PROPOSED HOSPITAL DEVELOPMENT

ON PLOT L.R NO. BUTSOTSO/SHIKOTI/18683 IN EMUHONDO VILLAGE, LURAMBI SUBLOCATION, KAKAMEGA COUNTY

ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

February 2021

EXPERT

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This study report has been prepared in accordance with the requirements of the Environmental (assessment and Audit) Regulations, 2003, pursuant to The Environmental Management and Coordination Act, (EMCA) amendment 2015.

CERTIFICATION

The preparation of this Environmental Impact Assessment Study Report was commissioned by the Proponent in fulfilment of requirements of the EIA/EA Regulations, 2003 and Environment Management and Coordination Act 1999, amendment 2015.

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ACKNOWLEDGEMENT

We as the team of experts would like to express our appreciation to the following individuals and organizations for their overwhelming support in the journey that led towards the successful completion of this study report.

It is our duty to acknowledge with gratitude Dr. Morris Alwora and Kenneth Odongo Alwora (Proponent) and the area neighbours for making available the opportunity to undertake the exercise and assisting with the task of gathering data for the study report, he has a wide knowledge and expertise in the construction field hence the technical view expressed in this report is owed to them.

The final report is the result of a collaborative process which drew on the effort, knowledge, expertise and patience of Mark Mua, Mercy Chepkerui, Beatrice Randa and Regina Wanyonyi. Others that have not been named here, their efforts are earnestly recognized.

ACRONYMS AND ABBREVIATIONS

Table 1: Acronyms and abbreviations

DOHSS	Directorate of Occupational Health and Safety Services
EA	Environmental Audits
EHS	Environment, Health and Safety
CDE	County Director of Environment
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
SEM	Sustainable Environmental Management
KPLC	Kenya Power and Lighting Company
NEMA	National Environment Management Authority
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
SWM	Solid Waste Management
KKG	Kakamega County Government
KAWASCO	Kakamega Water and Sanitation Company
dBA	decibels
OPD	Out Patient Department
IPD	In Patient Department

EXECUTIVE SUMMARY

The proposed hospital development is located on plot No. **Butsotso/Shikoti/18683** measuring **0.32 ha** in Emuhondo village, Lurambi Sublocation, Lurambi Subcounty in Kakamega County. The site is approximately 200m along D262A murram road, off Eshikinji- Esumeiya (C40) road at Emahondo junction and 10km from Kakamega town.

The Environmental Impact Assessment Study Report of the proposed Hospital development is prepared in accordance with section 58 of the Environmental Management and Coordination act (EMCA) No.8 of 1999 amended 2015 and Environmental (impact assessment and Audit) Regulations (2003) that requires that such enterprises and project must undergo an Environmental Impact Assessment. The purpose is to predict all possible positive and negative impacts that the project may have on both human and natural environment and suggest mitigation measures for the significant negative impacts before the project is implemented.

The main objective of the EIA study is to provide information on the nature and extent of potential environmental impacts arising from the construction and operation of the proposed Hospital development (hereinafter referred to as "the Project") and related activities taking place concurrently and to contribute to decisions on the overall environmental acceptability of the Project after the implementation of environmental mitigation measures.

The methodologies used to conduct this EIA study were a) Questionnaires b) Interviews c) Focus Group Discussions d) Public meeting e) Field observations f) Still digital photography g) Desktop research.
The public participation comments, copy of the title deed for the plot and a map of the site layout have been annexed at the back of this report.

In carrying out the EIA study for the project, various Acts of Parliament were reviewed: Environment Management and Co-ordination Act, 1999 amended 2015, The Science and Technology Act, Cap 250, The Water Act, Cap 372, The Public Health Act, Cap 242, County Government Act, 2012, Physical Planning Act, Cap 286 and Building Code, The land planning Act, Cap 303, The Penal Code, Cap 63 and The Occupational, Safety & Health Act, 2007.
The scope of the study was to describe the project, document all the baseline information, address both the positive and negative impacts and develop mitigation measures for negative impacts including designing environmental management plan for the project.

The following are areas of concern as well as positive impacts that have been discussed at depth in the report and their mitigation measures outlined. a) Solid and liquid waste generation b) Noise nuisance c) Employment d) dust emissions and air pollution e) occupational, health and safety concerns f) National economic benefits g) energy use h) loss of vegetation i) Soil erosion j) Fire hazards and accidents k) hazardous waste management.

The NEMA Guidelines on EIA require that assessments of options available for a project are important considerations at the project planning stage. The environmental implications of each option should be considered before commitments are made.

The assessment should identify technical, economic and environmental reasons for selecting a preferred option. The alternatives to the proposed project should feasibly attain most of the basic project objectives but would avoid or substantially reduce any of the significant negative effects of the proposed project. The analysis of the alternatives summarized here is explained in details in the report. The following alternatives were identified: No project alternative, different site Waste Management and the proposed Development Alternative.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background and location of the Project

The proponent of the project is Kenneth Odongo Alwora. The proposed Hospital development is located on plot No. **Butsotso/Shikoti/18683** measuring **0.32 ha** in Emuhondo village, Lurambi Sublocation, Lurambi Subcounty in Kakamega County. The project will benefit both the entire Kakamega County population and its environs with adequate and quality medical services. Copy of Title Deed is annexed at the back of this report.

1.2 Objectives of the project.

The proposed project is being developed with the following main objectives:

a. To provide modern health/medical services that is secure, comfortable and meets the required competitive standards.
b. Provide employment to many Kenyans who are jobless especially during the construction and its operation phase.
c. Improve and promote both small scale and large scale business within the location through supplies of materials like cement, steel bars among others.
d. Promotion of transportation business through supplies of sand, building stones, ballast, articles.
e. Help in promoting the government through payment of tax and other revenues to Kenya revenue authority(KRA)
f. Promotion of secondary employment or indirect employment like medical staffs, watchmen, compound caretakers e. t. c.
g. Adherence to government vision 2030 where all Kenyans will be provided with proper and adequate health care.

1.3 The Study report Legal Context Requirement

The Environmental Management and Coordination Act (EMCA) of 1999 provides for the legal framework for the management of the Kenyan environment. According to section 58 of the Act (EMCA) No. 8 of 1999, second schedule 9 (i) and the environmental (Impact Assessment and Audit) Regulations, 2003, all new enterprises and ongoing projects must undergo Environmental Impact Assessment (EIA). The EIA study report is submitted to the National Environment Management Authority (NEMA) in the prescribed form.

Under the EMCA, all proposed projects according to the Second Schedule will undergo an Environmental Impact Assessment (EIA) while projects already in place will undertake annual Environmental Audits (EA). This Act came into force on 14th January 2000. It aims at coordinating environmental protection activities in the country. In its preamble, the Act states that every person in Kenya has a right to a clean and healthy environment.

The National Environmental Management Authority (NEMA) approval document on the proposed project undertaking will enable the proponent to construct the proposed hospital project.

CHAPTER TWO

2.0 LOCATION OF THE PROJECT

This section gives the environmental and social profile of the project area. The proposed project seeks to provide health services to the neigbouring locals within Emahondo area, entire Kakamega County and its environs.

2.1 The site Location and Size

Figure 1: Proposed project location and surrounding (*courtesy of Google map*)

The proposed project site is located on plot No. **Butsotso/Shikoti/18683** measuring **0.32 ha** within Emuhondo village, Lurambi Sublocation, Lurambi Subcounty in Kakamega County. The plot size is measuring 0.32ha. The site is approximately 200m along D262A road, off Emahondo junction and 10km from Kakamega town.

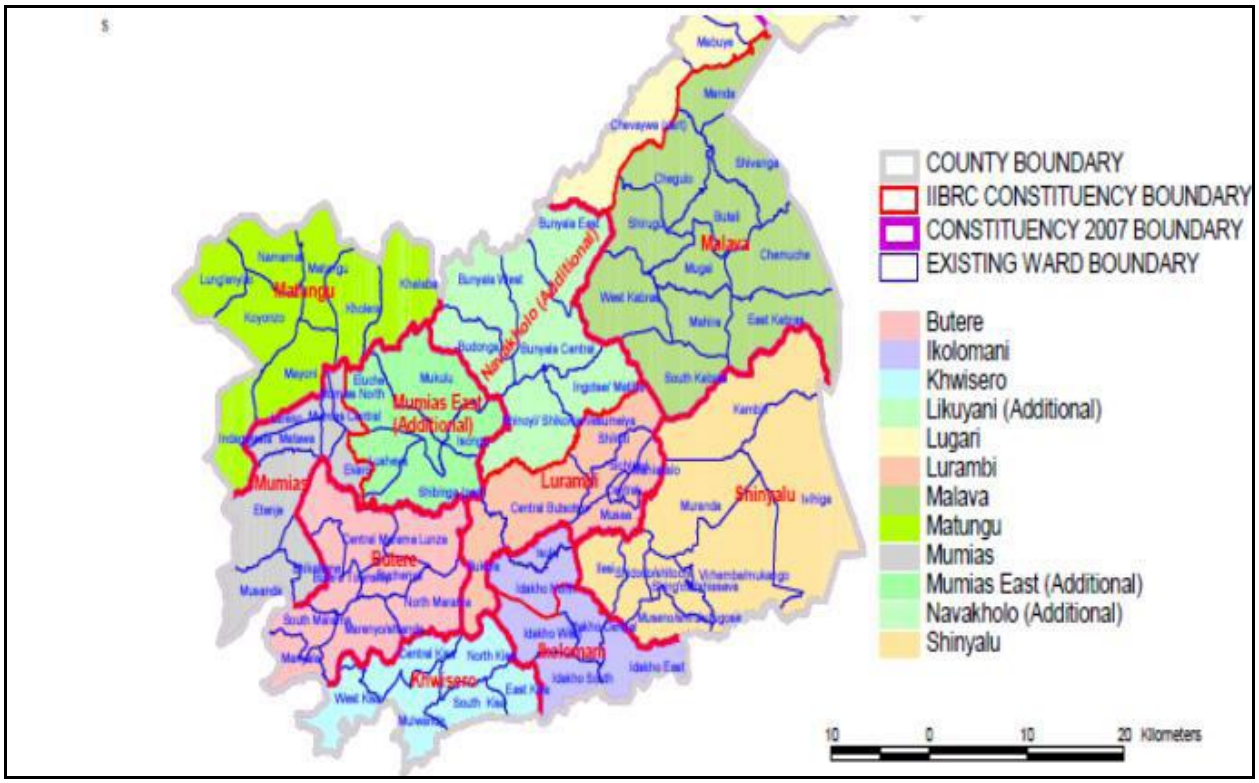
The project site lies in peri-urban setting characterized by gentle slope southwards, shrubs, maize and kale farms and few neighbouring homesteads and commercial buildings.

