main economic activity is agriculture. Both livestock and crop farming is practiced here. Some of the livestock kept include cattle, sheep and goats. The crops mainly grown are Beans, maize and bananas.

Agriculture is also a large contributor to the county's economy. Some of the cash crops are tea and coffee. There are also businesses that operate from urban areas such as Kisii town. These include wholesale, retail shops, supermarkets and shopping mall. Real estate developers have also built residential homes and hotels that offer affordable accommodation to the residents and visitors who regularly come to the county. Some of these visitors are tourists. The area surrounding the site is characterized by residential/commercial housing.

3.2.3 Infrastructural facilities

The road serving the project area is earth Road which is tarmacked. There are a number of schools and hospitals around the area and other commercial buildings nearby are located about 200m away from the proposed project site. Networks for Safaricom, Airtel, Yu and Orange are available. KPC cable has passed through the site and the owner will connect it to the building upon commissioning.

Electricity passing along the project site

CHAPTER 4: LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 General Overview

Kenya has a policy, legal and administrative framework for environmental management.

Under the framework, the National Environment Management Authority (NEMA) is responsible for ensuring that environmental impact assessments (EIAs) are carried out for new projects and environmental audits on existing facilities as per the environmental management and coordination Act 1999.

Environmental Impact Assessment (EIA) is a tool for ensuring new projects and programmes incorporate appropriate measures to mitigate adverse impacts to the environment and peoples' health and safety as well as enhancing sustainable operations with respect to environmental resources and co-existence with other socio-economic activities in their neighborhood. Necessary policies and legislation ensures that EIA are carried out on every new project, activity or programme and a report submitted to National Environmental Management Authority (NEMA) for approval and issuance of relevant licenses.

According to Section 68 of the Environmental Management and Coordination Act (EMCA) 1999, The Authority shall be responsible for carrying out environmental audits on all activities that are likely to have a significant effect on the environment.

Environmental Auditing (EA) is a tool for environmental conservation and has been identified as a key requirement for existing facilities to ensure sustainable operations with respect to environmental resources and socio-economic activities in the neighbourhood of the facilities.

The government has established regulations to facilitate the process on EIAs and environmental audits. The regulations are contained in the Kenya Gazette Supplement No. 56, legislative supplement No. 31, and legal notice No. 101 of 13th June 2003.

In the past, the government has established a number of National policies and legal statutes to enhance environmental conservation and sustainable development.

The proponent will need to observe the provisions of the various statutes that are aimed at maintaining a clean and healthy environment throughout the lifecycle of the proposed project.

Some of the policy and legal provisions are briefly presented in the following sub-sections.

4.2 Policy on Environment and Development (Sessional Paper No. 6 of 1999)

The key objectives of the Policy include: -

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

Under this paper, broad categories of development issues have been covered that require a "sustainable development" approach. These issues relate to waste management and human settlement. The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low or non-waste technologies, increased public awareness and appreciation of a clean environment. It also encourages participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others.

4.3 Legal Aspects

Applications of national statutes and regulations on environmental conservation suggest that the proponent has a legal duty and social responsibilities to ensure the proposed development is carried out without compromising the status of the natural resources, public health and safety. This position enhances the importance of this environmental impact assessment for the proposed site to provide a benchmark for its sustainable operation when it is finally commissioned. The key national laws that govern the management of environmental resources in the country have been briefly discussed below.

4.3.1 The Environmental Management and Co-ordination Act, 1999

The Environmental Management and Co-ordination Act No. 8 of 1999 is an Act of Parliament that provides for the establishment of an appropriate legal and institutional framework for the management of the environment.

EMCA was developed as a framework law, and this is due to the fact that the Act is thus far, the only single piece of legislation that contains to date the most comprehensive system of environmental management in Kenya. The Act provides for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya and for matters connected therewith and incidental hereto. The Act is based on the recognition that improved legal and administrative co-ordination of the diverse sectoral initiatives is necessary in order to improve national capacity for the management of the environment, and accepts the fundamental principle that the environment constitutes the foundation of our national, economic, social, cultural and spiritual advancement.
According to Section 58 of the Act an Environmental impact assessment study needs to be carried out on projects specified in the second schedule of the Act that are likely to have a significant impact on the environment. *It is against this background that the proponent has appointed EIA Experts to prepare this EIA project report for submission to the Authority.*

4.3.2 The Occupational Health and Safety Act, 2007

The Act focuses on the provision of safety, health and welfare of workers and all persons lawfully present at workplaces. Part VI provides for the general welfare of the workers with respect to supply of drinking water, washing facilities and first aid among other aspects. Related to the workers welfare, Part VII section 51 states in part "In every factory or work place in which, in connection with any process carried on, there is given off any dust or fumes or other impurity of such a character and to such an extent as to be likely to be injurious or offensive to the persons employed, or any substantial quantity of dust of any kind, all practicable measures shall be taken to protect the persons employed against inhalation of the dust or fume or other impurity and to prevent it accumulation in any workroom, and in particular, where the nature of the process makes it practicable exhaust appliances shall be provided and maintained as near as possible to the point of origin of the dust or fumes …….". Section 53 of this Act requires that workers employed in a process involving exposure to wet or to any injurious or offensive substances, suitable protective clothing and appliances (gloves, footwear, goggles, and head coverage) shall be provided.

