ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED PURPOSE-BUILT STUDENTS' RESIDENCE ON PLOT LR NO ELDORET MUNICIPALITY/BLOCK 7/316, ALONG MAKASEMBO ROAD, ELDORET, UASIN GISHU COUNTY

PROPONENT:

LANCEWOOD PROPERTIES LLP,
P.O BOX 13759-00100,
NAIROBI, KENYA.

UNDERTAKEN BY:

Environmental Management Consultancy (EMC)
Diamond Plaza 2nd Floor Suites A8 & A9
P. O. Box 3891, 00100
Nairobi
www.emconsultants.co.ke
TEL: 020-3752019
Mobile: 0723114020/ 0734562810

DECLARATION

LANCEWOOD PROPERTIES LLP

This Environmental Impact Assessment (EIA) study report is submitted to the National Environment Management Authority (NEMA) pursuant to the Environment Management and Coordination Act, CAP 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003.
The project is based on the proposed student residence on LR No. ELDORET MUNICIPALITY/BLOCK 7/316, Along Makasembo Road, Eldoret, Uasin Gishu County.
The EIA has been conducted following the laid down regulations and procedures.

That the developer will abide by the findings and the recommendations of the study and the EIA license conditions throughout the project implementation cycle

NAME: Lancewood Properties LLP
P.O Box 13759-00100,
Nairobi.

SIGNATURE:…… **DATE:**……

EIA CONSULTANTS:
That the Environmental Impact Assessment (EIA) study report submitted is based on the proposed student residence on LR No. ELDORET MUNICIPALITY/BLOCK 7/316, Along Makasembo Road, Eldoret, Uasin Gishu County.
To my knowledge, all information contained in this document is an accurate and truthful representation of all findings as relating to the proposed project as per projects information provided by the proponent and the responsible project actors to the EIA consultant:

NAME: Firm of Experts EMC **Reg. No:** 1541
Lead experts name: Vincent O. Oduor **Reg. No:** 0346

Experts' Contacts:
Environmental Management Consultancy (EMC)
Diamond Plaza,
2nd Floor Suites A8 & A9,
P. O. Box 3891, 00100.
Nairobi.
Tel: 020-375 2019
Mobile: 0723114020 / 0734562810
www.emconsultants.org

SIGNATURE……. **DATE** ……

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABREVIATIONS

^{O}C	Degree Celsius
CPP	Consultation and Public Participation
DRDS	Domestic Refuse Disposal Services
EA	Environmental Audit
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EMP	Environmental Management/Monitoring Plan
HWM	Household Waste Management
KEBS	Kenya Bureau of Standards
Km	Kilometres
KPC	Kenya Power Company
KVA	Kilo Volts Amperes
L.R	Land Reference
ELDOWAS	Eldoret Water and Sewerage
NEC	National Environmental Council
NEMA	National Environment Management Authority
OHSO	Occupational Health and Safety Officer
PCs	Private Companies
PPE	Personal Protective Equipment
PPM	Parts Per Million
SWM	Solid Waste Management
ToR	Terms of Reference
VOC	Volatile Organic Compounds

0. EXECUTIVE SUMMARY

0.1. Introduction

Lancewood Properties LLP proposes to construct a purpose-built student accommodation comprising of two blocks of both the Qwetu (Block A) and Qejani (Block B) models. The student residence will be developed on a 0.789-acre parcel of land.

The Block A Qwetu model will comprise of Lower Ground Floor, Ground Floor, 16 typical Residential Floors and the Roof terrace floors having 514 accommodation rooms, whereas the Block B Qejani Model will comprise of Lower Ground Floor, Ground Floor,15 typical Residential Floors and the Roof terrace floors having 510 accommodation rooms, the proposed Purpose-Built Students residencies will comprise of 1024 accommodation rooms.

The accommodation blocks will comprise of the below floor plan.

Table 1 Construction typology summary.

	Qwetu Block A	**Qejani Block B**
Lower Ground Floor	Parking areas	Generator and Transformers rooms, Service area, parking area
Ground Floor	Cafeteria, Study rooms, server room, Reception area, Maintenance store, changing rooms, stores and refuse holding among others.	Cafeteria, server room, Reception area, maintenance store, changing rooms, stores and refuse holding among others.
Typical Residential Floor	Accommodation Rooms: Cluster Rooms, Twin Rooms, Premium Rooms and Standard Studios	Accommodation Rooms: Quad Rooms and Double Room
Roof Terrace	Amenities floor (Gym, Lounge washing and drying yard)	Amenities floor (Study rooms, Lounge, washing and drying yard).

The total project cost to establish both blocks will be; One Billion, five hundred and fifty one million, three hundred and four thousand, eight hundred and forty four Kenya shillings (1,551,304,844) out of which a total of One million, five hundred and fifty one, three hundred and four shillings (1,551,304) is payable to the authority (NEMA) being the sum of 0.1% as seen in the annexed summary Bill of Quantities.

The project is socially inclusive and sensitive to the needs of all students including the physically challenged persons. For instance, it provides paraplegic rooms, ramps and elevators for individuals

using wheelchairs or mobility aids, wider doorways and hallways, wheelchair-accessible restrooms and designated parking spaces for the physically challenged.

The Kenya Government policy on such projects requires that an Environmental Impact Assessment (EIA) be carried out at the planning stages of the proposed undertaking to ensure that the negative impacts to the environment are taken into consideration during the design, construction, operation and decommissioning of such projects so as to carry out adequate mitigation measures. Therefore, in compliance with the law and to avoid unnecessary conflicts that slow development, the proponent has undertaken this EIA and incorporated adequate mitigation measures for the adverse impacts.

EIA is a tool for environmental conservation and has been identified as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) Cap 387 second schedule 9 (1), and Environmental (Impact Assessment and Audit) regulation, 2003, new projects must undergo EIA process. Consequently, the EMCA 2019 categorizes projects of similar magnitude under ***High-Risk Projects***, thus; ***(g) establishment of new housing estate developments exceeding One hundred housing units;*** The Report of the same must be submitted to National Environment Management Authority (NEMA) for approval and issuance of relevant licenses. This was necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment adversely.

0.2. Scope

The scope of the assessment covered construction works which include ground preparation, masonry of the proposed development as well as installation of utilities required by the proposed project. The output of this work was a comprehensive EIA Project Report for the purposes of applying for an EIA licence.

0.3. Methodology Outline

Since the proposed site is located within an area with no rich natural resources whose total effect to the surroundings would not adversely affect the surroundings and noting that the intended development and use of the facility will be in character with the surrounding (the area is characterised by developments of similar scale), an environmental study report was required because of the scope of the proposed development. The general steps followed during the assessment were as follows:

- Formulation of the Terms of Reference (submitted and approved under Ref: **NEMA/TOR/5/2/734**).
- Environment screening, in which the project was identified as among those requiring a comprehensive environmental impact assessment study under schedule 2 of the EMCA Cap 387

- Environmental scoping that provided the key environmental issues
- Desktop studies
- Physical inspection of the site and surrounding areas
- EIA Public participation via public interviews through questionnaires and photography
- Reporting.
- Stakeholder consultation including publication and advertisements

0.4. Positive Impacts

The proposed project will come along with numerous positive impacts as exhaustively discussed within the report. They include:

- ✓ Increased student accommodation facilities within Eldoret town thus enhancing enrolment
- ✓ Reduced travelling distance for students hence enhanced quality of learning
- ✓ Enhanced students' security and flexibility.
- ✓ Convenience and Accessibility for learning students.
- ✓ Promotion of students' Independence and Responsibility.
- ✓ Enhanced Social Life and Community for the students.
- ✓ Enhanced knowledge transfer among various key skilled professions
- ✓ Employment opportunities to the wider population
- ✓ Revenue generation to the County and National governments,
- ✓ Optimal use of land.
- ✓ Economic benefit to the proponent
- ✓ Reduction of traffic within the Eldoret CBD among several other benefits.

0.5. Negative Impacts mitigation Measures

The proposed project is to be developed in an area that is already designated for such developments and hence, no conflict in land use is anticipated. The Table 2 below is a summary of anticipated impacts as well as proposed mitigation measures. The construction activities should not negatively impact on the adjacent developments if all the proposed mitigation measures are adhered to strictly.