2.2 Baseline Information

2.2.1 Kakamega County Position and Size

Kakamega County is one of the four counties in the western region. It boarders Vihiga County to the south, Busia and Siaya County to the West, Bungoma and TransNzoia to the north, Uasin Gishu

to the North East, and Nandi County to the east. The county covers an area of approximately 3050.3 Km2. Map 1 indicates the Position of Kakamega County on the Map of Kenya.



2.3 Physiographic and Natural Conditions

2.3.1 Physical and Topographic Features

The altitudes of the county range from 1,240 metres above sea level to 2,000 metres above sea level. The southern part of the county is hilly and is made up of rugged granites rising in places to 1,950 metres above sea level. The Nandi Escarpment forms a prominent feature on the county's eastern border, with its main scarp rising from the general elevation of 1,700 metres to 2,000 metres. There are also several hills in the county such as Misango, Imanga, Eregi, Butieri, Sikhokhochole, Mawe Tatu, Lirhanda, Kiming'ini hills among others.There are seven main rivers in the county namely, Rivers Nzoia, Yala, Lusumu, Isiukhu, Sasala, Viratsi and Sivilie.

2.3.2 Ecological Conditions

There are two main ecological zones in the county namely; the Upper Medium (UM) and the Lower Medium (LM). The Upper Medium covers the Central and Northern parts of the county such as Lurambi, Malava, Shinyalu and Ikolomani that practise intensive maize, beans and horticultural production mainly on small scale; and Lugari and Likuyani where large scale farming is practised. The second ecological zone, the Lower Medium (LM), covers a major portion of the southern part of the county which includes Mumias, Matungu and Butere and Khwisero. In this zone, the main economic activity is sugarcane production with some farmers practising maize, sweet potatoes, tea, ground nuts and cassava production.

2.3.3 Climate

The annual rainfall in the county ranges from 1280.1mm to 2214.1 mm per year. The rainfall pattern is evenly distributed all year round with March and July receiving heavy rains while December and February receives light rains. The temperatures range from 18^0 C to 29^0C. January, February and March are the hottest months with other months having relatively similar temperatures except for July and August which have relatively cold spells. The county has an average humidity of 67 percent.

2.4 Natural Ecological Resources

2.4.1 Flora and fauna

There is various flora and fauna around the area and Kakamega forest ia about 10km away hence no inference will be experienced. The site was previously used for farming and by the time of assessment, harvesting had been done and the site was bare. Few flora observed at the boundary included; grass, few Eucalyptus trees, shrubs. Wild animals were not present on site. There will be less interference to the few trees at the boundary during the proposed development.

2.5 Socio-economic conditions

Kakamega town and it's environs has Approximately 364,461 persons according to 2009 census. Kakamega town is surrounded by hilly Kakamega farmland and the Kakamega forest. Urbanization within the town is as a result of the Learning institutions, shopping malls such as Tuskys and Nakumatt malls and various government institutions.

Leaning institutions such as Masinde Muliro University of Science and Technology, government and non- government offices, residential homes, commercial centers and the entire Kakamega town is in need of fast and efficient internet through fiber optic cable infrastructure.

2.6 Infrastructure and Access

2.6.1 Road, Rail Network, Ports and Airports, Airstrips and Jetties

The county has a total of 3500 km road network of which 260 km is of bituminous standard while gravel surface covers 1,701.7 km and the earth surface covers 1389.3 km. Most roads in the county are not passable although a number of sub-counties have made efforts to have all of them regularly maintained. A number of government and other stakeholders have tried to ensure that the roads are in good state. The current government agencies include KeNHA, KeRRA, KURA, county government and the national government. On the other hand, there are other major non-state actors involved in road maintenance including sugar companies i.e Mumias Sugar, West Kenya Sugar Company. There is need for more stakeholders to come on board so as to improve the state of these roads through regular maintenance, storm water management, maintenance of road boundaries amongst other activities. All stakeholders in different sectors need to harmonize their activities to avoid destruction and interference of other physical infrastructure along these roads. There are 30 km of railway line with two railway stations; however, they are rarely used due to frequent vandalism. The county has two air strips, one in Kakamega and the other in Mumias. There is need to upgrade and expand the airstrips within the county and revive the railway transport.

CHAPTER THREE

3.0 RELEVANT LEGISLATIGVE AND REGULATORY FRAMEWORK

3.1 Environment Management and Co-ordination Act, EMCA 1999 amended 2015

The Environmental Management and Coordination Act (EMCA) of 1999 provides for the legal framework for the management of the Kenyan environment. Under the EMCA, all proposed projects that are likely to have significant impact on the environment according to the Second Schedule will undergo an Environmental Impact Assessment (EIA) while projects already in place will undertake annual Environmental Audits (EA). This Act came into force on 14th January 2000. It aims at coordinating environmental protection activities in the country. In its preamble, the Act states that every person in Kenya has a right to a clean and healthy environment. According to section 58 of the Act (EMCA) No. 8 of 1999, second schedule 9 (i), and the environmental (Impact Assessment and Audit) Regulations, 2003, all new enterprises and projects must undergo Environmental Impact Assessment (EIA). The EIA study report is submitted to the National Environment Management Authority (NEMA) in the prescribed form, and accompanied by the prescribed fees.

It is in line with this provision that the proponent appointed EIA experts to undertake an environmental Impact Assessment and prepare a study report in respect of the proposed development. This addresses the requirement as the project activities are likely to have negative environmental impacts. This will ensure the Proponent observes continuous improvement on environmental, health and safety management and takes appropriate measures to mitigate any adverse impacts to the environment and the surrounding communities that the project may have during its implementation and operation.

Part VII, Section 68 of the same Act requires operators of projects or undertakings to carry out environmental audits in order to determine level of compliance with statements made during the EIA. The audit report should be submitted to NEMA.

The proponent shall submit an Environmental Audit report in the first year of occupancy to confirm the efficacy and adequacy of the Environmental Management Plan

Section 87 sub-Section 1 states that no person shall discharge or dispose of any wastes, either generated within or outside Kenya, in such a manner as to cause pollution to: environment or ill health to any person, while Section 88 provides for acquiring of a license for generation, transporting or operating waste disposal facility. According to section 89, any person who, at the commencement of this Act, owns or operates a waste disposal site or plant or generate hazardous waste shall apply to the NEMA for a license.

Sections 90 through 100 outline more regulations on management of hazardous substances including oils, chemicals and pesticides.

The proponent will have to ensure that environmental protection facilities or measures to prevent pollution and ecological deterioration such as solid waste management plans, septic tank maintenance and landscaping are implemented, as per the design drawings and maintained throughout the project cycle

3.2 The Water Act, 2016

Section 82, subsection 1 provides that applications for permits for the same purpose or for different purposes shall receive consideration in accordance with the circumstances of each use.

The Ministry of water is vested with the duty to conserve and regulate the use of natural water resources (estuaries, surface, ground water and marine). The Act prohibits the release of wastewater without a permit and also spells out penalties for pollution of water. The Ministry through the district water board regulates the use of water and the drilling of boreholes.

Part II Section 18 of this Act provides for national monitoring and information systems for 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 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 sub-Section 1 allows the licensee to construct and maintain drains, sewers and sewer works for intercepting, treating or disposing of any foul water arising or flowing on 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, the 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 conveyor cause or permit to be own or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive or wholesome 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 Water Act provides the legal framework for sustainable utilization and management of water resources through an elaborate governance framework. It has four key institutions charged with separate functions and decentralized decision making systems. These institutions are summarized in the table below.

Table 4: Water Resources Management Institutions and their roles as established under the Water Act, 2016

Institution	**Role**
Water Service Boards (WSBs)	Development and maintenance of regional water provision infrastructure
Water Service Providers (WSPs)	Provision of reticulated supply
Water Resources Authority (WRA)	The Authority is responsible, among other things, for the issuance of permits for boreholes
Water Services Regulatory Board (WSRB)	License all providers of water and sewerage services who supply water services to more than twenty households

The project Proponent will be required to ensure that all construction waste are collected and dumped at approved sites to prevent potential for contaminating surface and underground water sources. All hazardous materials will need to be stored in a store with concrete floor. In addition, maintenance of fuel powered equipment and/or vehicles should be done off-site

There is no water body in or around the project site, however, underground water cannot be ruled out and therefore this EIA proposes waste water disposal mechanism will observe this provision when disposing off waste water to the septic tank to ensure that it does not infiltrate into underground water resulting to pollution. Compliance with the act will be ascertained by control audit which will be done in the subsequent years.

3.3 County Government Act, 2012

The County Government Act of 2012, which has been adapted to the Constitution's State and County structure in relation to devolution, declares the County Integrated Plan to be central to the County's administration and prohibits any public spending outside of the plan. The Act clarifies that the County Integrated Plan to be broken down into the economic plan, physical plan, social environmental plan and spatial plan. Also, the Act states that the County Plan commands,

- County integrated development plan
- County Sectoral plans
- County spatial plan
- Cities and urban areas plans as stipulated by Urban Areas and Cities Act

The act also stipulates that the County Government will be –responsible for functions stipulated in

article 186 and assigned in the Fourth Schedule of the Constitution which includes control of air pollution, noise pollution, other public nuisances and outdoor advertising.

The Proponent will ensure the project will be compliant with County Government Act 2012 by ensuring that the project is approved by relevant county departments, controlling all forms of solid and liquid wastes that are the major forms of pollution. Additionally an Environmental and Social Management/monitoring plan has been provided in this report with measures for mitigating potential environmental pollution anticipated from the development of the project.

3.4 The Occupational Safety and Health Act, 2007 (No. 15 of 2007)

This is an act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes.

The key areas addressed by the Act include:

General duties including duties of occupiers, self employed persons and employees.

Enforcement of the act including powers of an occupational safety and health officer.

Registration of workplaces.

Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences.

Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver.

Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas.

Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials

Welfare general provisions including supply of drinking water, washing facilities, and first aid.

Under section 6 of this act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7). He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning

which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21).

According to section 44, potential occupiers or users of any premises as work places are required to apply for registration to the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

To ensure machinery safety, every hoist or lift - section 63 and/ or all chains, ropes and lifting tackles - section 64 (Id), shall be thoroughly examined at least once in every period of six months by a person approved by the Director of Occupational Health and Safety Services. Similarly, every steam boiler - section 67 (8) and/or steam receiver section 68 (4) and all their fittings and/or attachments shall be thoroughly examined by an approved person at least once in every period of twelve months whereas every air receiver shall be thoroughly cleaned and examined at least once in every period of twenty four months or after any extensive repairs - section 69 (5). According to section 71 (3), every refrigeration plant capable of being entered by an employee also needs to be examined, tested and certified at least once in every period of twelve, months by an approved person.

In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe. Furthermore, a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored-section 78 (5). In addition, necessary precautions for dealing with fire incidents should be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom - section 81. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.

To promote health and safety of employees who are at risk of being exposed to chemical substances, section 84 (3) and 85 (4) requires every employer to maintain at the workplace material safety data sheets and chemical safety data sheets respectively for all chemicals and other hazardous substances in use and ensure that they are easily available to the employees.

The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard - section 95 at suitable point (s) conveniently accessible to all employees.

Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary precautions to be taken - section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable protective clothing including suitable gloves, footwear, goggle and head coverings in any workplace where employees are likely to be exposed to wet, injurious or offensive substance section 101 (1).

During project implementation and operations, workers will be involved. This act makes provisions for safety, health and welfare of persons upon which provision of their protection will be based. This will protect them against hazards to health and safety arising out of or in connection with their activities at work especially during the construction phase. This Act therefore safeguards workers welfare during the project phases by ensuring capacity building on Health and safety of workers at work place. In summary, this act will be used a guideline to ensure health and safety of workers is guaranteed. *The proponent will ensure that the contractor includes in the contract document adequate measures to promote safety and health of workers during all phases of the proposed project.*

3.5 The Science and Technology Act, Cap 250

Section 4 of the act provides for a council whose functions include;

To ensure the application of the results of scientific activities to the development of agriculture, industry and social welfare in Kenya.

To advise the Government on the scientific and technological requirements for the conservation of the natural and social environment in Kenya.

The contractor will employ technologies that take into consideration the conservation of the natural and social environmental in Kenya. It will also ensure that all technologies that are used are geared toward sustainable development and embrace recovery, recycling and reuse.

3.6 The Public Health. Act (Cap. 242)

Section 115 of the Act states that no person/institution shall cause nuisance or, addition liable to be injurious or dangerous to human health. Section 116 require local Authorities to take lawful, necessary and reasonably practicable measures to maintain areas under their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health.

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

The proponent will be required to abide by these provisions throughout the project cycle.

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

The proponent will be required to contract a licensed solid waste collector to collect all solid waste from the site to an approved dumping site. Sewage from the site will be discharged into a septic tank which is the appropriate method for this area awaiting construction of the sewer line.

3.7 The Physical Planning Act, Cap 286

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.

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/Audit experts prepare and submit this Environmental Impact Assessment study report to National Environmental management Authority (NEMA).

3.7 The Wayleaves Act Cap 292

Under the Act, the government may carry any sewer, drain or pipeline into, through or under any land whatsoever but may not in so doing interfere with any existing building. Section 7 of the Act makes it an offence for any person who causes building to be erected over any sewer, underground electricity and telephone cables, drain or pipeline.

3.8 The Land Planning Act (Cap. 303)

Section 9 of the subsidiary legislation (The development and use of land regulations 161) under this Act requires that before the local authorities submit any development plans to the Minister for approval, steps should be taken as may be necessary to quaint the owners of any land affected by such plans.

Particulars of comments and objections made by the landowners should also be submitted. This is intended to reduce potential conflict between the interests of the authorities and those of landowners in respect of settlement, social and economic activities

3.9 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 to the sewer line and that all wastewater must be discharged into the sewers. The code also prohibits construction of structures or buildings on sewer lines.

For this development a septic tank will be constructed for effluent disposal awaiting the construction of sewer system in the area soon.

3.10 The Penal Code (Cap. 63)

Section 191 of the Penal Code states, that any person or institution that voluntarily corrupts or foils water of 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 neighbourhood or those passing along public way commit an offence.

The Proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impacts.

3.11 The Environmental Management and coordinating (water quality) regulation 2006

The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, river's, streams,' springs, wells and other water sources).

It is an offence under Regulation No.4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radio active waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment

Regulation No. 14 (1) requires every licensed person generating and discharging effluent into the environment to carry out daily effluent discharge quality and quantity monitoring and to submit quarterly records of such monitoring to the Authority or its designated representatives.

The proponent will have to ensure that appropriate measures to prevent pollution of underground and surface water sources are implemented throughout the project cycle.

3.12 The Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including:

- domestic waste
- industrial waste,
- hazardous and toxic waste
- pesticides and toxic substances
- biomedical wastes and radioactive waste

Regulation No.4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

- Improvement of production process through-
- Conserving raw materials and energy :
- Eliminating the use of toxic raw materials and waste~
- Reducing toxic emissions and wastes
- Monitoring the product cycle from beginning to end by-
- Identifying and eliminating potential negative impacts of the product
- Enabling the recovery and re-use of the product where possible, and

- Reclamation and recycling and
- Incorporating environmental concerns in the design and disposal of a product

The Proponent shall ensure that the main contractor adopts and implements all possible cleaner production methods during the construction phase of the project.

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non- hazardous waste for appropriate disposal

Regulation 14 (1) requires every trade or industrial undertaking to install at its premises anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking

Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment

Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA

Regulation 18 requires all generators of hazardous waste to ensure that every container or package for storing such waste is fixed with a label containing the following information:

The identity of the hazardous waste

The name and address of the generator of waste

The net contents

The normal storage stability and methods of storage

The name and percentage of weight of active ingredients and names and percentages of weights of other ingredients or half-life of radioactive material

Warning or caution statements which may include any of the following as appropriate-

-the words "WARNING" or "CAUTION"

- the word "POISON" (marked indelibly in red on a contrasting background; and

-the words "DANGER! KEEP AWAY / NO ENTRY FOR UNAUTHORIZED PERSONS" and

-a pictogram of a skull and crossbones

Regulation 19 (1) requires every person who generates toxic or hazardous waste to treat or cause to be treated such hazardous waste.

During the construction phase of the project, the Proponent shall ensure that the main contractor implements the above mentioned measures as necessary to enhance sound environmental management of waste.

CHAPTER FOUR

4.0 PROJECT ACTIVITIES

4.1 Project cycle

In order to predict impacts for this project on the human and natural environment, it is important to describe its various phases and the activities to be carried out in each phase. These have been described below.

4.1.0 Conflict Resolution

All environmental resources, more so land and water are characterized by conflicts and controversies. Most of these conflicts emanate from disagreements where two or more land/water users are interested in the same limited resource.

One of the key objectives of carrying out an EIA process is to resolve existing, anticipated as well as unforeseen conflicts. There are filled questionnaires by various stakeholders attached at the back of this report. To the best of the EIA experts, no conflicts are expected to arise.

4.1.1 Planning and Design

This stage involves technical site survey and technical drawings design for the project. Technical designs for the proposed hospital development are attached at the back of the report.

Project design consideration

The design considerations incorporate aspects of modern architecture, the current County government building policy guidelines and the latest standards developed by Kenya Bureau of standards.

Ventilation: The design caters for natural ventilation with features that encourage natural air circulation (including use of permanent air vents above all doors and windows)

Lighting: The design caters for various types of energy efficient luminaries including fluorescent lamps and natural lighting through glass windows and doors as appropriate for both security and lighting.

Sanitary Accommodation: The number of toilets and wash hand basins has been selected according to guidelines in BS 6465.

Plumbing and drainage Sewage- to be drained into a septic tank and water supply and reticulation to be done using galvanized steel piping to BS 1387 and or PPRC piping.

Sustainable resource use: The design of the development incorporates landscaped gardens which will be planted with suitable species of trees shrubs and grass to prevent ecological deterioration and improve aesthetic value of the site. Part of the excavated soil will be used for landscaping therefore reducing the amount of soil to be transported away from the site.

Solid waste management: The proponent will be required to contract a waste handler for proper waste disposal.

Human body wastes: The proponent will be required to construct a modern type of incinerator to be used in disposing of human body parts and other related hazardous wastes.

Fire protection: The design of the proposed development incorporates firefighting equipment to be installed in each floor.

4.1.2 Project Output and Design

The technology used in the design and construction of the hospital block will be based on international standards, which have been customized by various housing complexes in Kenya.

The project will be a three storey block with abasement and will consist of the ground, first, second and third floor and abasement. When completed, the project will have several units with different utilities. (Please refer to architectural drawings attached). Each floor will be partitioned into the following components:-

Basement floor:

- Parking lot
- Transformer room
- Generator room
- Switch room
- Lift lobby
- Septic tank

Ground floor:

- Ct scan room
- X-ray room
- Ultra sound room
- Laboratory
- Sample collection room
- Pharmacy
- 04no. consultation rooms
- Records store
- Nhif office
- Examination room
- Receptions
- Waiting areas

- Cafeteria
- Kitchen
- Laundry
- Ramps
- Washrooms

First floor:

- 06no. consultation rooms
- Dental unit
- Board room
- Administration office
- Reception
- CEO'S office
- Washrooms
- 02no. procedure rooms
- Recovery room
- Sluice room
- Lift lobby

Second floor plan

- ICU and HDU
- Nurses station
- Isolation room
- Office and storage room
- Counselling room
- Changing rooms
- Lift lobby
- Labour ward
- Delivery room
- Nurses room
- Antenatal ward
- Nursery
- Postnatal ward
- Anaesthetist room
- Recovery area

- Changing area
- 02no. Major theater rooms and setting areas
- C.S.S.D/Store
- Washrooms

Third floor

- Male and female wards
- Nurses stations
- Washrooms
- Lift lobby

Mortuary block

- Reception
- Body store area
- Viewing area
- Post- mortem preparation area
- Sluice room
- Offices embalming and cleaning section
- Offices

4.1.3 Site (Project) Activities during the Construction Phase

4.1.3.1 Staff Amenities:

(i) Site Office

The project proponent shall ensure that the main contractor constructs a modest site office and a sample materials store with timber walls and framing and a raised timber / concrete floor. The roof should be made of iron sheets or any other recommended material whereas the ceiling board will be constructed using soft board on timber framing.