The contractor will ensure that safety precautions are observed during construction. All construction workers will be provided with Personal Protective Equipment so as to ensure their safety while onsite.

The proponent and contractor will undertake measures to prevent pollution, minimize the emission of dust and production of noise during the process of site preparation and development.

4.3.3 The Water Act 2002

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

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

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

Section 94 of the Act makes it an offence to throw or convey or cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or unwholesome matter or thing into or near to water resource in such a manner as to cause, or be likely to cause pollution of the water resource.

The proponent shall put in place solid and liquid waste management mechanism to ensure they do not impact surface and groundwater.. Measures such as construction of a well-designed connection to the existing sewage line. Solid waste collection firm to dispose of the garbage from the housing units shall be put in place.

4.3.4 The Public Health Act (Cap. 242, Laws of Kenya)

Part IX section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. **Section 116** requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary

to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

Section 118 provides what constitutes nuisance. These includes: Any dwelling or premises or part thereof which is or are of such construction or in such state or so situation or so dirty or so verminous as to be dangerous to health; any street, road or any part thereof, any stream, pool, ditch, gutter, watercourse, sink, water tank, cistern, waste pipe, drain, sewer, garbage receptacle, dustbin, refuse pit in such a way or so situated to be offensive or to be injurious or dangerous to health; any noxious matter or waste water flowing or discharged from premises; any accumulation or deposit of refuse; any accumulation of stones, timber or other material and any dwellings or premises which is so overcrowded, among other provisions.

All these issues have been addressed in the proposed mitigation measures and Environmental Management Plan (EMP).

4.3.5 Physical Planning Act (Cap. 286, Laws of Kenya)

The Local Authorities are empowered under **Section 29** of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same Section, therefore, allows for prohibition or controls the use and development of land and buildings in the interest of proper and orderly development of an area.

Section 30 states that any person who carries out development without permission will be required to restore the land to its original condition. It also states that NO other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local authority. *The proponent has complied with this provision by submitting the plans for the proposed development to county government for verification and approval.*

Finally, **Section 36** states that if in connection with a development application, local authority is of the opinion that the proposed development activity will have injurious impact on the environment; the applicant shall be required to submit together with the application an environmental impact assessment (EIA) report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the National Environmental Management Authority (NEMA) and should be followed by annual environmental audits. *The proponent has complied with this provision by appointing EIA Experts to carry out Environmental Impact Assessment Project Report for submission to the Authority.*

4.3.6 Local Government Act (Cap. 265 Laws of Kenya)

Section 163 allows the County Council to prohibit all business, which may be or become a source of danger, discomfort, or annoyance due to their noxious nature through smoke, fumes, dust, noise, or vibrations. **Section 165** allows the local authority to refuse to grant or renew any license which is empowered in this act or any other written law on the grounds that the activity does not conform to the requirements of any by-laws in force in the area of such local authority the granting of the license would be contrary to the public interest.

Section 170 allows the right of access to private property at all times by local authorities, its officers and servants for purposes of inspection, maintenance and alteration or repairs. In addition, the municipal Council may establish and maintain sewage farms or disposal works, and dispose of the effluent there from, but shall not be liable for any nuisance or damage as a consequence of proper and ordinary conduct of the sewage farms or disposal works **(section 171)**. To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and well-being of the inhabitants of its area as provided for under **section 201** of the Act.

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

4.3.7 The Forests Act, 2005

The Act stipulates that all forests in Kenya other than private land and local authority forests are vested in the State, subject to any rights of the user in respect thereof, which by or under this Act or other written law, have been or are granted to any other person.

The Act requires that before a person cuts a tree even if it is in her or his compound, he or she has to seek permission from the relevant authority.

There are no trees at the proposed project site

4.3.8 The Building Code 2000

Section 194 requires that where a sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect the sewer line and that all waste water must be discharged into the sewers. The code also prohibits construction of structures or buildings on sewer lines. *There is no sewer line at or near the proposed project site.*

4.3.9 The Penal Code (Cap. 63, Laws of Kenya)

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

4.4 Environmental Regulations

4.4.1 Environmental Management and Coordination (Waste Management) Regulation of 2006

These Regulations apply to all categories of waste as is provided for. According to the regulations, no person should dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed of such waste in the manner provided for under these Regulations. Any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility.

The proponent should minimize the wastes he generates by adopting the following methods: conserving raw materials and energy, enabling the recovery and re-use of the products where possible, reclamation and recycling, and incorporating environmental concerns in the design and disposal of a product. The unusable waste will be disposed as appropriate at designated disposal site after proper segregation.

4.4.2 Environmental Impact Assessment and Environmental Audit Regulation of 2003

The Environmental Impact Assessment guidelines require that the study be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on **schedule 2** (ecological, social, landscape, land

use and water considerations) and general guidelines on **schedule 3** (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures.