Table 2: A summary of the Impacts and Mitigation Measures

Possible Impacts	Mitigation measures
Soil erosion	Control earthworks; Install drainage structures properly; Ensure management of excavation activities
Vegetation Disturbance	Restore/re-establish vegetation in some parts of the disturbed areas through implementation landscaping programme
Noise pollution	Sensitize workforce including drivers of construction vehicles; Install sound barriers for pile driving activity; Install portable barriers to shield compressors and other small stationary equipment where necessary; Display signs to indicate construction activities; Maintain all equipment; Workers in the vicinity of high-level noise to wear safety and protective gear.
Dust generation	Spray stock piles of earth with water; Avoid pouring dust materials from elevated areas to ground; Cover all trucks hauling soil, sand and other loose materials; Provide dust screen where necessary
Exhaust emissions	Vehicle idling time shall be minimized; Equipment shall be properly serviced and maintained,
Increased Water Use	Installation of motion-sensing taps, urinals, and toilets to automatically switch off once the user leaves the station. A motion sensor tap would cut up to 85% of annual water usage compared to conventional taps. Rainwater harvesting: The harvested water would be used for cleaning, flushing toilets, watering plants, etc. Avail storage tanks.
Waste Management	Special attention shall be paid to the sanitary facilities on site; Garbage shall be disposed periodically. Contract a NEMA licensed waste handler
Emission of greenhouse gas emission	Installation of a solar PV system on the rooftop to supplement KPC supply thereby abating about GHG emissions. Implementing energy efficiency mechanisms to reduce energy consumption. Undertaking annual energy audits to monitor progress and exploit opportunities for energy efficiency
Public health and occupational safety	Ensure proper solid waste disposal and collection facilities; Ensure dustbin cubicles are protected from animals, rains and are well covered; Provide suitable safety gear for all personnel; Proper treatment of waste water
Climate change risks and vulnerability	Water management; The project should invest in water management strategies like rainwater harvesting, storage facilities, and efficient water use practices. These measures aim to mitigate water scarcity during dry periods and reduce flood risks during heavy rainfall events. Infrastructure Design: Incorporate resilient features to withstand extreme weather like flooding, storms, and high temperatures. Energy Efficiency: Implement technologies and practices to reduce greenhouse gas emissions and dependency on fossil fuels. Biodiversity Conservation: Protect and enhance natural ecosystems to preserve biodiversity and ecosystem services, including reforestation, habitat restoration, and sustainable land management practices.
Traffic disruption	Properly plan for transportation of materials to ensure that vehicles are optimally filled to reduce the number of trips done or the number of vehicles on the access roads; Employment of formal flagmen/women to ensure the public safety; Place clear signage's at the gate to alert drivers to be cautious about the construction and to look out for entering and/or exiting vehicles.

0.6. Conclusion

Considering the positive socio-economic and environmental benefits to accrue as a result of the development, and the EIA having found no major impacts to arise from the development, it is our recommendation that the project be allowed to proceed on the understanding that the proponent will adhere to the recommended mitigation measures and will further implement the proposed EMP.

0.7. Recommendations

i. The proponent to implement strictly the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.
ii. Maximize positive impacts as much as possible as exhaustively outlined within the report. These measures will go a long way in ensuring the best possible environmental compliance and performance standards.
iii. The developer be licensed to implement the project as proposed to help fill the gap in students' accommodation facilities thus promote enrolment.

1. INTRODUCTION

1.1. Background and Rationale

The surge in student enrollment has been significant in the recent years. However, this has brought about substantial challenges for both public and private universities in Kenya, particularly in their efforts to accommodate this growing student population. The rapid increase in enrollment has underscored a noticeable gap between the rate at which students are enrolling at the various institutions and the construction of essential facilities, such as student hostels.

In its endeavor to ensure access to higher education for as many Kenyans as possible, the Government has adopted a policy of delinking students' admission to the available bed space to ensure that no one who qualifies for studies in local universities is denied the chance on account of inadequate accommodation facilities. Consequently, the available accommodation facilities and bed spaces fall far short of the number of students enrolled. The development of students' hostel facilities has not received much attention from the government, meanwhile, students' enrollment in public universities has increased tremendously in the recent past thereby leading to shortage of bed space.

Lancewood Properties LLP proposes to construct a purpose-built student accommodation comprising of two blocks having both the Qwetu and Qejani models typologies. The student residence will be developed on a 0.789-acre parcel of land. The project will comprise of one thousand and twenty-four (1024) student accommodation rooms. The development will also comprise of the following amenities: gym, lounge, drying area, dhobi area, cafeteria, shop, car parking, stores, management room and reception among other associated complementary amenities.

The proposed site has adequate space to accommodate the proposed project with the proposed service infrastructure such as water, power supply, waste management and effluent disposal. It was recognised that this form of development is likely to impact on the site and the surrounding environment thereby calling for a full EIA study to enable impact mitigation owing to its magnitude.

An EIA is a tool for environmental conservation and has been identified as a key component in new project implementation. According to section 58 of the Environmental Management and Coordination Act (EMCA) No.8 Cap 387 second schedule 9 (1), and Environmental (Impact Assessment and Audit) regulation, 2003, new projects must undergo Environmental Impact Assessment. The report of the same must be submitted to National Environment Management Authority (NEMA) for approval and issuance of relevant certificates.

1.2. The need for the project

Approximately 639,700 students enrolled in Kenyan universities for the 2022/23 academic year according to the Commission of University Education and statista.com reports, reflecting a notable thirteen percent increase from the previous year 2020/21, which had an approximate

count of 562,000 students. This growth is primarily attributable to a higher number of government-sponsored students, with men constituting the majority, totaling 359,028, while women accounted for 279,567. It's important to note that the majority of these students were enrolled in public universities.

The shortage of students' accommodation has compelled various institutions to develop robust accommodation policies in a bid to come to a solution in allocating the limited bed spaces focusing on prioritization.

In Eldoret, there are a total of nine universities offering one hundred and five study programs and several other institutions of higher learning. Two universities in Eldoret lead in the number of students' population with the University of Eldoret having a student population of above 14,000 and the student population in Moi University currently having over 52,000 students; the need to develop accommodation facilities thus is seen as long overdue to ease the demand from the students. According to Free-Apply.com, Eldoret is ranked number two in Kenya by the number of universities available after the capital City Nairobi.

In order to bridge the clear gap in the market, Lancewood Properties LLP has acquired a 0.789-acre parcel of land within the larger Eldoret CBD close to various institutions. The development will consist of two blocks; Block A; Qwetu typology having a total number of 18 floors above ground comprising 514 rooms and Block B; Qejani typology, having a total of 17 floors above ground, with 510 rooms. The facility offers Student Residences with amenities such as study areas, a gym, a lounge, backup power, borehole water, lifts, high-speed Wi-Fi, CCTV, and biometric/card access. Additionally, the building will feature convenience stores on the ground floor to cater to residents' needs.
Qwetu offers four room typologies; Twin rooms, Premium rooms, Cluster rooms and Standard studio whereas Qejani offers two room typologies, i.e. Double and Quad rooms.

The proposed project will provide institutional accommodation for the universities and colleges within Eldoret area and will remedy both the accommodation shortage and security concern for the students.

1.3 Scope, Objective and Criteria of the Environmental Impact Assessment (EIA)

1.3.1. Scope

The Kenya Government policy on new projects, programmes or activities requires that an EIA be carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility. Regarding the magnitude and scope of the project, a developer can either conduct a summary project report (SPR), a comprehensive project report (CPR) or an Environmental Impact Assessment (EIA) study. The scope of this project comprising of over one hundred housing units called for the carrying out of a comprehensive Environmental Impact Assessment Study, therefore, covered:

- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- Proposition of appropriate and adequate mitigation measures,
- Provision of an environmental management plan.

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

The TORs for the EIA study was approved by the authority under Ref: *NEMA/TOR/5/2/734.*

1.3.3. Data Collection Procedures

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

1.3.4. Reporting and Documentation

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

1.3.5. Methodology Outline

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, CAP 387
- Environmental scoping that provided the key environmental issues
- Desktop studies and interviews
- Physical inspection of the site and surrounding areas
- EIA Public participation using questionnaires
- Comprehensive Reporting.

2. PROPOSED PROJECT DESCRIPTION

2.1. Location

The proposed property earmarked for development located on LR No. Eldoret Municipality/ Block 7/316 is located along Makasembo Road, off the main Eldoret- Malaba Road (A104), Uasin Gishu County. The plot is located on coordinates; 0.5148421, 35.2789349 as shown by the pin drop in the Figure 1 below. The proposed project which is proposed in a commercial set up area is in line with the zoning of the area and the project neighbourhood comprises of multi-dwelling units and high-rise developments.

Figure 1:. ***Proposed project site and area***

2.2 Project Cost

The total project cost to establish both blocks will be One Billion, five hundred and fifty-one million, three hundred and four thousand, eight hundred and forty-four Kenya shillings (1,551,304,844) out of which a total of One million, five hundred and fifty-one, three hundred and four shillings (1,551,304) is payable to the authority (NEMA) being the sum of 0.1% as seen in the annexed summary Bill of Quantities.