(ii) Toilets

Pit latrines to cater for both men and women will be built for usage by the workers and visitors during construction. A water fountain will be provided for' hygienic purposes.

(iii) Material Storage and Handling

All materials to be used shall conform to the Kenya Bureau of Standards requirements for quality or equal and approved.

(iv) Non-Hazardous Materials

The store for non-hazardous materials will be accommodated within the site office.

(v) Hazardous Materials

Hazardous materials likely to be stored at the site shall include paints, oil, grease and fuel. The store for these materials shall have iron sheet walling and roof and a waterproof concrete floor to contain spills. Storage and handling of all Hazardous chemicals shall be in accordance with manufacturer's instructions as outlined on the material safety data sheets.

(vi) Bulk Construction Materials

The bulk materials likely to be stored on site include: sand, ballast, stones, cement, quarry chips and timber. Sand, ballast, stones and quarry chips will be sourced from within Kakamega County approved material sites. Building rods, cement and other appliances will be sourced from hardware in Kakamega and Nairobi. To avoid material accumulation with potential for impeding site activities, inducing safety hazards and creating a nuisance in the neighbourhood, the main contractor intends to have materials delivered to the site in small quantities.

Timber will be used mainly for roofing, formwork, ceiling, joinery and other carpentry needs. Most joinery works will be fixed at a workshop located outside the site before being delivered ready for installation. Formwork timber will be fixed at the site. Consideration will be given to the working area and material storage requirements to ensure there is no conflict with the movement of the workers.

4.1.4 Construction Activities

The construction phase will be accomplished through the following stages:

(i) Fencing

The whole project site will be enclosed with 3 metre high corrugated iron sheets. This will help to control access to the site for purposes of security and safety. The fence will also serve to reduce the amount of dust and other solid waste with potential of getting into and out of the site especially during the windy and rainy season.

(ii) Site preparation

Clearance of the site for construction will be controlled to minimize the extent of ecological deterioration. The site currently contains some few grass and shrubs on the fence which will be cleared during construction. However, the proponent is intending to landscape the area and bring in some grasses and flowers after construction.

(iii) Excavation

Excavation of top soil to pave way for a strong foundation will be carried out using excavator machine and a loader. Most of this soil will be used to backfill potholes in highways upon authorization by the County Government. The other soil will be utilized in general landscaping of the compound.

(iv) Backfilling of the Excavated Area:

This will be carried out using murram and quarry chips which will be compacted in layers to achieve firm bases for the buildings, driveways and parking.

(v) Building the foundation

The foundation will be built using stone, concrete, steel or wood, basement, crawl space, pilings and slab on grade. The process will generate some noise, smoke and dust especially from the cement. However, workers will be sensitized on the use of personal protective equipment and management of air pollution from construction machinery.

(vi) Framing

This will involve framing the exterior and interior walls and then raising the roof trusses and stairs. Wall sheathing will be attached to enclose the partitions and roof sheathing over the trusses.

(vii) Doors and windows

All external door openings for the proposed hospital building units shall be fixed with steel doors. Grills will be used to reinforce them. Window openings shall be closed with steel aluminum casement and with ordinary 4mm thick glass.

(viii) Erecting of grills

Grills will be erected along the staircase and on the balcony to prevent any possible accidents. The steel will be bought from hardware in Kakamega or Nairobi Counties. Structural specifications shall be followed.

(ix) Plumbing system

The internal water supply will be one of cold water system. Since the supply is under pressure, the whole water supply system will be designed to be leak proof and provide with valves to control the flow of water. To ensure reliable water supply, the proposed development will be connected to the main water storage tank and the KAWASCO supply line.

(x) Electrical installation

The area has electrical connection and the connection will be extended to the new building through a three phase supply. The installation will also cater for lighting, appliances, heating and cooling system. The installation will also cater for television and alarm system. All installations shall be to Kenya power and lighting Company specification. The proponent has promised to install energy saving bulbs to conserve energy and also explore the possibility of using solar energy for water heating and power back up systems for convenient.

(xi) Finishing

Floors – The floors shall be finished in granite tiles and wet areas shall be finished in ceramic tiles. Other parts will be finished in ceramic tiles.

Walls - The walls will be finished by plastering and painting to give them a good finish.

Ceilings - The ceiling suffix to the roof will be made of a lime plaster render on the reinforced concrete slab; the ceiling on the upper flow will be done using hard boards with painting

Landscaping -The site will be landscape with flowers and grass. The top soil will also be treated with organic manure to encourage faster and improved plant growth.

Building a perimeter wall-A perimeter wall will be constructed for security purposes. This wall will be enhanced with flowers along the perimeter.

Emergency appliances -Safety devices like fire extinguishers and sand buckets will be put in central place. The proponent with consultation will map out and mark a fire assembly point. The proponent has also agreed to be in charge of emergencies and will have contacts with the fire department and other agencies for fast response. Areas will be, marked accordingly e.g. power rooms and slippery floors.

The construction of the hospital building will commence after issuance of Environmental Impact Assessment license by NEMA.

The contractor shall be held solely and entirely responsible for the completion and the safety of the works and shall indemnify the proponent against all claims that may arise as a result of carrying out the works.

4.1.5 Operation

This is the stage where the proponent will start offering the proposed health care services to the public.

4.2 Project Alternatives

The following alternative projects to the proposed hospital development at the site were considered and their advantages and disadvantages outlined.

a) No Project Alternative

This alternative would mean that the project does not proceed.

Advantages

- The natural ecosystem will remain undisturbed.
- Air pollution from dust as a result of the construction process will not occur.
- There wouldn't be soil compaction as a result of heavy machinery use.
- There will be a reduction of soil erosion due to less loosening of soil on the surface.
- There would be no soil or water contamination from the alien materials that will be introduced in the system.
- There would be no generation of hazardous hospital wastes

Disadvantages

- There will be no creation of employment.
- There will be no secondary development as a result of the project.
- The expected income to the developer and the economy will not be realized.
- The value of land might improve but it will remain underdeveloped.
- There will be stagnant development among the local community.
- The general public will continue experiencing hardships in access to adequate and quality health services within Kakamega town and its environs.

b) Different site selection

The project can be sited in a different area of a lower status.

Advantages

- The cost of land would be lower
- The maintenance costs would be less

Disadvantages

- The issue of insecurity may arise.
- Less income would be realized due to the low status of the area.
- Extreme strain on the already overstretched facilities experienced in the low status area.

c) The proposed Development Alternative

Under the proposed development alternative, the proponent would be issued with an EIA license for the proposed project. In issuing the license, NEMA would approve the proposed development provided all environmental measures are complied with during the construction period and occupational and decommissioning phases.

This alternative consists of the applicant's acceptance of approval conditions provided by NEMA in light of the provisions of Environmental Management and Co-ordination Act 1999, to ensure environmentally sustainable developments are complied with.

The anticipated insignificant environmental impacts resulting from construction and operation of the development as proposed would occur.

4.3 DECOMISSIONING PHASE

Decommissioning is a general term for a formal process to remove something from active status. It brings to closure, or terminates the useful life of business operations in a certain building. The owner or licensee normally decides when the facility is to permanently cease operations. The following shall be done before and during decommissioning;

The management shall come up with a decommissioning plan that addresses:

- Facility description and history

- Project scope and objectives
- Characterization data summary
- Specific decommissioning methods
- Health and safety plans
- Risk assessment
- Site release criteria
- Waste generation estimates and waste disposal procedures
- When a decommissioning plan is developed, it will be based on;
    - Adequately protecting public and occupational safety and health
    - Potential environmental and ecological impacts
    - Compliance with statutory, contractual and regulatory requirements
    - Effective project management, including selection among viable alternatives based on risk, cost and desired facility end state
    - Human capital management, consistent with future site utilization plans
    - Show that a proposed decommissioning project plan can be conducted safely.
    - Show that at completion the facility will comply with regulatory requirements
    - Prepare formal documentation of the decommissioning of the facility
    - Adhere to the occupational, health and safety regulations while conducting the decommissioning
    - Evaluate potential for re-use and recovery of material and equipment
    - Consider waste minimization and appropriate disposal
    - Release all staffs and other workers after giving them one month notice

NB: The product of this project will have a long life span of more than fifty years. By having this consideration in my mind, the proponent will adequately invest the construction and finishing processes by ensuring appropriate technology and materials of high quality and durability are used to increase the proposed project life span. The decommissioning will therefore take many more decades.

CHAPTER FIVE

5.0 METHODOLOGY

5.1 Data collection

A formal data collection process was necessary as it ensured that data gathered was both defined and accurate and that subsequent decisions based on arguments embodied in the findings will be valid. The process provides both a baseline from which to measure from and in certain cases a target on what to improve.

The following methodology was used:

- **Pre collection activity** – Desktop research i.e. field trip logistics, agreed goals to be achieved, target data to be collected, definitions used, methods
- **Collection – data collection** – Field visits, questionnaires, interviews, still digital photography.
- **Presentation of findings** – Sorting of the data collected, analysis and/or presentation in the form of a comprehensive study report.

a) Questionnaires

Questionnaires were administered to the neighbours to get their views on the proposed project. The respondents were asked to sign on the form for proof of participation.

Plate 1: Questionnaires administration during public participation and consultation exercise conducted on on 11th and 12th of February 2021

b) Interviews

Interviews were carried out in an attempt to get more information regarding the project. This involved interviewing the area residents and some immediate neighbours who gave an in-depth description of their perception of the proposed project.

c) Field Observations

Field observations formed an integral part of the study as the experts gathered considerable information through observations. This involved site visits and recording the situation on the

ground. Observations were also used as a tool for verifying the facts that were gathered through interviews and questionnaires.

d) Still digital photography

Still digital photographs were taken as evidence of compliance or non compliance. Photography is a very useful tool in data collection. It represents a good picture on the ground as it was at the time of visit.