The proponent has undertaken this EIA in compliance with this requirement.

4.4.3 Environmental Management and Coordination (Water Quality) Regulation of 2006

It states "Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource is polluted before the enactment of the Act".

The proponent shall put in place solid and liquid waste management mechanism to ensure they do not impact on surface and groundwater.

4.4.4 Noise and Excessive Vibration Pollution Control Regulations of 2009

These regulations prohibit emission of excessive noise and vibration. It states that "Except as otherwise provided in these Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment"..

Tab le 1: Maximum permissible Noise levels during operational phase

Zone		Sound Level Limits dB(A)		Noise Rating Level (NR)	
		Day	Night	Day	Night
A.	Silent Zone	40	35	30	25
B	Places of worship	40	35	30	25
C.	Residential : Indoor Outdoor	45 50	35 35	35 50	25 25
D.	*Mixed residential (with some commercial and places of entertainment)*	*55*	*35*	*50*	*25*
E	Commercial	60	35	55	25

Day: 6.01 a.m. – 8.00 p.m. Night: 8.01 p.m. – 6.00 a.m.

***Source**: Legal Notice No. 61 Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009)*

The proponent shall ensure that all construction activities take place within the permitted periods.

4.5 INSTITUTIONAL FRAMEWORK

4.5.1 National Environment Management Authority (NEMA)

The National Environment Management Authority, (NEMA) is the principal instrument of Government in the implementation of all policies relating to the environment. NEMA is established under the Environmental Management and Co-ordination Act, (EMCA) of 1999. The Act entitles every person to a clean and healthy environment, while requiring each person to safeguard.

4.5.2 Public Complaints Committee

The PCC is established by section 31 of the Act and is chaired by an appointee of the Cabinet Secretary and who shall be a person qualified to be a Judge of the High Court. The function of PCC is to investigate any allegations against any person, institution or against the Authority in relation to the condition of the environment. The PCC can on its own volition investigate any case of environmental degradation and make a report of its findings together with its recommendations to the National Environment Council.

4.5.3 National Environmental Tribunal (NET)

NET is established by **section 125** of the Act and is chaired by an appointee of the cabinet secretary and who shall be a person qualified to be a Judge of the High Court. The NET reviews administrative decisions made by NEMA relating to issues of revocation or denial of licenses and conditions of licenses. It also provides legal opinion to NEMA on any complex matter where NEMA seeks such advice. The Tribunal is also empowered to change or give an order, give direction and to carry out investigations where necessary.

4.5.4 National Environment Council (NEC)

NEC is established by section 4 of the Act and is chaired by the Cabinet Secretary responsible for environment. It is responsible for policy formulation and directions for purpose of the Act; setting national goals and objectives and determining policies and priorities for the protection of the environment. Promoting co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes; and performs such other functions as are assigned under the EMCA.

CHAPTER 5: ANTICIPATED IMPACTS AND MITIGATION MEASURES

This chapter mainly focuses on the anticipated impacts from the project cycle. The impacts may be positive or negative. The types of impacts considered include:

- Primary impacts: - a primary impact is direct and occurs at the same time and place of action
- Secondary impacts: - a secondary impact occurs later in time, or after the chemical has interacted with others to undergone transformation or at a different place from the initial action or as a result of the initial/ primary impact.
- Cumulative impacts: - cumulative impacts result from incremental impact of a proposed action on a common resource when added to the past, present and foreseeable future.

Measures have been put in place to counter impacts during the construction phase, occupation phase and in the decommissioning stage of the proposed project.

Significance of impacts has been determined in terms of context and intensity of an action. Context in this case refers to geographical scale local, national or global. Intensity on the other hand is defined by the severity of the impact for example, the magnitude of deviation from background conditions, the size of the affected area, duration of the effect, violation of legal compliance and the overall likelihood of occurrence.

5.1 Construction phase

Positive impacts

a) Job opportunities

During construction phase, people will be employed to work at the site including casual workers until the project is complete. These will create jobs especially to the youths.

b) Provision of market for food vendors

Food vendors will profit from the sale of food to the people working at the project site during construction. This will boost local business in the area.

c) Gains in the local and national Economy

There will be gains in the local and national economy. Through consumption of locally available materials including: iron sheets, timber and cement. The consumption of these materials, fuel oil and

others will attract taxes including VAT which will be payable to the government. The cost of the materials will be payable directly to the producers.

d) Provision of market for supply of building materials

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

Negative Impacts and Mitigation Measures

a) Soil Erosion

No significant soil erosion is anticipated from the activities of the project. However, the construction activities are expected to loosen top soil as a result of the excavations and earth moving activities. The effects will mainly be localized.

Mitigation measures

In view of the fact that only micro-effects are anticipated, mitigation measures will also be localized.