2.3 Design of the project

The proposal is to construct student residences comprising of two blocks, A & B with both the Qwetu and Qejani models.

Table 3: Salient features of the proposed project

Block	Qwetu (Block A)	Qejani (Block B)
No. of Floors Above Ground	18	17
No. of Rooms	514	510
Plot Size	0.789 Acres	
Built Up Area (m^2)	13,461	12,617
Employment	The project is foreseen to employ an approximate number of 500 personnel directly during construction; a bigger number will be employed both directly and indirectly by the operation of the premises;	
Project timelines	Approximately 24 months after licensing and construction commencement	

The proposal is to develop the property into student accommodation incorporating amenities such as gym lounge, study rooms, drying yard, lift and staircase that will serve the residents within the property. The Qwetu Block A model typology will have the following components:

Floor Plan	**Qwetu Block A**
Lower Ground Floor	Parking areas
Ground Floor	Cafeteria, Study rooms, server room, receptions area, Maintenance store, changing rooms, stores and refuse holding among others.
Typical Floor plan	16 Floors: Accommodation Rooms
Roof Terrace	Amenities floor (Gym, Lounge, washing and drying yard)

A total of **514** student accommodation rooms are proposed for Qwetu, Block A.

The Qejani model typology will have the following components

Floor Plan	**Qejani Block B**
Lower Ground Floor	Generator and Transformers rooms, Service area, parking areas
Ground Floor	Cafeteria, server room, reception area, maintenance store, changing rooms, stores and refuse holding among others.
Typical Floor plan	15 Floors: Accommodation Rooms
Roof Terrace	Amenities floor (Lounge, Study rooms, washing and drying yard)

A total of **510** student accommodation rooms are proposed.

Currently, there exists similar buildings within Eldoret Town; the tallest building in Eldoret town is The Eldoret Daima Towers (MUPS Plaza) with a total of twenty four and is located along Uganda road. The KVDA plaza is the second tallest building in Eldoret town with thirteen floors. Other proposed buildings are earmarked to be constructed within Eldoret town thus making the proposed Purpose-built students accommodation comparable in stature and magnitude with other developments.

Construction will be guided by national and international standards for both engineering and environmental compliance.

The development will have the following environmentally sound characteristics:

1. Power conservation: these can be enhanced by use of occupation sensors for lighting and enhancing natural lighting during the day.
2. Reduced need for air conditioning by enhanced natural cross ventilation and reduction of solar glare/heat gain through having the mid-section open to the sky.
3. Water conservation by use of water efficient sanitary fittings and delay action taps.

2.3.1. Access for the physically challenged.

The design has incorporated the following elements to enhance accessibility for the physically challenged.

a) **Providing for ramps and elevators**: Ramps and elevators will provide easy access to different levels for individuals using wheelchairs or mobility aids.
b) **Wider doorways and hallways**: The doors will have sufficient width to accommodate wheelchairs and other mobility devices comfortably.
c) **Accessible restrooms**: There will be restrooms that are wheelchair accessible, with features such as grab bars, lowered sinks, and spacious turning areas.
d) **Accessible parking**: Accessible parking spaces for the physically challenged will be designated close to entrances, ensuring they meet the required standards, including proper width and adjacent access aisles.
e) **Paraplegic rooms**; wheelchair accessible rooms

2.3.2 Electrical system

The building will be connected to the electricity main line of the Kenya Power Company, which will be used in all phases of the project. The various components of the electrical system shall comprise single and twin socket outlet, lockable meter board with glass view panel, gate lights and security alarm panel outlet and CCTV connection system. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

2.3.3. Effluent treatment

There shall be effluents from the civil works, workers and storm water drainage. It is envisaged that during construction stage, effluents that shall be discharged shall be sprinkled on the working areas to reduce dust generation by the construction machinery. Wastewater from the toilets

together with the solids will be collected into a conservancy tank, which shall be constructed for this purpose.

2.4 Water Supply Demand and Conservation System

The World Health Organization (WHO) recommends two (2) gallons (about 7.5 litres) per person daily to meet the requirements of most people under most conditions; and around five (5) gallons per person daily to cover basic hygiene and food hygiene needs. Household survey findings indicated that 50% of the households consumed 51–100 litres of water, 18.3% consumed 1–50 litres and 12.7% consumed 151–200 litres while 11.7% consumed 101–150 litres respectively. In other terms most of the households averagely use five jerricans (holds about 19-20 liters) of water daily for their domestic use.

During the operation, assuming that the Purpose-built accommodation block will host approximately 1050 residents with each resident consuming an average of 50 litres per day. Thus 50 litres x 1,050 residents will require approximately 52,500 litres (52.5 M^3 of water daily). This water will be adequately supplied and held onto storage tanks so that there is adequate supply for the residents.

During construction, water from ELDOWAS and other water vendors will be used. There will be water storage tanks to increase water capacity at the project site to the required amount.

At operation, the development will source water from reticulated supply by ELDOWAS main supply. Due to the unreliability in water supply, it is expected that the project proponent will supplement the water supply through the use of borehole water and rainwater harvesting to ensure sufficiency of clean water during the operation/occupation stage of this project. There will be water storage tanks to increase water capacity at the project site to the required amount. It is a recommendation that the proponent undertakes tests on yields and analysis of the water quality to determine capacity to meet the demand and conformity to Schedule 1 of the Water Quality Regulations, 2006. The proponent has undertaken hydrogeological survey to establish the viability of ground water for the project (the permit application processes with WRA and NEMA for the borehole are ongoing).

Water conservation is vital for sustainable development and buildings contribute significantly to overall water usage among human activities. The following measures will contribute to using water sensibly during the construction and occupation phases of the project.

- Installation of delay action taps, urinals and dual flush toilets. Delay action taps would cut up to 85% of annual water usage compared to conventional taps[1].

[1] Chicago Faucets. (2023). 5 Immediate Benefits of Motion-Sensor Faucets. https://learn.chicagofaucets.com/blog/5-immediate-benefits-of-motion-sensor-faucets#:~:text=5%20Leading%20Benefits%20of%20Motion-Sensor%20Faucets%201%201.,of%20Germs%20...%205%205.%20Simple%20Installation%20

- Rainwater harvesting: The harvested water would be used for cleaning, flushing toilets, watering plants, etc.
- Reducing water losses (e.g., leaks) by ensuring high competency in plumbing and promptly fixing any damages immediately they occur.
- Educating employees and occupants about water efficiency to encourage water-saving behaviours.
- Reusing onsite water that would otherwise be discarded or discharged to the sewer (e.g., reusing treated grey water or rainwater to water landscaped areas).
- Creating a water management plan. This would include i) assembling a management team and making a commitment to conserve water, which shall be communicated to all occupants, ii) assessing the facility water use, iii) setting and communicating goals, iv) creating an action plan, v) implementing the action plan, vi) evaluating progress and vi) recognizing achievements on a semi-annual basis.

2.3.4 Waste/Sewerage and Storm water run-off

The County sewerage system serves the area to which the complex will be connected. Effluent discharge from the project site will be connected to the existing sewer management system. Solid waste management will consist of collections by dustbins in the residencies and along the corridors at designated points. The collected waste will later be transported to a waste treatment site by NEMA licensed waste collector. All storm water drainage will be channelled into the existing storm drains and into the premises sewer management system.

2.4. Description of the project's construction activities

2.4.1 Demolition, excavation and foundation works

Currently, there exists buildings on the plot that are earmarked for demolition. The demolition process will follow the procedure as described in section 2.6.1 below. Some of the usable material will be used for the current project e.g. in construction of a site office. Excavation will be carried out to prepare the site for construction of foundations, pavements and drainage systems. This will involve a combination of earthmoving machinery such as bulldozers and wheel loaders as well as manual labour.

2.4.2. Storage of materials

Building materials will be stored on site. Bulky materials such as building stones, ballast, sand and steel should be carefully piled on site. To avoid piling large quantities of materials on site, the contractor should order bulky materials such as sand, gravel and stones in quotas as required on site. Materials such as cement, paint and glasses among others will be stored in temporary storage structures built for this purpose.

2.4.3. Masonry, concrete work and related activities

The construction of the building walls, foundations, floors, pavements, drainage systems, among other components of the project involves a lot of masonry work. General masonry includes stone

shaping, concrete mixing, plastering, slab construction, construction of foundations and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and are supplemented by machinery such as concrete mixers.

2.4.4. Structural steel works

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

2.4.5. Plumbing

Plumbing will be done to enhance the flow of different classes of water to serve the building. Pipework will be installed to enhance supply of domestic water into the facility. Installation of pipework will be done to connect sewage from the ablution blocks to the sewer system. Plumbing will also be done for drainage of storm water from the rooftop into the peripheral storm water harvesting tanks. Plumbing activities will include metal and plastic pipe cuttings, the use of adhesives, metal grinding and wall drilling among others.