CHAPTER SIX

6.0 PUBLIC PARTICIPATION AND CONSULTATION

6.1Questionnaires distribution

One of the key information sources used during the Environmental Impact Assessment exercise was public participation exercise. Positive and negative views of the project site neighbours were sought on 11th and 12th of February 2021. The exercise was conducted by a team of experienced registered environmental experts via administration of pre-designed questionnaires and by interviewing neighbours surrounding the proposed project site.

The purpose for such interviews was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeds as planned.

Table 2: List of the public consultation participants

S/N	Name	Contacts	Occupation
1.	Charles	0726839144	Boda bada
2.	Josia Muhande	0724368680	Mason
3.	Julius Makomere	0721879402	None
4.	Nicodemus	0712545784	Student
5.	Jamima Were Ajeche	0706082209	Farmer
6.	Sylvester Muchekha	0729941071	Contractor
7.	John Asala	0718029916	Boda boda
8.	Anna Kiprono		
9.	Ruth Akira	0711442581	
10.	Christine Ambutsi	0710178430	
11.	Tabitha Akala		Business woman
12.	Jesca Wakhungu		Business
13.	Clinton Ongesa	0742229269	business
14.	Bill Abraham Munai	0700325666	Farmer
15.	Derrick Lubanga	0799655273	Student
16.	Walter Adiedo	0713477968	Mason/ boda boda
17.	Burton Eshikanda	0799834944	Driver
18.	Ibrahim Amboka	0700269657	Contractor
19.	Enos Omolindi	0721464952	Contractor
20.	Mery Ambanyi	0721819516	Business

6.1.1 Issues raised

6.1.1.1 Increased business market

Those with businesses within the area supported the construction of the proposed hospital project. According to them, the number of people to promote small surrounding businesses will increase

right from the construction workers to those who will seek treatment from the facility once complete.

6.1.1.2 Improved Security

The local residents were optimistic that the establishment of the hospital project will lead to improved security situation in this area as security will be provided around the premises through 24-hour guard patrols, strategically located security lights and maybe strong perimeter fence.

6.1.1.3 Employment Opportunities

The persons interviewed were positive that during its construction, the project has and will continue to create numerous employment opportunities for the local residents most of whom are currently jobless.

6.1.1.4 Dust emissions

The people expressed concern over possibility of generation of large amount of dust and fumes within the project site and surrounding areas as a result of excavation works and transportation of building materials. The proponent will ensure that dust levels at the site are minimized through sprinkling water in areas being excavated and along the tracks used by the transport trucks within the site. Additional mitigation measures presented within the EMP will be fully implemented to minimize the impacts of dust generation.

6.1.1.5 Hospital Wastes:

Neighboring premises owners raised concerned over the effectiveness of hospital wastes disposal especially the human body parts and mortuary wastes. The proponent will ensures proper disposal of these wastes through construction of a modern recommended incinerator and standard septic tank and soak pit for liquid wastes that will be regularly exhausted.

6.1.1.6 Noise

Noise will be controlled by the proponent by observing the recommended noise standards by the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

6.1Stakeholders/ Public meeting

The meeting was held on 10th April 2021at the proposed project site in Emuhondo village, Lurambi Sublocation, Lurambi Subcounty within Kakamega County. The site is approximately 200m along D262A murram road, off Eshikinji- Esumeiya (C40) road at Emahondo junction and 10km from Kakamega town.

Various comments were raised by the participants with most of them in agreement with the proposed hospital. A summary of comments is as shown.

Name/Organization	Comments/ Concerns and responses
Mr. Pius K. Imbali	Improved medical services in the area in addition to job opportunities. The project is okay to go ahead as it creates employment for the youth from the area during construction majorly. Besides it will improve security due to proper lighting and enabling better pricing for customers due to healthy competition among private hospital facility owners.
Mr. Ronald Egesa P.O Box 124 Kakamega	No threat to safety of the community. Employment opportunities. The adverse impacts should be mitigated through improvement of sewerage system in the whole area. Employ local people. Medical waste generated from the hospital should be properly management. **Response:** The Expert team noted that and promised to work close with the proponent to ensure proper medical waste management.
Mr. Evans Likuyani P.O Box 489 Kakamega	There is no effect to the environment hence the site is suitable. The project is okay to go ahead. Overall, the project has positive impact resulting from availability of affordable and quality health services in the area, creation of employment, revenue generation for the government, and increased business for the business people e.g food suppliers.
Mr. Isaac Indasia P.O Box 145 Kakamega	Project will offer employment, thus okay to go ahead. Nevertheless to minimize noise and by ensuring the construction activities be done during the day and sprinkle water around site to curb dust pollution during dry periods. **Response:** The experts reiterated that the contractor will be monitored to ensure he waters the dusty areas during dry seasons.
Mr. Francis Ambasa P.O Box 146 Kakamega	No negative environmental impact seen and we encourage the developer to continue. The project will ensure healthy community in the area through creation of affordable and quality medical services, creation of employment and development in the area. The project is a positive development and should go ahead. The owner to employ qualified local people both during construction and operation. But proponent should institute proper medical waste management especially from the mortuary section. **Response:** The proponent assured the meeting that the community employment concerns will be considered both during construction and operation period.
Mr. Erick Sisiali	There is no effect and the project is suitable for the neighbourhood. Project is okay to go ahead as it has minimal negative significant adverse environmental implication. It will also provide employment and improve development in the area.
Ben Wiraga P.O Box 146 Kakamega	We welcome the project. The projects will greatly enhanced development in the area. However there might be unnecessary disruptions from high traffic to the facility. Proponent to consider maintaining the access road to the facility to make it more motorable during operation. **Response:** The proponent promised to aid in minor road repairs that might be destroyed as a result of the project development, traffic

	management on site will be done
Josphat Majanja	No objection. But the mortuary location should be cited far away from any residential house and the entire project should be fenced using perimeter wall to enhance security. Advanced incinerator should be installed to help in managing hazardous hospital wastes. **Response:** Mortuary is located at the farthest end of the site. The proponent will also install a modern incinerator to manage the hazardous hospital waste.

Plate 2: Consultative meeting at the proposed project site on 10th April 2021

CHAPTER SEVEN

7.0 POSSIBLE ENVIRONMENTAL IMPACTS, THEIR MITIGATION MEASURES

7.1 DEFINITION & CLASSIFICATION OF ENVIRONMENTAL IMPACTS

An environmental impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long-term or short-term in duration, and wide-spread or local in the extent of their effect. Impacts are termed cumulative when they add incrementally to existing impacts.

In the case of the proposed hospital development in Emahondo area, Kakamega County, potential environmental impacts would arise during the construction and the operations phases of the project and at both stages positive and negative impacts would occur.

7. 2 Impact significance

The purpose of an EIA is to identify the significant impacts related to the project or activity under consideration and then to determine the appropriate means to avoid or mitigate those which are negative, and if possible, enhance any positive effects resulting from the project.

Significant impacts are defined, not necessarily in order of importance, as being those which:

- Are subject to legislative control;
- Relate to protected areas or to historically and culturally important areas;
- Are of public concern and importance;
- Are determined as such by technically competent specialists;
- Trigger subsequent secondary impacts;
- Elevate the risk to life threatening circumstances; and
- Affect sensitive environmental factors and parameters.

7.2.1 Construction Phase Negative Impacts

7.2.1.1 Soil erosion - land degradation

Site preparation, vegetation clearance and excavations using heavy construction equipment usually expose soils in the affected areas and leave them vulnerable to erosion by heavy rainfall and surface run-off. Improper location of stockpiles of sand, gravel, cement, etc., at the construction site could also cause fine materials to be washed into the drainage system during heavy rainfall events. This would not only represent a waste of materials but would also contribute blockage of drainage systems.

7.2.1.2 Accumulation of solid waste at the site

Considerable volumes of solid waste will be generated during site preparation and construction works, which would include some vegetation and typical construction waste such as wasted concrete, steel, wooden scaffolding and forms, pulp and polythene bags, waste earth materials, etc. This waste will negatively impact the aesthetic value of the site and surrounding environments if not properly managed and disposed of at an approved dumpsite. Solid waste, if allowed to accumulate on the ground, could cause localized pooling and flooding. Pooling of water, in turn, would create conditions conducive to the breeding of nuisance and health-threatening vectors such as mosquitoes. Improper management of construction waste constitutes a short-term negative impact.

7.2.1.3 Construction works noise - auditory nuisance

Although not expected to create a significant negative impact, the use of vehicular activities and heavy equipment during construction and building works will inevitably generate noise, which may create a nuisance for nearby residents, particularly the immediate neighbours. Albeit annoying, this negative impact will be short-term (limited to the construction phase). Noise beyond some level is itself a nuisance and need to be avoided. Such noise emissions should be minimized as much as possible from the source point through appropriate measures.

7.2.1.4 Dust Emission - air quality degradation

During the construction phase air quality is expected to decline as a result of an increase in levels of fugitive dust from excavation works, the stockpiled earth materials, dusty roads and concrete mixing. Respirable particulates are a public health hazard and may otherwise create considerable nuisances to the public. This is expected to be a short term, reversible impact lasting only for the duration of the construction activity.

7.2.1.5 Spillage of hazardous materials

All sorts of motorized equipment, from generators to trucks, requiring fuel, lubrication and maintenance will be used at the construction site. Many will also be fitted with lead batteries. Spillage of hazardous materials on the ground surface has a potential of contaminating underground water.

7.2.1.6 Fire outbreak - environmental disaster

Some intensive dry processes will be conducted on site. Such a process may result to a fire outbreak within the project site especially if flammable materials such as locomotive fuel will be stored on site. Minor welding works will be carried out on site so as to repair broken down machines or vehicles and this increases the chances of fire outbreak.

7.2.1.7 Construction works induced traffic - traffic congestion

Activities related to construction works will undoubtedly induce uncharacteristic levels of additional vehicular traffic along Kakamega- Eshitinji – Esumeiya (C34) road. Related issues of vehicle congestion and reckless driving by truck drivers delivering construction materials to the site will be sources of annoyance, if not accidents, to locals during the construction phase.

7.2.1.8 Construction works water demand - Increased pressure on existing supply

A considerable amount of fresh water will be required during the construction works, especially for use by construction workers (washing), for cement mixing and for wetting of the site to control dust. This may place some amount of strain on water supply and may exacerbate current shortage of water supply in the country.