- Excavations of the site will be confined only on the sections of the building and be planned such that a section is completed and rehabilitated before another one begins,
- Apply soil erosion control measures such as leveling the site to reduce run off velocity and increased infiltration into the soil,
- Ensure that any compacted areas are ripped to reduce runoff,
- Planting of grass and trees where applicable,
- Ensure that construction vehicles are restricted to graded roads to avoid soil compaction within the project site,

b) Noise

Noise is expected during construction with the major receptors being the immediate neighboring residents as well as the construction workers. Sources of noise would be the construction equipment, materials delivery trucks, concrete mixer, steel bars and wood work activities as well as the work force.

Mitigation measures

For the comfort of the neighboring occupants, the following measures would be necessary:

- Ensure that construction equipment are maintained at the best operating conditions and avoid unnecessary noise,

- Construction activities should ONLY be undertaken during the day (preferable between 8.30am and 5.00pm)
- Sensitize construction drivers to avoid hooting especially when passing through sensitive areas such as churches, schools or hospitals,
- Ensure workers are provided with the necessary Personal Protective Equipment(PPE) including earplugs when operating or working near noisy equipment,
- Ensure all generators and heavy machines are insulated or placed in an enclosure to minimize ambient noise levels,
- Encourage drivers to switch off vehicle engines when not in use.

c) Air Quality

Dust (from excavations and materials delivery), particulate matter from dry materials (sand, cement, gravel etc.) and emissions (smoke, hydrocarbons and nitrogenous gases among others from machinery exhausts) will be expected to increase slightly and they have an adverse effect on human health. This will, however, be a much localized effect to be felt just within 100m from the site.

Mitigation measures

- Maintain all machinery and equipment in good working conditions to ensure no or minimum emissions including carbon monoxide, nitrogen and sulphur oxides and suspended particulate matter,
- Trucks removing soil from the site, delivering sand and cement to the site will be covered to prevent dust emission into the surroundings,
- Sprinkle exposed dry materials and earth at the site with water to keep it moist and prevent dusty conditions in the neighborhood,
- Use of dust nets at high levels of the building,
- Provide workers with dust masks,

d) Increased solid Waste

During project implementation solid waste will be generated. These include papers used for packing cement, plastics, metal pieces or chips, concrete crumbs or debris and wooden 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 pest breeding, pollution of physical environment, invasion of scavengers and emerging of informal recycling communities.

Mitigation measures

The proponent will be responsible for efficient management of solid waste generated by the project during project implementation. In this regard, the proponent will provide waste handling facilities such as waste bins for temporarily holding waste generated at the site. In addition, the proponent will ensure that such wastes are disposed of regularly and appropriately. It is recommended that the proponent puts in place measures to ensure that the occupants of the housing units manage their waste efficiently through recycling, reuse and proper disposal procedures.

In addition the following are recommended;

- Construction debris resulting from the project will be disposed of in sustainable manner such as reuse in road gravelling or land fill in excavated sites. Reuse of timber and steel bars as well as dumping in appropriate disposal sites. It is suggested that the contractor identify suitable disposal areas with the necessary consultations.
- Use of an integrated solid waste management system is recommended i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion.
- The proponent will provide a section where the wastes will be stored temporarily before it is collected by the County Government of Kisii workers for disposal.
- Solid waste to be disposed only at designated disposal sites.
- Ensure that construction materials left over at the end of the construction will be used in other projects other than being disposed.
- Reuse packaging materials such cartons, cement bags, empty metals and plastic containers to reduce wastes at the site.
- Use building materials that have minimal or no packaging.
- Use of durable, long lasting materials that will not need to be replaced as often.

e) Occupational Health and Safety risks

During construction of the proposed housing project, it is expected that construction workers are likely to have accidental injuries and hazards as a result of handling hazardous waste. Because of the intensive engineering and construction activities including erection and fastening of roofing materials,

metal grinding and cutting, concrete work, steel erection and welding among others, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets among others.

Dust, emissions and noise are notable health hazard to the neighbors as well as the construction workers. There is tendency of informal food vendors selling food to construction workers at the work sites and this has a potential health implication to the workers.

Mitigation measures

- The contractor should provide a small section of the construction site complete with a shed where the food vendors can serve the construction workers to ensure hygiene and health of the employees
- Workers will be provided with suitable personal protective gear (such as nose masks, ear plugs/muffs, helmets, overalls, industrial boots, etc.) and ensure they are used at all times while at their place of work,
- A fully equipped First Aid Kit should also be provided at the site and have a trained person to handle emergencies,
- The contractor must have workmen's compensation cover as required by law (The Workmen's Compensation Act), as well as other relevant Ordinances, Regulations and Union Agreements,
- The contractor should ensure there is a temporary toilet on site for the workers, designated for male and female workers separately
- Sensitization campaign on STDS and AIDS in the workers,
- Provide safe scaffoldings and railings at heights,
- Train workers on use of machines and simple maintenance,
- The workers, immediate neighbors and other stakeholders will be sensitized on the dangers and risks associated with construction works for enhanced self-responsibility on personal safety at all times during the construction.
- Appropriate signage will also be posted at strategic locations around the construction site.

- The completed building will be fitted with safety facilities including firefighting equipment and suitable safety signage will also be placed strategically around and within the building.