2.5. Description of the project's occupational activities

2.5.1. Solid waste and wastewater management

The proponent will provide facilities for handling solid waste generated within the facility. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at the designated sites. Bins of different colours for different types of waste will be provided within the complex to facilitate segregation. The collected waste will be transported to a waste treatment site by a licensed waste collector.

2.5.2. Cleaning

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

2.5.3. General repairs and maintenance

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

2.6. Description of the project's decommissioning activities

The description of the decommissioning activities discussed below includes the decommissioning of the proposed project development once its utility is ended.

2.6.1. Demolition works

Upon decommissioning, the project components including buildings, pavements, drainage systems and associated facilities will be demolished. This will produce a lot of solid waste, which

will be re-used for other construction works or if not re-usable, disposed of appropriately by a licensed waste disposal company.

2.6.2. Dismantling of equipment and fixtures

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

2.6.3. Site restoration

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

3. BASELINE INFORMATION OF THE STUDY AREA

3.1. Physical environment

3.1.1. Climatic Conditions

The County of Uasin Gishu has a mild and temperate climate favorable for large-scale production of maize and wheat, which along with neighboring Trans-Nzoia, is often referred to as the country's breadbasket. It also produces sizable quantities of milk, horticultural produce, and a wide variety of other crops and animals in smaller amounts.

The county is characterized by four distinct seasons, dominated by two rainfall periods: January to March, which is generally considered the 'warm dry season', April to June known as the 'long wet season', July to September the 'cool dry season', and October to December as the 'short wet season'. These climatic conditions are favourable for wheat and maize growing, as well as livestock production. It can also support cash crops such as vegetables, coffee, flowers, pyrethrum and horticulture.

The topography is higher to the east and declines gently towards the western border. It experiences much cooler temperatures ranging between 18°C to 21°C and receives an annual average rainfall of 1500 mm per year.

The chart below shows the mean monthly temperature and precipitation of Uasin Gishu in recent years (*weatherandclimate.com/kenya/uasin-gishu)*

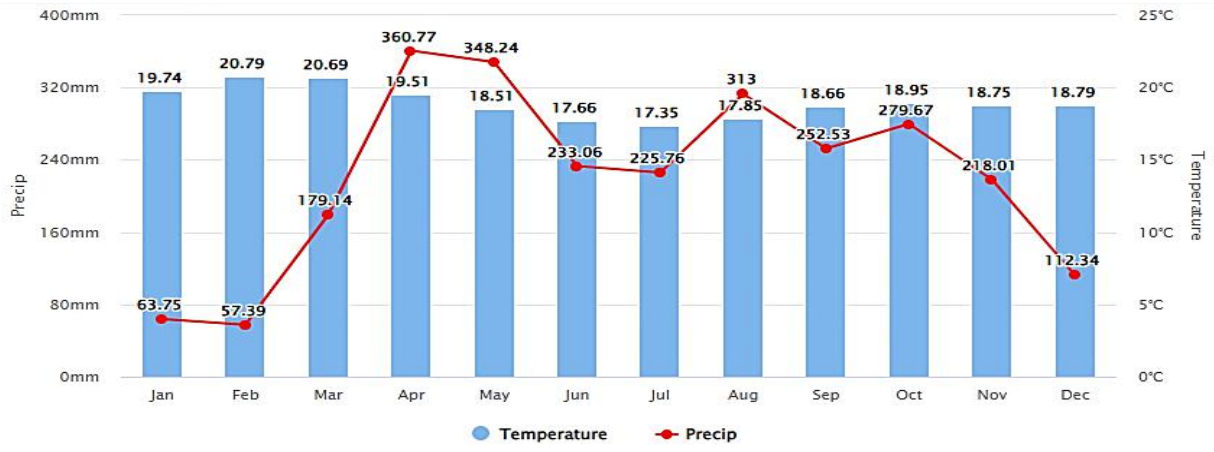

Figure 2 Uasin Gishu monthly temperature and precipitation chart

3.1.2. Average Daily Temperatures

The district's yearly temperature is 19.5ºC (67.1ºF) and it is -3.0% lower than Kenya's averages. On average, the month of February experiences the highest temperature with an average value of 19.2 °C | 66.6 °F. July has the lowest average temperature of the year. It is 15.6 °C | 60.1 °F.

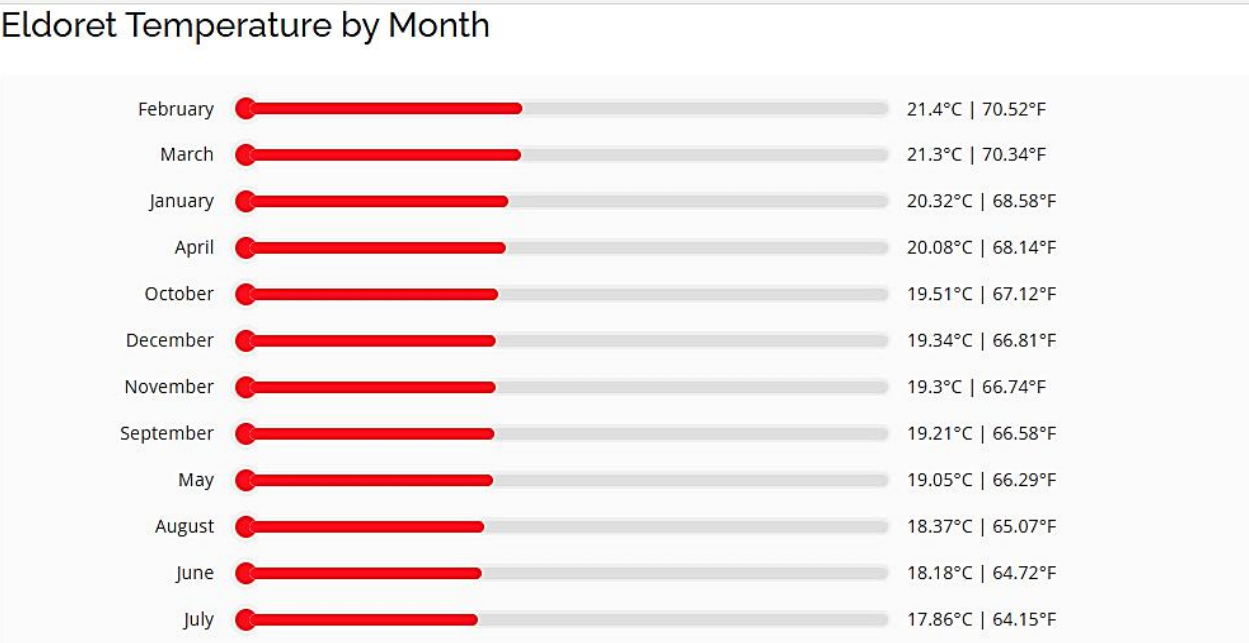

Figure 3: Eldoret Temperature by month (*Source; weatherandclimate.com/kenya/uasin-gishu/eldoret)*

3.1.3. Average Humidity Values

There is a notable fluctuation in precipitation, with 263 mm | 10 inch variance observed between the month of least rainfall and that of highest downpour. During the year, the average temperatures vary by 3.6 °C | 6.4 °F.

It has been determined that August exhibits the highest relative humidity, with a percentage of 83.72. On the other hand, it is observed that during February, there is an extremely low level of relative humidity at only 47.48 percent. The wettest month is July (26.60 days), whilst the driest is February (6.20).

3.1.4. Average Rainfall

Uasin Gishu typically receives about 220.3 millimeters (8.67 inches) of precipitation and has 253.01 rainy days (69.32% of the time) annually.

3.1.5. Average Winds

The wind experienced at any given location is highly dependent on local topography and other factors and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Eldoret experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 5.6 months, from October 25 to April 12, with average wind speeds of more than 5.2 miles per hour. The windiest month of the year in Eldoret is December, with an average hourly wind speed of 7.7 miles per hour. The calmer time of year lasts for 6.4 months, from April 12 to October 25. The calmest month of the year in Eldoret is July, with an average hourly wind speed of 2.5 miles per hour.