7.2.1.9 Gaseous emissions

The various materials required for construction and building (e.g. sand, ballast, aggregate, steel, blocks, lumber, asphalt, cement, etc.) will be obtained from sources within and elsewhere and transported to the site. Transportation of these materials, characteristically in over-laden trucks, usually results to gaseous emissions. Other construction equipment including excavators, bull dozers and concrete mixers have also a potential of resulting to air pollution. Emission of gaseous pollutants into the atmosphere represents indirect, short-term, reversible, negative impacts on public health and safety.

7.2.1.10 Disposal of sewage

Lack of or inadequate provision of toilets for use by workers can lead to ad hoc defecation in secluded areas or structures on the site, thus creating unsanitary conditions and sources of fly infestation. This can threaten the health of neighbours and workers themselves. Indiscriminate sewage disposal can also result to contamination of underground water resources.

7.2.1.11 Workers accidents and hazards during construction

During the construction of the hospital project, it is expected that construction workers are likely to have accidental injuries and hazards as a result of handling hazardous waste. Because of 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.

7.2.1.12 Extraction and use of building materials

Building materials such as hard core, ballast, cement, rough stone and sand required for the construction of the Hospital project, will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as river banks and land.

Since substantial amount of these materials will be required for construction of the buildings, the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in short term. In addition, the sites may be significantly affected in several ways including landscape change, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

7.2.2 Construction Phase Positive Impact

7.2.2.1 Employment - socio - economic benefit

Several positive impacts are expected from the development of the project. These include the generation of employment for skilled and unskilled labour in the short to medium term.

7.2.2.2 Improving growth of the economy

Through the use of locally available materials during the construction phase of the project including cement, concrete and ceramic tiles, timber, sand, ballast electrical cables etc, the project will contribute towards growth of the economy by contributing to the gross domestic product. The consumption of these materials, fuel oil 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

7.2.3 Operation Phase Negative Impacts

7.2.3.1 Increased pressure on infrastructure

The proposed hospital development will definitely lead to increased pressure on existing infrastructure such as roads, piped water and other utilities like electricity.

7.2.3.2 Increased generation of solid waste

The quantities of solid waste to be generated by the medical facility operation services are expected to be significant. Such waste will include; needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails, expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.). Foodstuffs, empty plastic containers, cartons, waste papers, plastic bags, etc. Improper management of solid waste will result to aesthetic degradation and breeding of disease vectors.

7.2.3.2 Increased traffic flow - Increased accidents

The number of vehicles within the area is likely to increase and this may lead to congestion and road accidents along Kakamega- Eshitinji – Esumeiya (C34) road.

7.2.3.3 Effluent Disposal

A project of such magnitude is expected to generate huge amounts of effluent to the environment. Proper management of the effluent will ensure a clean environment for the residents of this area. The proponent is suggesting the use a designed incinerator and septic tank in mean time while they wait the construction of the sewer line system in the area.

7.2.4 Operation Phase positive Impacts

7.2.4.1 Increased quality health services

Currently the demand for quality medical services in Kakamega region and its environs by far outstrips the supply. One of the positive aspects of project is that it will contribute to provision of quality and accessible health services.

7.2.4.2 Employment opportunities

Employment opportunities are one of the long term impacts of the proposed project. Potential beneficiaries will include medical staffs, security guards, waste transporters, cleaners and gardeners.

7.2.4.3 Improving growth of the economy

The owner of the proposed hospital development will be required to pay revenue to the Kenya revenue authority (K.R.A) hence contributing positively to the growth of the Kenyan economy.

7.2.4.4 Optimal use of land

By putting up the proposed hospital project on the plot, the owner would have utilized it optimally.

7.2.5 Decommissioning phase negative impacts

During the decommissioning phase, another comprehensive EIA study based on the intended new use of the site will be conducted.

7.2.5.1 Noise and Vibration - Audible nuisances

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

7.2.5.2 Solid Waste Generation

Demolition of the hospital development 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. 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 ground and surface water quality.

7.2.5.3 Dust emission

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

7.2.6 Decommissioning phase positive impacts

7.2.6.1 Employment opportunities

For demolition to take place properly and in good time, several people will be involved. As a result several employment opportunities will be created for the demolition staff during the demolition phase of the proposed project.

7.3 MITIGATION MEASURES

7.3.0 Mitigation measures for impacts in the construction phase

7.3.1 Controlling soil erosion

- Stage site clearance works so as to minimize the area of exposed soil at any given time.
- Re-cover exposed soils with grass and other ground cover as soon as possible.
- Monitor areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled.
- Levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil
- Building of physical barriers to prevent mass movement where necessary.
- The stockpiling of construction materials should be properly controlled and managed. Fine-grained materials (sand, marl, etc.) should be stockpiled away from any surface drainage channels and features.
- Low bumps should be placed around the piles of sand and marl and/ or tarpaulin used to cover open piles of these materials to prevent them from being washed away when it rains heavily.
- Safe storage areas should be identified and retaining structures put in place prior to the arrival
- Materials to be delivered on site in installments.

7.3.2 Management of Construction Waste

- A site waste management plan should be prepared by the contractor prior to commencement of construction activities. This should include designation of appropriate

waste storage areas, collection and removal schedule, identification of approved disposal site, and a system for supervision and monitoring.

- Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being monitored independently.
- Special attention should be given to minimizing and reducing the quantities of solid waste produced during site preparation and construction.
- Any vegetation and combustible waste must not be burned on the site.
- Reusable inorganic waste (e.g. excavated sand/soils) should be stockpiled away from drainage features and used for in filling where necessary and/or possible.
- Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed of at an approved dumpsite.
- Provide solid waste receptacles and storage containers, particularly for the disposal of plastic bags, boxes, so as not to block drainage system and to prevent littering of the site.
- Make arrangements for the daily collection of litter from the site and appoint a licensed solid waste transporter to collect and transport it for dumping at approved site.

7.3.3 Control of Construction works noise

- Restrict noisy construction activities to normal working hours (8am - 5pm).
- Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of piling works.
- Workers operating equipment that generate noise should be equipped with noise protection gear including ear muffs and plugs. Workers operating equipment generating noise levels greater than 80 dBA continuously for 8 hours or more should use earmuffs whereas those experiencing prolonged noise levels of 70 - 80 dBA should wear earplugs.
- Limit pick up trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- All construction equipment should be regularly inspected and serviced

7.3.4 Control of Dust Emissions

The main contractor will be required to train workers on appropriate methods for minimizing dust emission during construction phase. Proposed methods for minimizing dust emission include;

- Covering of all haulage vehicles carrying sand, aggregate and cement
- Stockpiles of fine materials (e.g. sand and ballast) should be wetted or covered with tarpaulin during windy conditions.

- Access roads and exposed ground must be wetted in a manner and at a frequency that effectively keeps down the dust.
- Workers in dusty areas on the site should be issued with dust masks during dry and windy conditions
- Providing appropriate enclosure for the concrete mixer and
- Use of dust nets at high levels of the building

7.3.5 Managing Spillage of Hazardous Materials

Spillage of hazardous materials shall be managed by implementing the following measures;

- Refueling and maintenance of large vehicles will not take place at the construction site
- All hazardous materials to be stored in appropriately bonded containers and placed on concrete floor
- Maintaining spill response kits at the site office
- Prepare and display on site spill response procedures and
- Training of workers on spill response and management

7.3.6 Containing Fire outbreak

Fire incidents shall be managed by implementing the following measures;

- Provide adequate number of appropriate fire fighting equipment and Post 'No smoking signs' where flammable materials will be stored
- Organize for inspection and maintenance of fire equipment at least once in a period of six months
- Train staff on the use of the available fire fighting equipment
- At least one person trained on handling fire fighting techniques should be available through-out the construction phase of the project.
- Develop and post at the site, fire emergency and evacuation procedures
- Maintain on site telephone contacts for fire brigade, G4S fire brigade and St. Johns ambulance service provider

7.3.7 Control of Traffic

- Issue notices/advisories of pending traffic inconveniences and solicit tolerance by local residents before the commencement of construction works.
- As far as possible, transport of construction materials should be scheduled for offpeak traffic hours. This will reduce the risk of traffic congestion and of road accidents on the roads leading to the site.

- Appropriate traffic warning signs, informing road users of a construction site entrance ahead and instructing them to reduce speed, should be placed along the main road in the vicinity of the entrance to the site during the construction period.
- Flagmen should be employed to control traffic and assist construction vehicles as they enter and exit the project site.
- Train drivers on road safety
- Maintain on site a record of incidents and accidents

7.3.8 Management of water demand

The proposed development will increase water demand throughout the construction phase. Increase in water demand can be minimized by;

- Providing adequate water storage reservoirs at the construction site to meet project needs during periods of high demand externally and refill
- Engaging water supply tankers in case of total supply failure.
- Implementing appropriate water conservation measures

7.3.9 Management of terrestrial habitat & biodiversity

Biodiversity at the proposed site shall be managed by retaining and restoring as much of the original vegetation, including grass, as is practical on the site. This would be achieved by:

- Set a replanting and landscaping programme that focuses on increasing "green area"
- Ensure proper demarcation of the project area to be affected by the construction works. This will be aimed at ensuring that any disturbance to flora is restricted to the actual project area and avoid spill over effects on the neighbouring areas.
- In the same vein, there will be strict control of construction vehicles to ensure that they operate only within the area to be disturbed by access routes and other works.

7.3.10 Management of sewage

- Providing adequate sanitary facilities for workers with appropriate sanitary arrangement to prevent runoff.
- Sensitize workers on the rationale of using the sanitary facilities.

7.3.11 Control of gaseous emissions

- Gaseous emissions will be managed by
- Proper engine tune up
- Regular inspection and maintenance of construction equipment
- Reduce machines and vehicles idling time

- Avoid burning of solid waste at the site

7.3.12 Workers Health & Safety

- Engaging only those workers that are trained to operate specific machines and equipment.
- Proper signs on site to warn workers of safety requirements as regards machines with moving parts and other equipment at site.
- Provide a First Aid box and have a trained person to handle site emergencies and incidences.
- Display in the site telephone numbers of ambulances or provide a site vehicle to specifically transport the injured to hospital (during construction).
- Provide fire-fighting mechanism at site. Display emergency call numbers that can be used in case of a site fire.
- Provide safe scaffoldings and railings at heights.
- Provide washing (enclosed bathroom) and toilet facilities at site with both drinking and washing water. The number of workers engaged determines the number of the toilets and bathrooms provided.
- Providing safety helmets, safety masks (welders), safety shoes (loaders), uniforms and hand gloves to the workers.
- Using well-maintained equipment by qualified personnel.