5.2 Operation phase

Positive Impacts

a) Increased housing units

After completion of the project there will be increased housing units which will contribute to alleviation of housing problem in the area. There will be a total 224 housing units.

b) Enhance income generation to the owner

The owner will generate income through renting of the residential units after completion.

Negative impacts

a) Water pollution

If the sites for dumping solid wastes are not well taken care of, they may cause contamination to ground water sources and also if sewage from the building if it is not properly disposed it will lead to both surface and ground water contamination.

Mitigation measures

- The proponent will ensure that there are adequate means for handling the waste water generated from the building. will be connected to the existing line at the site.
- It will also be important to ensure that sewage pipes are not blocked or damaged 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

b) Electricity consumption

The project shall consume large amount of electricity once the project is complete. Since electric energy in Kenya is generated mainly through natural resources, namely water and geothermal resources, increased use of electricity have adverse impacts on these natural resources base and their sustainability.

Mitigation measures

- The proponent should install an energy-efficient lighting system within the building.

- The proponent should ensure energy conservation through sensitization of occupants to conserve electricity by switching off electrical equipment or appliances when they are not being used.

c) Solid waste generation

The project is expected to generate solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist of polythene bags, plastics, metal, textile and organic wastes. Such wastes can be injurious to the environment through blockage of drainage systems, choking of animals and negative impacts on human health. Some of these waste materials especially the plastic/polythene are not biodegradable hence may cause long-term injurious effects to the environment. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas which is a greenhouse gas known to contribute to global warming. They may lead to pest breeding.

Mitigation measures

- Provide waste handling facilities such as waste bins and skips for temporarily holding waste generated at the site
- The proponent should set a policy that encourages tenants to engage a licensed firm/company to collect and dispose wastes emanating from the building,
- 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

d) Increased water demand

After the building is complete there will be an increase in population of tenants which will lead to increase in water demand. The current water supply systems can be overwhelmed by the demand leading to shortages of water.

Mitigation measures

- The proponent will install water-conserving taps to reduce wastage.
- Any water leaks through damaged pipes and faulty taps will be fixed promptly by qualified staff.
- In addition, the occupants of the building will be sensitized to use water efficiently.

- Installing individual water meters to instil discipline on water use

e) Storm water run off

The building's roof and pavements will lead to increased volume and velocity of storm water or run-off flowing across the area. 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 flooding in the neighbouring areas.

Mitigation measures

- The proponent should install a roof catchment system to trap rain water reducing run off from the development.
- Landscaping should be done and include use of grass to improve water infiltration

5.3 Decommissioning phase

Positive Impacts

a) Rehabilitation

Upon decommissioning of the project, rehabilitation of the project site will be carried out to restore the site to its original status. This will include replacement of topsoil and re-vegetation which will lead to improved visual quality of the area.

b) Employment opportunities

Several employment opportunities will be created for the demolition staff

Negative Impacts

a) Solid waste

Demolition of the building and related infrastructure 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. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

Mitigation measures

The materials should be properly segregated to encourage recycling of some of them. Some demolished stone materials can be used as backfills or reused in other projects.

A reputable solid waste handler will be contracted to collect solid waste from the site and ensure appropriate disposal.

b) Dust

Large quantities of dust will be generated during demolition works. This will affect demolition staff as well as the neighbouring residents.

Mitigation measures

i. Provision of dust masks to demolition staff
ii. Sprinkle water to reduce dust emissions

c) Noise and Vibration

The demolition works will lead to significant deterioration of the acoustic environment within the project site and the surrounding areas.

Mitigation measures

- Demolition works should be carried out only during the specified time which is usually as from 0800 hrs to 1700 hrs.
- Provision of bill boards at the project site gates notifying of the demolition activity and timings

CHAPTER 6: PUBLIC PARTICIPATION

Consultation and public participation (CPP) is a requirement in EIA process as it is stipulated in Environmental Management and Coordination Act, 1999. The integration of public participation or involvement of stakeholders in EIA process is very important in terms of its implication for sound decision making and the sustainability of development activities. Kenya EIA Procedures provides for the involvement of stakeholders and the public in the assessment and review of proposed undertakings. This was achieved in this report through live interviews and administering questionnaires to relevant correspondents.

The public should be provided with sufficient information about the proposed project and properly understand the project and issues to be able to give informed comments and participate fully in the process.

Public and Stakeholders' involvement in the EIA process is essential and may lead to enormous benefits for the proponent, stakeholders and the nation. Where this is ignored, conflicts and problems may be created for project implementation and sustainability.

The persons who gave insights to the proposed project included residents in the neighbourhood and the surrounding area, experts among others. Data collection was carried out by use of interview schedules and distribution of questionnaires to the members of the public who reside near the area. Observation was also used in gathering information about the area in relation to the proposed project *(Sample of questionnaires in the appendices).*

6.1 Objectives of the consultation and public participation

The objective of the consultation and public participation was to:

- Disseminate and inform the stakeholders about the project with special reference to its key components and location
- Gather comments, suggestions and concerns of the interested and affected parties
- Incorporate the information collected in the EIA study

Interviews and discussions were held with the proponent and the neighboring residents. The neighboring residents were sampled and issued with a questionnaire to fill in respect to the proposed project.