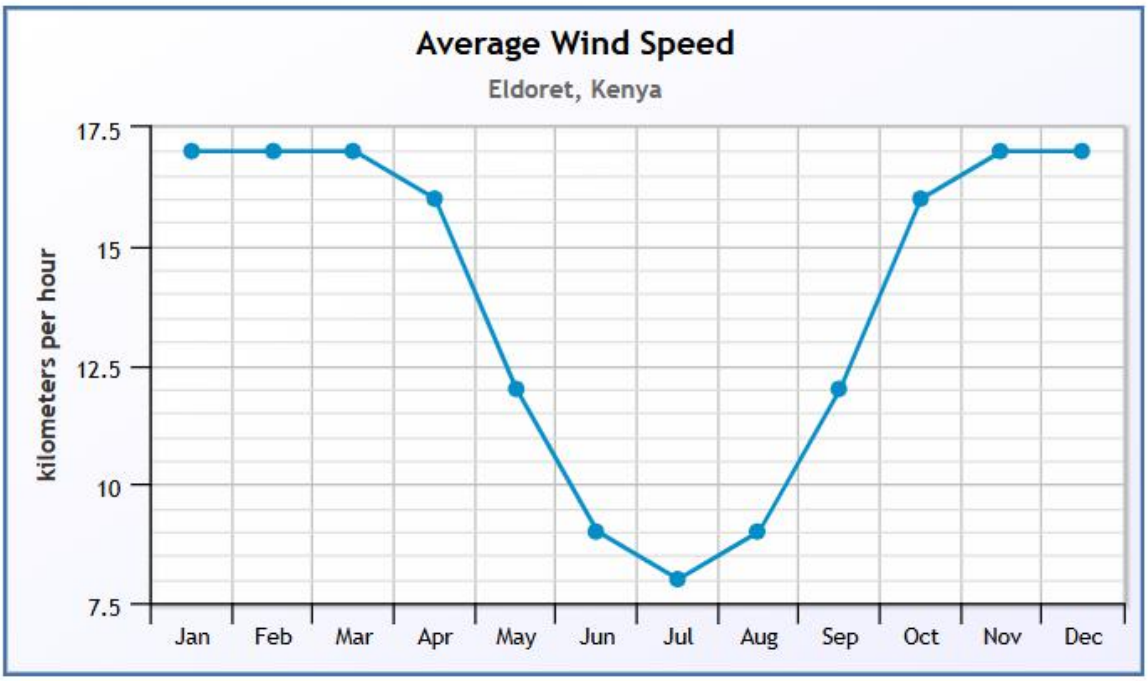

Figure 4: Average wind speed in Eldoret *(Source; weatherbase.com)*

3.1.6. Average Sunshine

The length of the day in Eldoret does not vary substantially over the course of the year, staying within 9 minutes of 12 hours throughout. In 2024, the shortest day is December 21, with 12 hours, 6 minutes of daylight; the longest day is June 20, with 12 hours, 9 minutes of daylight. The earliest sunrise is at 6:19 AM on November 3 and the latest sunrise is 31 minutes later at 6:50 AM on February 11. The earliest sunset is at 6:25 PM on November 3, and the latest sunset is 31 minutes later at 6:56 PM on February 12.

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	18.4 °C (65.1) °F	19.2 °C (66.6) °F	19.2 °C (66.5) °F	18.2 °C (64.8) °F	17.4 °C (63.3) °F	16.4 °C (61.5) °F	15.6 °C (60.1) °F	15.7 °C (60.2) °F	16.6 °C (61.9) °F	17.1 °C (62.8) °F	17 °C (62.6) °F	17.4 °C (63.3) °F
Min. Temperature °C (°F)	12.2 °C (54) °F	12.7 °C (54.9) °F	13.1 °C (55.6) °F	13.1 °C (55.7) °F	12.9 °C (55.3) °F	12.4 °C (54.3) °F	11.8 °C (53.2) °F	11.6 °C (52.9) °F	12 °C (53.6) °F	12.3 °C (54.1) °F	12.2 °C (53.9) °F	11.9 °C (53.5) °F
Max. Temperature °C (°F)	24.4 °C (75.9) °F	25.6 °C (78.1) °F	25.4 °C (77.7) °F	23.8 °C (74.9) °F	22.5 °C (72.5) °F	21.2 °C (70.2) °F	20.4 °C (68.7) °F	20.7 °C (69.2) °F	21.9 °C (71.4) °F	22.4 °C (72.3) °F	22.2 °C (72) °F	23 °C (73.3) °F
Precipitation / Rainfall mm (in)	51 (2)	51 (2)	100 (3)	201 (7)	251 (9)	228 (8)	256 (10)	314 (12)	202 (7)	174 (6)	128 (5)	71 (2)
Humidity(%)	53%	47%	54%	68%	74%	79%	83%	84%	74%	71%	71%	62%
Rainy days (d)	5	5	8	14	16	17	20	20	14	13	10	6
avg. Sun hours (hours)	10.2	10.4	9.9	8.9	8.5	7.8	7.2	7.2	8.7	8.9	9.0	9.6

Figure 5: Weather Averages for Eldoret *(Source: Climatedata.org)*

3.1.7. Physiographic Conditions

Uasin Gishu County is a highland plateau with altitudes falling gently from 2,700 metres above sea level to about 1,500 metres above sea level. The topography is higher to the east and declines

gently towards the western border. The County is physio-graphically divided into three zones: the upper highlands, upper midlands and lower highlands. These zones greatly influence land use patterns as they determine the climatic conditions. The geology is dominated by tertiary volcanic rock with no known commercially exploitable minerals

3.1.8. Ecological Conditions

Uasin Gishu County divides into three agro-ecological zones (AEZs) namely; the upper highlands (UH), upper midlands (UM) and lower midlands (LM) zones. High and reliable rainfall experienced in the county support crop farming, livestock rearing and forestry. The Lower Highlands (LH2) have an annual average precipitation of 1150 – 1220 mm, annual mean temperatures of 15.7^0C – 15.1^0C and an altitude of 2350-2450 m. Areas under LH3 have an annual precipitation of 900-1300 mm and annual mean temperatures of 18.0C-15.10C with altitude ranging between 1950-2450 m above sea level. Areas under LH4 have an annual precipitation of 900-1100 mm and annual temperatures of 18.00C-16.30C with altitude ranging between 1950-2250 m above sea level. Areas under Upper Midlands (UM4) have an annual precipitation of 1000-1400 mm and annual mean temperatures of 20.50C-18.00C and an altitude ranging between 1550-1950 m above sea level. The remaining areas of the county fall under Upper Highlands (UH2), which have an annual precipitation of 1150-1400 mm and annual mean temperatures of 150C-130C. UH3 areas have an annual precipitation of 1100-1200 mm and annual temperatures of 150C-130C. Altitude in these areas range between 2350-2750 m above sea level content (cgiar.org).

3.1.9. Soils

Soils in the county are red loam soils, red clay soils, brown clay soils and brown loam soils.
The climatic conditions in the county make it favourable for growing various crops, livestock rearing and forestry.

3.1.10 Solar Energy

This section discusses the total daily incident shortwave solar energy reaching the surface of the ground over a wide area, taking full account of seasonal variations in the length of the day, the elevation of the Sun above the horizon and absorption by clouds and other atmospheric constituents. Shortwave radiation includes visible light and ultraviolet radiation.
The average daily incident shortwave solar energy experiences some seasonal variation over the course of the year.
The brighter period of the year lasts for 2.3 months, from January 16 to March 26, with an average daily incident shortwave energy per square meter above 7.1 kWh. The brightest month of the year in Eldoret is February, with an average of 7.5 kWh.
The darker period of the year lasts for 2.5 months, from June 4 to August 21, with an average daily incident shortwave energy per square meter below 5.7 kWh. The darkest month of the year in Eldoret is July, with an average of 5.3 kWh.

3.2. Socio-economic environment

3.2.1. Population

According to the 2019 KPHC, the population of the County stood at 1,163,186 with 580,269 males, 582,889 females and 28 intersex. This population is projected to increase to 1,232,563 in 2022 consisting of 611,529 males and 621,034 females and rise further to 1,306,865 and 1,355,385 in 2025 and 2027, respectively. The inter-censual population growth rate for the County is 3.8 per cent which is higher than the national rate of 2.2 per cent. The high population growth rate is mainly due to a high fertility rate of 3.0 per cent and immigration from other regions in search of employment and business opportunities.

3.2.2. Land use

The Uasin Gishu County has an average land holding of 5 hectares in rural areas, and 0.25 of hectares within Eldoret Municipality. Land use practices vary considerably across the County. In 2012 there were 919 landless households distributed in various schemes, with Turbo settlement scheme accounting for 658 households; Jabali settlement Scheme 161 and Maili Tisa 100. Some of the landless are squatters living in gazetted forests; immigrants from other counties; and those who become landless by virtue of selling family land.
The land use in the project area is both commercial and residential use.

3.2.3. Infrastructure and Access

Uasin Gishu has an extensive road network comprising of over 300 Kms of tarmac roads, 549 Kms of murram and 377 Kms of all-weather roads. It also boasts 179 Kms of railway line with 8 railway stations. In addition, there is an inland container depot. The Moi International Airport and two airstrips are also located in Uasin Gishu easily making it the region's service hub.