7.4 Mitigation measures at operational phase impacts

7.4.1 Reducing pressure on infrastructure

Relevant authorities such as the Kenya Power and Lighting other utility providers have been informed of the capacity of expansion and are aware of the necessary requirements concerning the project.

However, the proponent will install water-conserving automatic taps and toilets, as well as energy saving electrical fittings to optimise use of public resources. Moreover, any water leaks through damaged pipes and faulty taps will be fixed promptly by a licensed plumber.

In addition, both the staffs and casuals will be sensitized to use conserve energy and water. It will be important for the proponent to monitor water and energy use during the operation phase of project and to set targets for their efficient use.

7.4.2 Proper solid waste management

The staffs will be responsible for proper management of solid waste generated from various operation sections during operation phase. In this regard, they are required to contract a private waste handler who is licensed by NEMA for waste disposal.

7.4.3 Control of traffic flow

The proponent will be required to implement the following measures in order to control flow of traffic during operational phase.

- Appropriate traffic warning signs instructing occupants and visitors to reduce speed, 'should be placed at the vicinity of the entrance to the site
- Security guards should be instructed to control traffic to the site and assist vehicles as they enter and exit the project site.
- Security guards should maintain a record of incidents and accidents at the site
- Contacts of emergency service providers including St. Johns ambulance, breakdown vehicle and traffic police, should be displayed at the main entrance area

7.4.4 Management of Fire Incidents

Fire incidents shall be managed by implementing the following measures;

- Install fire fighting equipment prior to operation of the hospital
- Ensure fire fighting equipment are inspected and serviced at least once in a period of one year
- Identify and mark conspicuously an emergency assembling point
- Conduct an annual fire audit for the health facility

7.4.5 Effluent disposal

Effluent from the proposed hospital project will be disposed into a septic tank in mean time while awaiting the construction of the sewerage system in the area.

7.5. Mitigation measures for impacts in the decommissioning phase

7.5.1 Proper solid waste management

- A site waste management plan should be prepared by the contractor prior to commencement of demolition activities. This should include designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal site, and a system for supervision and monitoring.
- Any vegetation and combustible waste must not be burned on the site.
- Demolition debris should be stock piled at a safe place
- Reusable materials like doors, windows and timber should be sold to licensed scrap dealers
- Provide solid waste receptacles and storage containers, particularly for the disposal of plastic bags, boxes, so as not to block drainage system and to prevent littering of the site.
- Make arrangements for the daily collection of litter and demolition debries from the site by a licensed solid waste transporter for dumping at approved site.

7.5.2 Control of dust emission

High levels of dust concentration resulting from demolition or dismantling works will be minimized by implementing the following measures;

- Covering of all haulage vehicles carrying debris for dumping at approved sites
- Stockpiles of fine materials should be wetted or covered with tarpaulin during windy conditions.
- Access roads and exposed ground must be wetted in a manner and at a frequency that effectively keeps down the dust
- Workers should be issued with proper protective equipments.
- Proper hording (fencing with three metre high galvanized iron sheets) of the site prior to construction and demolition

7.5.3 Minimization of noise and vibration

Significant impacts on the acoustic environment will be mitigated as described below;

- Restrict demolition activities to normal working hours (8am - 5pm).
- Inform local residents beforehand, via notices and advisories, of pending noisy periods and solicit their tolerance well before the commencement of demolition works.
- Workers operating equipment that generate noise should be equipped with noise protection gear including ear muffs and plugs. Workers operating equipment generating noise levels greater than 80 dBA continuously for 8 hours or more should use earmuffs whereas those experiencing prolonged noise levels of 70 - 80 dBA should wear earplugs.
- Limit pick up trucks and other small equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- All demolition equipment should be regularly inspected and serviced.

7.6 Environmental Audit and Monitoring

Environmental Auditing will be done yearly and reports presented to NEMA for review.

CHAPTER EIGHT

8.0 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management and Monitoring involves, among others, the putting in place of sustainable environmental mitigation measures and monitoring plans. It is essential that the project is both environmentally friendly and appreciated by local residents.

Environmental Monitoring involves measurement of relevant parameters, at a level of details accurate enough, to distinguish the anticipated changes. Monitoring aims at determining the effectiveness of actions to improve environmental quality. The EMPs outlined in the table addresses the identified issues of concern (potential negative impacts) and mitigation measures as well as roles, costs and monitor able indicators that can help to determine the effectiveness of actions to upgrade the quality of environment; as regards the proposed project.

Unless the mitigation and benefit enhancement measures are identified in EIA and fully implemented, the prime function of the EIA cannot be achieved. Thus, the objectives of EMP for the present project are:

- Identification of Monitoring requirements and Monitoring indicators;
- Mitigation measures to reduce or eliminate negative impacts;
- Enhancement measures to maximize positive impacts; and
- To ensure that the component of facility are operated in accordance with the design

8.1 Construction Phase EMP

Table 3: Environmental Management Plan during construction phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High Demand of Raw material	**1.** Source building materials from local suppliers who use environmentally friendly processes in their operations.	Proponent & Contractor	Throughout construction period	0
	2. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.	Proponent & Contractor	Throughout construction period	0
	3. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Proponent & Contractor	Throughout construction period	0
	4. Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Proponent & Contractor	Throughout construction period	0
2. Reduce storm-water, runoff and soil erosion				

Increased storm water, runoff and soil erosion	**1.** Surface runoff and roof water shall be harvested and stored in underground reservoir for reuse.	The Civil Engineer, Mechanical Engineer and Proponent	2 months	500,000
	2. 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 Proponent	1 month	
3. Minimize solid waste generation and ensure efficient solid waste management during construction				
Increased solid waste generation	**1.** 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.	Proponent & Contractor	Throughout construction period	100,000
	2. 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.	Proponent & Contractor	One-off	0
	3. Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.	Proponent & Contractor	One-off	0
	4. Ensure that 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	Proponent & Contractor	One-off	20,000
	5. Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or home owners.	Proponent & Contractor	One-off	0
	6. 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	Proponent & Contractor	Throughout construction period	0
	7.Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Proponent & Contractor	One-off	50,000
	8. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste	Proponent & Contractor	Throughout construction period	0
4. Reduce dust emissions				
Dust emission	**1.** Ensure strict enforcement of on-site speed limit regulations	Proponent & Contractor	Throughout construction	0

			period	
	2. Avoid excavation works in extremely dry weathers	Proponent & Contractor	Throughout construction period	20,000 per month
	3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles	Proponent & Contractor	Throughout construction period	
	4. Personal Protective equipment to be worn	Proponent	Throughout construction period	
	5. Construction materials on site to be covered to prevent to be blown off by wind	contractor	Throughout construction period	
5. Minimization of exhaust emissions				
Exhaust emission	**1.** Vehicle idling time shall be minimized	Proponent & Contractor	Throughout construction period	0
	2.Alternatively fueled construction equipment shall be used where feasible equipment shall be properly tuned and maintained	Proponent & Contractor	Throughout construction period	0
	3. Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points	Proponent & Contractor	Throughout construction period	0
6. Minimization of Noise and Vibration				
Noise and vibration	**1.** Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Proponent & Contractor	Throughout construction period	0
	2. Sensitize construction drivers to avoid gunning of vehicle engines or unnecessary hooting especially when passing through sensitive areas such as churches, residential areas and schools	Proponent & Contractor	Throughout construction period	0
	3. Ensure that construction machinery are kept in good condition to reduce noise generation	Proponent & Contractor	Throughout construction period	0
	4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Proponent & Contractor	Throughout construction period	0
	5. The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work.	Proponent & all site foreman	Throughout construction period	0
***7.* Minimization of Energy Consumption**				
Increased energy consumption	**1.**Ensure electrical equipment, appliances and lights are switched off when not being used	Proponent & Contractor	Throughout construction period	0

	2. Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Proponent & Contractor	Throughout construction period	100,000
8. Minimize water consumption and ensure more efficient and safe water use				
High Water Demand	**1.** Promptly detect and repair of water pipe and tank leaks	Proponent	Continuous	10,000/month
	2. Ensure taps are not running when not in use	Proponent	Continuous	0
	3. Install a discharge meter at water outlets to determine and monitor total water usage	Proponent	One-off	50,000
	4. Proper recycling of water from other uses for sprinkling dusty pavements	Contractor	Continuous	0
9. Minimize occupational health and safety risks				
	▪ 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	Continuous	300,000 per year
	▪ Construction of a perimeter wall around the project area	Contractor	On commencement	1,000,000
Personal Protective Gear (PPG)	▪ Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc should be made available and construction personnel must be trained to use the equipment	Proponent & Contractor	Once off	200,000
Health and safety impacts	• Implement all necessary measures to ensure health and safety of workers and the general public during operation of the housing project as stipulated in OSHA, 2007	Proponent	Continuous	150,000
First Aid	• Well stocked first aid box which is easily available and accessible should be provided within the health facility	Proponent & Contractor	One-off	50,000
	• Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Proponent & Contractor	One-off	35,000
Fire protection	• Firefighting equipment such as fire extinguishers should be provided at strategic locations such as stores and construction areas.	Proponent & Contractor	One-off	150,000
	• Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained	Proponent & Contractor	Every 3 months	40,000
	• Fire escape routes and assembly point to be marked	Proponent & Contactor	Continuous	30, 000
	• Signs such as "NO SMOKING" must be prominently displayed within the premises, especially in parts where inflammable materials are stored	Proponent & Contractor	One-off	20,000

8.2 Operational Phase EMP

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 operational phase of the hospital building project are outlined below.