6.2 Issues raised during consultation and public participation

Creation of Employment and income generation

The neighboring residents were optimistic that the construction of the proposed project will create employment opportunities during construction thus generating income for the people involved in construction. The owner will also generate income through renting the residential units. Food vendors will also benefit through selling food to the workers at the construction site.

Increased housing units

Once the proposed project is complete, it will provide housing units for accommodation to the residents and business people and its environs.

Provision of market for supply of building materials

The project will provide a market for building materials that will be sourced locally such as murram, timber and rough stones. This is according to the feedback from respondents,

Noise pollution

Respondents feared the possibility of high levels of noise in the project site as a result of construction. Causes of noise will include cutting equipment, construction machinery, metal grinding, large trucks carrying construction materials to the site. The proponent is expected to ensure good maintenance of the equipment in the construction, undertake construction activities during the day only to reduce the noise disturbances in the night as well as providing the workers with protective equipment (noise muffles).

Dust emissions

Respondents expressed concern over dust emissions within the development site and the surrounding areas, especially during the construction period. Dust emissions from building materials such as cement and sand could affect the people living in the neighborhood and workers health as it causes allergies, respiratory diseases, eye problems and visibility problem. To minimize dust levels the proponent should ensure trucks carrying building materials such as soil and sand are covered and sprinkle the construction site with water to keep dust down as much as possible.

Generation of solid waste

According to respondents, there is possibility of generation of large quantities of solid waste.
During construction, empty cartons, empty paint and solvent containers and broken glasses left lying at the construction site will affect the aesthetic value surrounding environs as they are non-biodegradable. Sharp metals at the site might cause accidents to the workers.

Occupants of the apartments will also generate solid waste such as plastic paper bags and food stuffs. There is a need therefore for the proponent to provide bins for the collection of the waste for the occupants and contract a private company to ensure proper handling of the wastes. Cartons at the site can be reused or recycled.

From the discussions and interviews, it is evident that there are no real critical issues associated with the project. The respondents welcome the project and are very eager to see the project implemented.

CHAPTER 7: ANALYSIS OF PROJECT ALTERNATIVES

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. Looking for the land to accommodate the project and completing official transaction on it may take up to time although there is no guarantee that the land would be available. The developer will spend also money and time on design and approvals since design and planning has to be according to site conditions. Whatever has been done and paid to date will be counted as a loss to the developer. The consequence of this is that it would be a discouragement for local or foreign investors in urban development. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option.

The 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 community as well as a whole country. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain under-utilized.
- Shortage of housing units within Total area
- Increased urban poverty and crime in Kenya.

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

The Proposed Development Alternative

The proposed site for the development is conveniently located in an area with adequate services and infrastructure. The developer undertakes to incorporate all necessary measures to ensure adverse impacts are mitigated during the construction period and operation phase in accordance with the Environmental Management and Co-ordination Act 1999, to minimize environmental impacts to the maximum extent practicable.

Domestic waste water management alternatives

Five locally available technologies are discussed below:-

Alternative one – Waste water treatment plant

This involves the construction of a plant and use of chemicals to treat the effluents to locally/internationally accepted environmental standards before it is discharged into the river nearby. It is usually expensive to construct and maintain, but it is the most reliable, efficient and cost-effective in the long term. The sludge obtained can be composted and used for agricultural and gardening purposes. The option is not preferable due to the existing alternatives as outlined below.

Alternative two – Use of stabilization ponds/lagoons

This refers to the use of a series of ponds/lagoons which allow several biological processes to take place, before the water is released to the outside environment. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly. No chemicals are used/heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds. This option is not preferable in the area because the required space is not only available, and the local community is not likely to accept the option.

Alternative Three – Use of Constructed/Artificial wetland

This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant species on the site will also be required to avoid weed biological behavioural problems. Hence it is not the best alternative for this kind of project.

Alternative four - Connection to the sewer system

There is no sewer line within the project area. Therefore, connection to the sewer line will not be an option.

Alternative five - Use of septic tanks

This involves the construction of underground concrete-made tanks to digest the sludge emptying it into soak pits. It is expensive to construct the tanks but this is the most suitable way of disposing wastewater.

A well designed and constructed septic tank with soak pits does not require emptying unless non degradable materials like plastics and papers are introduced into the septic tank. Therefore it is

advisable not to introduce non degradable materials into the septic tank thus making this alternative the best option.

Solid waste management alternatives

Solid wastes will be generated from the proposed housing Project. An integrated solid waste management system is recommendable. First, the proponent will give priority to Reduction at source. This option will demand a solid waste management awareness programme in the management and the residents. Secondly, 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 Kisii Town and its environs. The third priority in the hierarchy of options is combustion of the waste that is not recyclable. Finally, sanitary landfilling will be the last option for the proponent to consider.