3.2.4. Water Resources and Supply

The main water resources in the County include dams, rivers, boreholes, shallow wells and springs. The County is drained by 4 major rivers, namely; Moiben with its three tributaries; Sosiani also with its 3 tributaries; Sergoit with two tributaries; Kipkarren with nine tributaries and River Nzoia. There are over 120 dams which were constructed by the colonial Government for recreation purposes but are now water sources for most households. There are also about 250 boreholes in the County of which 170 are registered. Most homes have shallow wells.
The water supply schemes in the County include Eldoret Water and Sanitation (ELDOWAS), Turbo, Moi's Bridge, Sosiani, Sambut, Kipkabus, Burnt Forest and Ngeria. There are also Community water supply schemes which were once operational but have since stalled due to high operational costs. In an effort to restore and improve water supply in the County, there is need to invest in the development of new water supply schemes and revamp the defunct community water schemes. Currently, the percentage of population in the County with access to potable water is 42%; although about 90% of the population has access to water within a 2 km radius.

3.2.5 Education

Eldoret town is served with education institutions-schools, colleges, universities, the town is home to Moi University with four of its campuses located within the city limits of Eldoret. These campuses are; Annex Campus (School of Law), Town Campus (School of medicine and school of dental sciences), Rivatex Campus (School of aeronautical engineering) and Eldoret West campus (for privately sponsored students). The student population at Moi University stands at approximately 30,000 distributed in five campuses across Kenya, namely; Annex, Coast, Eldoret Town (CHS), Eldoret, Main and Nairobi as at April 2023. The University of Eldoret is the second largest university in the city. Its main campus is located within the city limits to the north of the town. Other universities with campuses in the town include Catholic University of East Africa, Jomo Kenyatta University, University of Nairobi, University of East Africa - Baraton, Kabarak University and Kisii University. The city also is home to many technical and vocational institutes including Rift Valley Technical Training Institute, Eldoret National Polytechnic, African Institute for Research and Applied Studies.

3.2.6 Transport

Eldoret town has an extensive road network comprising of tarmac roads, murram and earth roads, railway line, an airport and airstrips, making it the region's service hub. Eldoret International Airport serves the city of Eldoret and the surrounding communities with daily flights to Nairobi and Lodwar. The Nairobi-Malaba Highway passes through the heart of the Central Business District of Eldoret Municipality. The city is also served by the Kenya Uganda railway. Due to the reduced use of the railway line to Uganda, there has been an unprecedented upsurge in the volume of road traffic, particularly heavy haulage trucks passing through the town.

.

4.0. WATER SUPPLY DEMAND AND CONSERVATION SYSTEM

4.1 Water Requirement

The United Nations Water Conference Action Plan recognized water as a right, declaring that all people have a right to have access to safe drinking water. It is estimated that at least 1.1 Billion people, which represent 17% of the global population lack access to improved water. Water shortage is a severe and growing global challenge. Over the last 50 years, water withdrawals have tripled due to economic development and rapid population growth, placing serious pressure on the planet's water systems. However, 884 million people in the world still do not get their drinking water from safe sources, specifically in developing countries, such as in Africa and Southern Asia. The World Water Council (WWC, 2012) noted that the world's population tripled in the 20th century, the use of the world water resources has grown six-fold, coupled with industrialization and urbanization. Water in the Sub-Sahara region is not only scarce but also of exceptionally of poor quality. Due to pollution as well as unreliable supply and sanitation infrastructure, only a small percentage of what little water is available can be used for human consumption. Almost half of all Africans suffer from water-borne diseases, with cholera and infant diarrhoea, the most frequently occurring sicknesses. Most of the countries with the lowest levels of sanitation are located in sub-Saharan Africa, where 45% of the population resorts to using shared or dangerously inadequate facilities – with little progress in the area recorded to date.

Eastern Africa's renewable freshwater resources amount to 187 km^3 per year; this is only 4.7 per cent of Africa's total, yet the sub-region is home to 19% of the region's population. This imbalance is set to worsen in the next two decades due to an increase in human and animal population increase.

Kenya is recognized by the United Nation Environment Programme (UNEP) as a water scarce nation, whose average supplies of available freshwater is 647m3 per capita, which is below the 1,000m3 per capita per year recommended by United Nation. Furthermore, Kenya ranks 21st for the worst levels of access to water in the world, compared to its neighbours in the region, Uganda and Tanzania at 2940m3 and 2696m3 respectively (UN-WWAP, 2006), and about 41% of the people do not have access to clean water causing about 10% of deaths (KCBS, 2009).

In many urban areas, the shortage of water has been amplified by the government's lack of investment in water. Most of the urban poor Kenyans only have access to polluted water, which has caused cholera epidemics and multiple other diseases that affect health and livelihoods.
Access to safe water supplies throughout Kenya is 59% and access to improved sanitation is 32%. There is still an unmet need in rural and urban areas for both water and sanitation. Kenya faces challenges in water provision with erratic weather patterns in the past few years causing droughts and water shortages. Kenya also has a limited renewable water supply and is classified as a water scarce country. Urban migration contributes to challenges in sanitation, as people crowd into cities and urban growth is unregulated (Kimutai 2018). The water demand in Eldoret

has far outstripped the existing water supply capacity of the company which has necessitated rationed supply to some parts of the town.

4.2. Uasin Gishu County Hydrology

Uasin Gishu County lies within the Lake Victoria catchment basin and all its rivers drain into the Lake Victoria. The County is drained by 4 major rivers namely Moiben River (with 3 tributaries), Sosiani River (with 3 tributaries), Sergoit River (with 2 tributaries) and Kipkarren River (with 9 tributaries). Nzoia River also traverses the boundary between Trans Nzoia and Uasin Gishu County to the North and Kakamega County to the North West. These rivers are dotted with many dams and wetlands which help regulate river flows. The higher forested areas in the south act as part of the catchment for the rivers. The forests are Timboroa, Cengalo, Nabkoi, Lorenge, Kipkurere and Kapsaret. The Sosiani River and its tributaries act as the receiver for all effluents discharged within the project area. The Sosiani River arises from the conjunction of the Endoroto and Ellegirini River, about 12 km upstream from Eldoret. The Two River Dam is located at this confluence, which is one of the sources of Eldoret's water supply. The Sosiani River flows after a course of 63 km into the Kipkarren River. The altitude of Sosiani River at Two River Dam is about 2,160 masl and at the confluence with Kipkarren River is 1,710 masl. The average slope of the Sosiani River is about 7%.

4.3 Ground water sources

A ground water assessment was conducted by MIBP Consulting Engineers and reported in the October 2016 Feasibility Study and Preparation of Water Supply Master Plan for Eldoret. From the examination, it was observed that the Sergoit catchment appeared to contain higher yielding wells, followed by the upper part of the Sosiani and Kipkarren catchments. The overall conclusion of the groundwater study was that groundwater resource within the study area was low. According to IBMP (2016), the main water sources in Uasin Gishu County include dams, rivers, boreholes, shallow wells and springs. There are also about 250 boreholes in the County out of which 170 are registered. Groundwater infiltration in the phonolites is reduced by a clogging of joints by clay-like weathering products at the top of these rocks. Practically, all shaft wells in the area draw their water from weathered phonolite layer. The "depth to water" level depends upon the local morphology and the thickness of the weathered phonolite layer. On the plateaux water levels are encountered at depth of around 10 m. In sloping areas stand the water level are mostly higher. The permeability of the weathered phonolite depends upon the locally variable degree of jointing and on the degree of joint sealing by mineral precipitation, but is always low and many wells fall dry at the end of the dry season. The shallow depth and poor filtration in the comparatively thin soil and in the jointed aquifer constitute pollution hazards. The predominance of pit latrines, open and partially unlined sewer ditches and the disposal of mineral oil, especially in the area of the town centre, contaminate the shallow groundwater in the densely populated areas.

4.4 Surface water sources

There are over 120 small dams which were constructed by the colonial government for recreational purposes but are now water sources for some communities. The overall capacity of existing bulk water sources within Uasin Gishu County is around 56,000m3/day.

4.5 Water demand and Supply

The World Health Organization (WHO) recommends two (2) gallons (about 7.5 litres) per person daily to meet the requirements of most people under most conditions; and around five (5) gallons per person daily to cover basic hygiene and food hygiene needs. Household survey findings indicated that 50% of the households consumed 51–100 litres of water, 18.3% consumed 1–50 litres and 12.7% consumed 151–200 litres while 11.7% consumed 101–150 litres respectively. In other terms most of the households averagely use five jerricans (holds about 19-20 liters) of water daily for their domestic use.