Table 4: Environmental Management Plan for the operation phase

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimization of solid waste generation and ensuring more efficient solid waste management				
Solid waste generation	1. Provide solid waste handling facilities such as waste bins and skips	Proponent/Management	One-off	30,000
	2. Ensure that solid waste generated from units is regularly disposed of appropriately at authorized dumping sites	Proponent/Management	Continuous	5,000/month
	3. Ensure that hospital staff and workers manage their waste efficiently through recycling, reuse and proper disposal procedures.	Proponent/Management	Continuous	_
	3. Donate redundant but serviceable equipment to charities and institutions	Proponent/Management	Continuous	0
2. Minimize risks of sewage release into environment				
Sewage disposal	1. Provide adequate and safe means of handling sewage generated at the facility i.e. septic tanks	Proponent & Contractor	One-off	1,500,000
	2. Conduct regular inspections for drainage pipe blockages or damages and fix appropriately	Proponent & Contractor	Continuous	5000 per inspection
	3. Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated	Proponent/Management	Continuous	5000/parameter
3. Minimize energy consumption				
Energy Resource Utilization	1. Switch off electrical equipment, appliances and lights when not being used	Proponent/Management	Continuous	_
	2. Install occupation sensing lighting at various locations such as storage areas which are not in use all the time	Proponent/Management	One-off	10-40 % higher than ordinary lighting
	3. Install energy saving fluorescent tubes at all lighting points within the facility rooms instead of bulbs which consume higher electric energy	Proponent/Management	One-off	10-40 % higher than ordinary lighting
	4. Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent/Management	Continuous	8,000/month

	5. Sensitize occupants to use energy efficiently	Proponent	Continuous	5000/month
4. Minimize water consumption and ensure more efficient and safe water use				
Water consumption	1. Promptly detect and repair water pipe and tank leaks	Proponent/Management	Continuous	20,000/month
	2. Management to conserve water e.g. by avoiding unnecessary toilet flushing.	Proponent/Management	Continuous	0
	3. Ensure taps are not running when not in use	Proponent/Management	Continuous	1000/month
	4. Install water conserving taps that turn-off automatically when water is not being used	Proponent	One-off	10-40 % higher than ordinary taps
	5. Install a discharge meter at water outlets to determine and monitor total water usage	Proponent	One-off	30,000
5. Minimization of health and safety impacts				
	1.Implement all necessary measures to ensure health and safety of the workers and the general public during operation of the hospital facility as stipulated in OSHA, 2007	Proponent/Management	Continuous	500,000
6. Ensure the general safety and security of the premises and surrounding areas				
	1. 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/Management	Continuous	50,000/month

8.3 Medical and Hazardous Waste Management Plan

Table 5: Medical and Hazardous Waste Management Plan

Type of Waste	Summary of treatment and disposal options	Responsibility
Infectious waste: Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. Includes pathological and anatomical material (e.g. tissues, organs, body parts, human fetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments, and other items that may have come into contact with infectious materials.	**Waste Segregation Strategy**: Yellow or red colored bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved. **Treatment:** Chemical disinfection; Wet thermal treatment; Microwave irradiation; Safe burial on hospital premises; Sanitary landfill; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) • Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving. • Anatomical waste should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator).	Management

Sharps: Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	**Waste Segregation Strategy**: Yellow or red color code, marked "Sharps". Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labeled "infectious waste". **Treatment**: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Encapsulation; Safe burial on hospital premises; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) • Following incineration, residues should be landfilled. • Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs. • Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment	Management
Pharmaceutical waste: Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.).	**Waste Segregation Strategy**: Brown bag / container. Leak-proof plastic bag or container. **Treatment:** Sanitary landfill; Encapsulation; Discharge to sewer; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator); Safe burial on hospital premises as a last resort. • Small quantities: Landfill disposal acceptable, however cytotoxic and narcotic drugs should not be landfilled. Discharge to sewer only for mild, liquid pharmaceuticals, not antibiotics or cytotoxic drugs, and into a large water flow. Incineration acceptable in pyrolytic or rotary kiln incinerators, provided pharmaceuticals do not exceed 1 percent of total waste to avoid hazardous air emissions. Intravenous fluids (e.g. salts, amino acids) should be landfilled or discharged to sewer. Ampoules should be crushed and disposed of with sharps. • Large quantities: Incineration at temperatures exceeding 1200 °C. Encapsulation in metal drums. Landfilling not recommended unless encapsulated in metal drums and groundwater contamination risk is minimal.	Management
Genotoxic / cytotoxic waste: Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the feces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.	**Waste Segregation Strategy:** See above for "infectious waste". Cytotoxic waste should be labeled "Cytotoxic waste". **Treatment:** Return expired drugs to supplier; Chemical degradation; Encapsulation; Inertization; Incineration (Rotary kiln, pyrolytic incinerator); • Cytotoxic waste should not be landfilled or discharged to sewer systems. • Incineration is preferred disposal option. Waste should be returned to supplier where incineration is not an option. Incineration should be undertaken at specific temperatures and time specifications for particular drugs. Most municipal or single chamber incinerators are not adequate for cytotoxic waste	Management

	disposal. Open burning of waste is not acceptable.	
Chemical waste: Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and nonhalogenated solvents, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).	**Waste Segregation Strategy**: Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects. **Treatment**: Return unused chemicals to supplier; Encapsulation; Safe burial on hospital premises; Incineration (Pyrolytic incinerator; • Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, salts) to sewer systems. • Small hazardous quantities: Pyrolytic incineration, encapsulation, or landfilling. • Large hazardous quantities: Transported to appropriate facilities for disposal, or returned to the original supplier using shipping arrangements that abide by the Basel Convention. Large quantities of chemical waste should not be encapsulated or landfilled.	Management
Radioactive waste: Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumor localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.	**Waste Segregation Strategy**: Lead box, labeled with the radioactive symbol. **Treatment:** Radioactive waste should be managed according to national requirements and current guidelines from the International Atomic Energy Agency. IAEA (2003). Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003.	Management
Waste with high content of heavy metals: Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).	**Waste Segregation Strategy**: Waste containing heavy metals should be separated from general health care waste. **Treatment:** Safe storage site designed for final disposal of hazardous waste. • Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.	Management
Pressurized containers: Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.	**Waste Segregation Strategy**: Pressurized containers should be separated from general health care waste. **Treatment:** Recycling and reuse; Crushing followed by landfill • Incineration is not an option due to explosion risks • Halogenated agents in liquid form should be disposed of as chemical waste.	Management

General health care waste (including food waste and paper, plastics, cardboard):	**Waste Segregation Strategy**: Black bag / container. Halogenated plastics such as PVC should be separated from general health care facility waste to avoid disposal through incineration and associated hazardous air emissions from exhaust gases (e.g. hydrochloric acids and dioxins). **Treatment**: Disposal as part of domestic waste. Food waste should be segregated and composted. Component wastes (e.g. paper, cardboard, recyclable plastics [PET, PE, PP], glass) should be segregated and sent for recycling where available.	Management

8.4 Decommissioning Phase

In addition to the mitigation measures provided in the table above, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the hospital 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 hospital project are outlined below.

Table 6: Environmental Management Plan for the decommissioning phase

Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Kshs)
1. Demolition waste management			
1. 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	Contractor, Proponent	One-off	**To be determined**
2. All foundations must be removed and recycled, reused or disposed of at a licensed disposal site			
3. 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	Contractor, Proponent	One-off	
4. Donate reusable demolition waste to charitable organizations, individuals and institutions	Contractor, Proponent	One-off	
2. Rehabilitation of project site			
1. Implement an appropriate revegetation programme to restore the site to its original status	Contractor, Proponent	One-off	
2. Consider use of indigenous plant species in revegetation	Contractor, Proponent	One-off	
3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent buildings and the development.	Contractor, Proponent	Once-off	

CHAPTER NINE

9.0 GENERAL CONCLUSION

9.1 Conclusion

The analysis of the EIA Study report has evidenced that the construction and occupation/operation of the proposed hospital project will have positive impacts to the Kenyan society. The impacts will include provision of quality and adequate health services, employment to local community members, increase in the national/local housing stock and quality, increase in Government revenue, and improvement of standards of living. However, despite the outlined positive impacts, the proposed development will come up with some negative impacts such as increased pressure on existing infrastructure, pollution (to Air, Water, soil) mostly during construction phase, and increased medical hazardous wastes (solid and liquid) generation among others.

The proposed project design has integrated mitigation measures with a view to ensuring compliance with all the applicable laws and procedures. The structures will be built to the required planning/ architectural/ structural standards. During project implementation and operation, sustainable environmental management (SEM) will be ensured; avoiding inadequate use of natural resources, conserving nature sensitively and guarantees a respectful and fair treatment of all people working on the facility, general public at the vicinity and neighbouring premises.

In relation to the proposed mitigation measures that will be incorporated during construction and operational phases; the development's input to the society; the project is considered beneficial and important. It is our considerable opinion that the proposed development is a timely venture that will subscribe to the government health policy and investment call. It is thus our recommendation that the project be allowed to go ahead with the implementation provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close adherence and implementation of the recommended Environmental Management and Monitoring Plans (EMPs).

Finally, the project proponent has promised to work closely with the Environmental Experts and relevant government bodies to enhance the facilitation of the issues of concern. This will ensure that environmental concerns are integrated into the project at every stage of the implementation phase and the co-existence of the proposed project with the environment during and after-implementation.

9.2 Recommendations

- To vegetate the compound.
- Construction of proper drainage system.
- Clearing of all unutilized building materials.
- Ensure that all designs, plans and maps are approved by the respective authorities.
- Ensure that all the water bodies are un-interfered with.
- Liaise with the neighbours to maintain relationship.
- Install proper sewage system/septic tank.
- Proper solid, medical and hazardous waste management plan

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APPENDICES

1. Photo Log
2. Public Participation Questionnaires
3. Public Meeting Attendance list
4. Approved building Plans
5. Copy of Title Deed
6. Change of use Approval Notification
7. Proponents Pin Certificate
8. Experts practicing Licenses
9. NEMA Acknowledgement and Approval of ToR

PHOTO LOG

Plate 3: Proposed project site and some few construction materials on site

Plate 4: Main tarmac Eshikinji- Esumeiya access road to the site

Plate 5: Site house currently under construction.

Plate 6: Emahondo junction to site off Eshikinji-Esumeiya road

Plate 7: Access murram Emahondo-Shimanyiro-Khakatsa road to the site.

Plate 8: Abutting kale farm.


Plate 9: Questionnaires administration during public participation exercise conducted on 11th and 12th of February 2021

Plate 10: Consultative meeting at the proposed project site on 10th April 2021