CHAPTER 8: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

This Environmental Management and Monitoring Plan (EMMP) outline has been developed to ensure sustainability of the project from construction through to operational phase. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitoring indicators. Implementation timeframes and responsibilities are also defined.

The responsibility for the integration of the proposed mitigation measures for the proposed development lies with the contractor during the construction stage while the proponent takes over the duty upon commissioning of the building. At every stage, the objective would be to ensure that the specified mitigation measures are implemented. The table below summarizes the Environmental Management Plan for the proposed development.

Table 2: ENVIRONMENTAL MANAGEMENT PLAN FOR CONSTRUCTION AND OPERATION PHASE

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
Soil erosion	Construction	▪ Control the earthworks and contain excavated soils on site, ▪ Ensure compacted areas are ripped to reduce run off, ▪ Apply soil erosion control measures such as leveling the site to reduce runoff velocity and increase storm water into the soil, ▪ Planting grass, ▪ Site excavation works be planed such that a section is completed and rehabilitated before another one begins,	Supervising Foreman and Contractor	Continuous throughout construction phase	Kshs.50,000
	Occupation	Planting grass in open areas Paving the area	Property Manager/care taker	Once	

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
Air Pollution (dust, exhaust emissions and particulate matter)	Construction	▪ Maintain construction machinery in working order at all times, ▪ Avoid excavation works in extremely dry weathers, ▪ Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles, ▪ Vehicle idling time shall be minimized, ▪ Delivery vehicles with dry materials be covered, ▪ Sensitize construction workers on aerial emissions.	Supervising Foreman and Contractor	Continuous throughout the construction phase	▪ Complaints from the neighbours, ▪ Physical appearance in the immediate air space, ▪ Depositions on surfaces (buildings, plants and stationary vehicles)
	Operation	Pavements should be cleaned daily to reduce dust emissions.	Property Manager/proponent	Continuous	

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
Noise pollution	Construction	▪ Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals ▪ Regular maintenance of machinery/ equipment, ▪ Undertake construction only during the daytime(8am-5 pm), ▪ Sensitize machine operators and vehicle drivers to switch them off when not being used, ▪ Workers to wear ear plugs/muffs as part of the personal protective gear. ▪ Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels	Supervising Foreman and Contractor	A continuous observance throughout the construction	▪ Complaints from the neighbours, Kshs. 30,000
	Occupation	Ensure the generator(if present) is placed in an enclosure to reduce ambient noise levels during power outages,	Property Manager		

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
Water Pollution (Oil spills, silt, leachate from solid wastes, suspended matter, infiltration into water supply pipes, sewage discharge, etc.)	Construction	▪ Proper storage, handling and disposal of oil and oil wastes from machinery, ▪ Discourage servicing of machinery and vehicles on site, ▪ A designed garage section of the site fitted with oil trapping equipment to be planed for changes, ▪ Provide safe means of handling sewage from construction workers.	Supervising Foreman and Contractor	Continuous through the construction period	Nature of surface runoff from the site No cost estimates (Part of the earthworks and landscaping)
	Operation	▪ Solid waste holding bins to be provided at the building in all the floors and the proponent to ensure regular disposal at designated dumpsites. ▪ Regular inspection of blockage or damage of sewer pipes. ▪ Comply with the provisions of Environmental Management and Co-ordination (Water Quality) Regulations 2006	Proponent or Property Manager	Continuous monitoring	Nature of surface runoff from the site No specific cost estimates (part of the sanitary and plumbing installations) Kshs. 1000 per inspection

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
Increased solid waste generation	Construction	▪ 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 Construction concrete debris be disposed of safely preferably re-used on road graveling or filling excavated land, ▪ 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 ▪ Other inert materials (wood, steel bars, nails, papers, glass, etc. be recycled off site OR dumped in designated dumping sites. ▪ Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste ▪ Through accurate estimation of the sizes and quantities of materials required, order materials in the right sizes and quantities they will be needed ▪ Provision of waste holding units as temporary storage bins. ▪ Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	The Architect Contractor, Supervising Foreman	Wastes are expected throughout the construction phase	Compatibility of the waste types with the recipient physical and social environment.

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
	Occupation	▪ 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. ▪ Provide solid waste handling facilities such as waste bins in all the floors ▪ Ensure that solid waste generated is regularly disposed of appropriately at designated dumping sites ▪ Engage approved refuse handling agents/licensed company for collection and disposal of wastes emanating from the building regularly, ▪ Comply with the provisions of Environmental Management and Co-ordination (Solid Waste) Regulations 2007	Care Taker or Property Manager	Facilities and mechanisms to be in place upon commissioning	Ksh.10,000
Increased water demand	Construction and occupation	▪ Sensitize construction workers and occupants to conserve water by avoiding unnecessary water use ▪ Install water conserving taps and a discharge meter at water outlets to determine and monitor total water usage,	Proponent and property manager.	Continuous	Ksh.10, 000 per month