Eldoret Town is served mainly by the following water supply systems:

- Chebara Water Supply whose source is Chebara Dam with a Treatment Capacity of 26,000m3/day.
- Sosiani Treatment Works whose source is Two Rivers dam with a current capacity of 14,000m3/day (2735 m3/day for Eldoret)
- Kapsoya Treatment Works whose source is Ellegerini Dam with a capacity of 9000m3/day (4000 m3/day for Eldoret)
- Upgrade and rehabilitation of the Two Rivers Dam is however ongoing. After project completion, capacity of the extended dam and treatment works will be around 70,000m3/day
- There is a proposed project, Kipkarren Dam, which will supply an additional 25,000m3/day whose construction will be funded by the African Development Bank (AfDB).

According to ELDOWAS, the county currently produce at least 43 million meters cubic of water against the current demand of 65 million cubic meters meaning that there is a supply shortage.
Clean water has become increasingly scarce with population increase in Eldoret. This has become a limiting factor to sustainable development. Little appreciation and understanding of the role of water in an economy has contributed to poor funding for water resources management and development. As a result, institutions responsible for implementing water resources management have weakened. Without a strategy to deal with this situation in Eldoret, rapid urbanization and population growth means worse conditions for millions of residents, especially the poorest in informal settlement (Kimutai, 2018).

To increase access to clean and safe water, the sector developed 338 community water projects against a target 383, drilled and equipped 85 boreholes against a target of 164, protected 37 springs against planned 36, rehabilitated 35 dams against a target of 108, constructed seven (7) water pans against a target of 30 and rehabilitated seven (7) water supplies against the planned 8. During the period under review, the Sector further completed one (1) new water supply against

planned 16 and constructed 27 intake and treatment works against a target of 44. As an effort to promote the use of renewable energy, the county installed 140 solar-powered water pumps against a target of 124. In addition, the sector planted a total of 1,081,400 tree 18 and flower seedlings (Uasin Gishu CIDP 2023-2027).

In Eldoret, the piped water is either provided by the municipal council through the Eldoret water and sewerage company (ELDOWAS) or is personally installed from other sources (boreholes). The 95.2% population have their water supplied by the municipal council ELDOWAS and 4.8% of the supply is by other providers.

4.6 Causes of water shortages in Eldoret Town

In a research carried out in Eldoret town, 40% of the population based the water shortage to high population hence an increase in demand for the scarce resource, 33% due to low water pressure and 15% due to reduced water levels at the sources (water catchment points). Reduced water levels at the sources, was also reported to cause water crisis. The water source points e.g., boreholes and wells, have been degraded due to lack of proper management and conservation and over exploitation leading to low levels of water available for consumption. High population was the major cause of water shortages since the increase in the water demand only translates to reduced levels of the resource and thus not always available due to rapid water withdrawal. From the analysis low water pressure caused water shortages since the water has very little force to move up the water table and higher distances. Due to this, at times the water force is very minimal for the water to move up the system translating to no water in the pipes and taps until the pressure is higher when the water level goes up. This may take longer especially during the dry seasons resulting to prolonged lack of water in the system and may require electricity to pump up the water.

Other causes identified include illegal water collection points where some households were obtaining water from were identified. This caused water shortage because much water and pressure were lost due to the leakages. Due to these illegal water interruptions; there is a lot of leakages and wastage that leads to water shortages. The respondents confirmed the high cases of illegal water connections and interference of water system which resulted to reduced water in the system. This has resulted to the households spending more on water than they should, thus impacting negatively on the economic status especially within the town's informal settlement. Others still attributed the water crisis to degradation of the catchment areas; majority said that climate change has resulted to reduced precipitation. Degradation of the water catchment areas in Eldoret is said to be the main environmental factor leading to reduced water supply. Lack of protection and conservation of water source points has resulted to reduced water levels available for use. Most of the water catchments are located far from urban areas and their management depends on the local area water management team at the source.

4.7 Projected Water demand at the Hostels

During the operation, assuming that the Purpose-built accommodation block will host approximately 1050 residents with each resident consuming an average of 50 litres per day. Thus 50 litres x 1,050 residents will require approximately 52,500 litres (52.5 M^3 of water daily). This

water will be adequately supplied from the municipal and from the proposed borehole facility (whose permit is being pursued with the WRA) and held onto storage tanks so that there is adequate supply for the residents.
During construction, water from ELDOWAS and other water vendors will be utilised. There will be water storage tanks to increase water capacity at the project site to the required amount.

At operation, the development will source water from reticulated supply by ELDOWAS main supply. Due to the unreliability in water supply, it is expected that the project proponent will supplement the water supply through the use of borehole water and rainwater harvesting to ensure sufficiency of clean water during the operation/occupation stage of this project. There will be water storage tanks to increase water capacity at the project site to the required amount. It is a recommendation that the proponent undertakes tests on yields and analysis of the water quality to determine capacity to meet the demand and conformity to Schedule 1 of the Water Quality Regulations, 2006. The proponent has undertaken hydrogeological survey to establish the viability of ground water for the project (the permit application processes with WRA and NEMA for the borehole are ongoing).

4.8 Water conservation

Water conservation is vital for sustainable development and buildings contribute significantly to overall water usage among human activities. The following measures will contribute to using water sensibly during the construction and occupation phases of the project.

- Installation of motion-sensing taps, urinals and toilets to automatically switch off once the user leaves the station. A motion sensor tap would cut up to 85% of annual water usage compared to conventional taps[2]. Motion sensors would also reduce the spread of germs since users do not have to touch the tap or toilet flush buttons.
- Rainwater harvesting: The harvested water would be used for cleaning, flushing toilets, watering plants, etc.
- Reducing water losses (e.g., leaks) by ensuring high competency in plumbing and promptly fixing any damages immediately they occur.
- Educating employees and occupants about water efficiency to encourage water-saving behaviours.
- Reusing onsite water that would otherwise be discarded or discharged to the sewer (e.g., reusing treated grey water or rainwater to water landscaped areas).
- Creating a water management plan. This would include i) assembling a management team and making a commitment to conserve water, which shall be communicated to all occupants, ii) assessing the facility water use, iii) setting and communicating goals, iv) creating an action plan, v) implementing the action plan, vi) evaluating progress and vi) recognizing achievements on a semi-annual basis.

[2] Chicago Faucets. (2023). 5 Immediate Benefits of Motion-Sensor Faucets. https://learn.chicagofaucets.com/blog/5-immediate-benefits-of-motion-sensor-aucets#:~:text=5%20Leading%20Benefits%20of%20Motion-Sensor%20Faucets%201%201.,of%20Germs%20...%205%205.%20Simple%20Installation%20

Table 4: Uasin Gishu County Spatial Development Strategies on Water Thematic Areas (Source; CIDP 2018-2023)

Thematic area	Status	Policy Strategy
Providing appropriate water infrastructure	Water sources in the county include dams, rivers/springs, boreholes and shallow wells. Existing water supply schemes within Uasin Gishu are ELDOWAS, Turbo, Moi's Bridge, Sambut, Sosiani, Burnt Forest and Kipkabus. **Sanitation**. Households in the county mostly rely on latrines for sewage disposal and only Eldoret town has a sewerage network cover.	Enforce the protection of water sources: Sensitization against encroachment of water catchment areas; Provide adequate water supply infrastructure; Establish Uasin Gishu Rural Water Services

4.9. Effluent /Sewerage and Storm water run-off

In Eldoret, Sewer services have improved over time, but at a much lower rate. The sewer lines only connect 6,254 customers and serve a population of 62,540 approximately. The population in the medium- to high-income areas is served by 1,654 septic tanks that serve 16,540 people approximately. The vast majority of the residents (125,000) use the 12,775 pit latrines.

Eldoret Water and Sanitation Co. Ltd is responsible for the waste-water collection, treatment and safe disposal in Eldoret Town and its environs. The company operates two state of the art sewerage treatment plants located in Huruma and Kipkanyo in the western part of the town. The County sewerage system serves the site to which the complex will be connected. Effluent discharge from the project site will be connected to the existing sewer management system.

Eldoret town is served by two sewage treatment plants (Quarry WWTW & Boundary WWTW) with a combined design capacity to treat 18,000m3/day. Both WWTW have a more or less equal capacity and are interconnected to allow for diversion of the entire flow to one of them during yearly de-sludging. Sludge is sold to surrounding communities as
fertilizer.

Quarry Treatment plant is a conventional treatment plant existing of the following"

- Mechanical screening
- 4 no Primary ponds
- 2 no Secondary ponds
- 2 no Tertiary ponds
- 2 no Maturation ponds
- 1 trickling filter

Boundary Treatment plant has a similar set-up:

- Mechanical screening
- 2 no Primary ponds
- 1 no Secondary ponds
- 1 no Maturation ponds
- 1 trickling filter

The two treatment plants currently operate at almost the design capacity due to low coverage of the sewerage network. The sewer network covers less than 30% of the town leaving the rest dependent on onsite sanitation methods which is both expensive and unsustainable to the environment, since no structural de-sludging logistics and treatment facilities are in place for onsite sanitation solutions.