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
		▪ Promptly detect and repair water pipes and tank leaks,			
Occupational Health and Safety	Construction	▪ Provide appropriate sanitation facilities for the construction workers, ▪ Provide and enforce application of personal protective equipment, ▪ provide a well-equipped First Aid Kit on site for the workers and have a person trained to handle emergencies, ▪ provide safety signage within and around the site, ▪ provide safe scaffoldings railings at heights, ▪ Sensitization campaign on STDs and AIDS in the workers, ▪ Train workers on use of unfamiliar machines and simple maintenance,	Contractor, property manager	Continuous	▪ Complaints from the residents, ▪ Compliance level of the construction workers. Kshs. 40,000
	Occupation	▪ Ensure elaborate fire detection and fighting facilities such as fire extinguishers are installed throughout the building, ▪ Train the security personnel and care taker on safety matters (fire safety included), ▪ Extend safety awareness to all occupants of the building as well as willing	proponent or Property Manager	An all-time requirement.	▪ Cases reported on health and safety, ▪ Compliance levels with health and safety requirements, ▪ Level of awareness of all stakeholders. Kshs.20,000

Environmental and Social Impact Aspect	Project Stage	Mitigation Action Plans	Responsibility	Timeframe	Cost Estimates (Kshs.)and or monitorable indicators
		members of the neighbouring community, ▪ Comply with all requirements on buildings as outlined under the Public Health Acts as well as the Local Government Acts (see section 4 of this report), ▪ Install visible and readable signage on safety throughout the building for enhanced safety awareness,	Occupants also have a responsibility of their health and safety.		
Increased energy consumption	Construction and occupation	▪ Ensure electrical equipment, appliances and lights are switched off when not being used ▪ Install energy saving fluorescent tubes or bulbs at all lighting points	Proponent or property manager Occupants have a responsibility	Continuous	Kshs. 10 000
Storm water run off	Operation	▪ The proponent should install a roof catchment system to trap rain water reducing run off from the development. ▪ Landscaping should be done and include use of grass to improve water infiltration	Proponent	Once-off	Kshs. 100 000 for buying storage tank

Table 3: Environmental Management Plan for the Decommissioning Phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Estimated Cost (Kshs)
Demolition waste	▪ Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3.Composting and reuse 4. Combustion. ▪ Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Project Manager or Contractor	Once-off	50,000
Site degradation	▪ Implement an appropriate landscaping programme to restore the site to its original status. ▪ Consider using indigenous plant species.	Project Manager or Contractor	Once-off	10,000
Noise and vibrations	▪ Undertake demolition only during day time(8am-5 pm), ▪ Workers to wear ear plugs/muffs as part of the personal protective gear.	Project Manager or Contractor	Once-off	0

CHAPTER 9:

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The EIA study has established that the proposed project will no doubt contribute significantly to the improvement of living standards among Kisii town inhabitants and by extension spur economic development. This will be through the prior discussed positive impacts namely; provision of market for supply of building materials, employment creation, increase in government revenue, optimal use of land and increased housing stock among others as it has been outlined within the report.

However, the EIA study has established that the proposed project will also come along with some negative impacts. The negative environmental impacts that will result from establishment of the proposed project which include noise pollution, dust emissions, solid waste generation, increased water demand, generation of exhaust emissions, workers accidents and hazards during construction, increased electricity consumption, soil erosion among others can however be sufficiently be mitigated.

The proponent of the proposed project shall be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the proponent shall focus on implementing 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. It is expected that the positive impacts that emanate from such activities shall be maximized as much as possible. These measures will go a long way in ensuring the best possible environmental compliance and performance standards.

Recommendations

The following recommendations have been listed to ensure that adverse impacts that may emanate from the proposed project are mitigated;

- Workers will require to be provided with appropriate personal protective gear and the application enforced at all times while at place of work,

- Sensitize material delivery drivers to avoid hooting especially when passing through sensitive areas such as churches, schools, residential areas and hospitals,
- Dry construction materials and excavated earth will be kept moist to prevent excessive dust and particulate matter emissions into the air,
- All machinery and equipment will be properly maintained and in good operating condition,
- The implementation of safety measures and emergency plans to contain accident risks associated with operation of machinery and other related activities,
- Emergency response plans/procedures including details (phone numbers and location) of the nearest dispensaries, hospitals and the proponents site representative will be provided to the site foreman/Site Manager for action in case of any accidents during construction,
- The contractor should ensure workers are trained on the use of any unfamiliar machinery and equipment that may pose danger to them. Particularly important is the provision of protective clothing, helmets and ear protectors,
- Open spaces with loose soils will require to be well compacted to prevent any erosion by wind and water,
- Excavated earth and other construction debris will require to be removed safely and dumped in approved sites or reused elsewhere as road gravelling or landfills materials,
- Solid wastes should be disposed regularly and at designated dumpsites. Resource recovery, re-use and recycling will be encouraged,
- Installation of water conserving taps that turn-off automatically to minimize wastage
- Electrical area classification/drawings will be done and all electrical fittings will comply with design, all electrical components at the site shall be of appropriate quality to minimize risks associated with faulty electrical fittings,
- Firefighting equipment should be located at strategic points within the building,

REFERENCES

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