At construction the contractor will be responsible for handling the generated construction waste which will be disposed of at the requisite areas.

During occupation, the solid waste management will consist of collections by dustbins in the residencies and along the corridors at designated points. The collected waste will later be transported to a waste treatment site by NEMA licensed waste collector. All storm water drainage will be channelled into the existing storm drains and into the premises sewer management system.

5.0. TRAFFIC ANALYSIS

The project is served by Makasembo Road off the main A104 (Eldoret- Malaba) highway a class A road to the Northern side; the project site also links to Nandi Road to the Southern Side. The proposed development project which consists of 1050 accommodation units will have an effect on the traffic in the area for both Motorized (MT) and Non-Motorized (NMT) traffic due to the additional daily generated trips to and from the development particularly during the peak hours.

To improve the road network, linkage and accessibility, the county constructed 4 Km of road to bitumen standards against a target of 83 Km, built 25 bridges and box culverts against planned 35, graded and gravelled 5,177.4 Km and 1,465 Km of roads respectively against target of 8100 Km and 2600 Km, maintained 814.34 Km of roads against a target of 2500 Km and installed 11,267 metres of culverts against planned 68100 meters. Further, Eldoret town by-pass road (Cheplaskei- Kapseret- Maili Tisa) was constructed, thus alleviating the traffic menace in the town. A total of 9,004 street light lamps were installed to enhance security and extend economic activities (24-hour economy). Towards enhancing the county's capacity to respond to fire and other emergencies, the sector constructed one fire station against planned four (4) (Uasin Gishu CIDP 2023-2027).

Table 5; Uasin Gishu County Spatial Development Strategies on transport Thematic Areas (Source; Uasin Gishu CIDP 2023-2027)

Thematic area	Status	Policy Strategy
Transportation network	There exist three modes of transport used in Uasin Gishu County namely roads, rail and air transport; Major public transport system is predominantly road based which includes matatu (which is a minibus), taxis, tuk tuk (motorized 3-wheel taxi) and motor cycles (boda boda). Eldoret town also has a good network of Non-Motorized Traffic (NMT).	Address deficiencies on existing roads by expanding road network; Construction of NMT; Introduce city/area-wide traffic control and information systems, including real- time traffic management and enforcement of traffic laws and regulations;
	- Railway plays a partial role in public transport.	Strategies to utilize railway transport for cargo transport.
	There are two air transport facilities in the county: the Eldoret International Airport and Eldoret Air Strip	Promoting the facility for the transportation of horticultural products and passengers in the region

5.1 Existing Road Network Hierarchy

The proposed development is located along Makasembo Road, off the main Eldoret- Malaba highway, in Eldoret town, Uasin Gishu County.

Makasembo Road classified under class EF& G links with Nandi Road (Class ABC Urban) to the South and with the Eldoret- Malaba highway (A104) to the North. The Eldoret- Malaba highway is a class A road which is a national trunk road. The road is used as a two-way road with vehicles to and from the Eldoret direction.

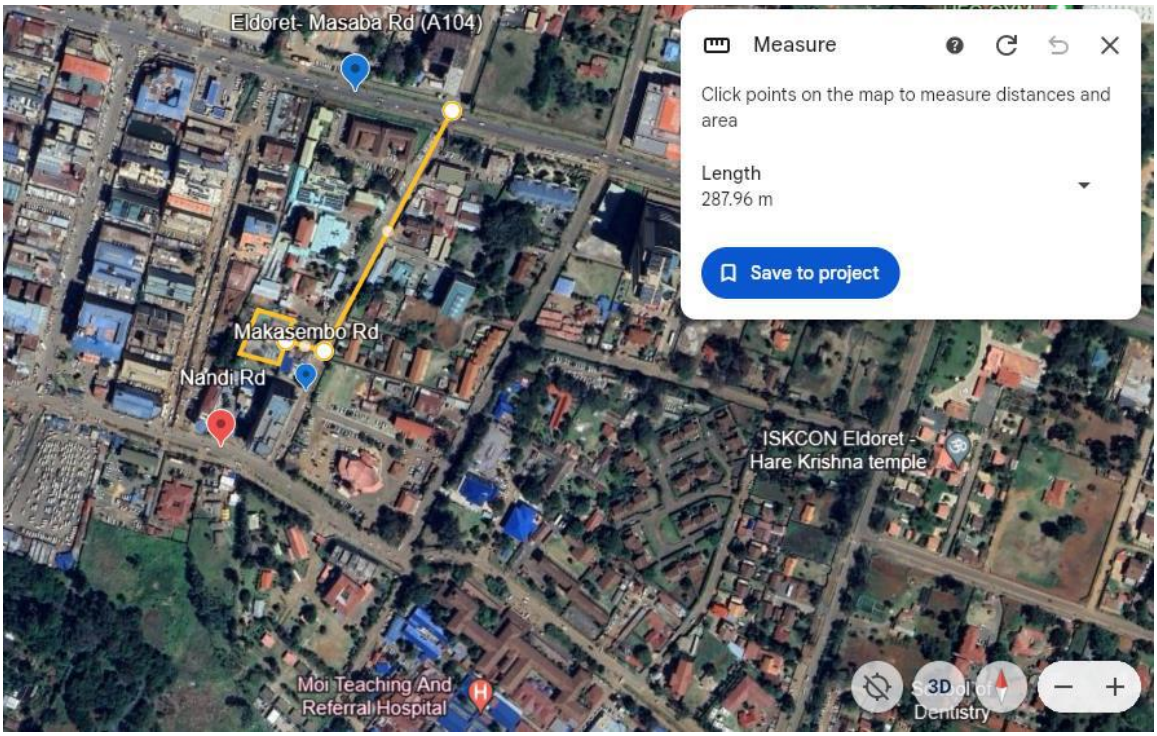

Figure 6; site location distance to the main roads

5.2 Non-Motorized Traffic (NMT) Analysis

Walking and other non-motorized modes of transport has become popular in the urban setup as the mode is cheaper, convenient, healthy and pollution free. Therefore, it is encouraged that proper NMT facilities are provided to increase the safety of pedestrians and cyclists in order to encourage more people to embrace this mode of transport especially in towns. The CIDP 2018-2023 Uasin Gishu county noted that Eldoret town has a good network of Non-Motorized Traffic (NMT) provision but with a target to improve the situation. The proposed development will mostly generate non-motorized traffic (pedestrians) composed of students' residents.

5.3 Design of Vehicle and Access Turning

The most dominant vehicle that will be frequenting the development will be passenger cars with approximate overall lengths of 3.5m to 4m. However, to cater for vehicles such as occasional delivery trucks and garbage collection, a single unit truck of overall length of 11m should be adopted for the access junction design. The minimum required turning radius recommended by

the Kenya Road design manual is 12.5m. A turning radius of 13 - 15m should therefore be allowed.

5.4 Increased traffic during construction and operation

The traffic at construction at the site will increase due to vehicles transporting building equipment and materials. The situation could worsen because the road serving the site ie. Makasembo Road is a narrow two-way road.

5.4.1 Proposed Mitigation Measures

- The contractor and the proponent should transport the materials and equipment during the evening or early in the morning (off peak hours).
- An appropriate Traffic Management plan should be developed for the same and plausible as a mitigation measure to ensure traffic congestion and possible accidents are kept to bare minimum.
- Limiting the number of trips made by the construction vehicles during peak hours and which will be ensured through proper planning on material acquisition.

5.4.2 Need for Auxiliary Lanes

Auxiliary lanes are designated lanes at intersections that aim at facilitating smoother traffic flow, especially during peak hours by separating the turning traffic from the through traffic. They include turning right and left lanes and acceleration/deceleration lanes. Makasembo road is a two way traffic road that links either to Nandi Road to the Southern End, or the main Eldoret- Malaba Road to the Nothern end, both two way traffic roads. Traffic management during construction should be enhanced to help promote a smooth flow of vehicles.
At occupation, it is not anticipated that traffic will be heighted owing to the limited number of vehicles expected at the hostels.

The proposed development will have minimal to no adverse impacts on the operational efficiency of the existing road networks since planning of traffic around the project site is easy to implement.

To enhance vehicular traffic mobility within and around the proposed project site and to reduce traffic conflicts and ensure the safety and comfort of the pedestrians it is recommended that: -

i. Provision be made for an adequate property access junction, a safe pick and drop-off within or adjacent to the development to ensure ease of access with the approval of the concerned road agency.

ii. Provision for security lighting at the entrance to enhance security of the development and neighbourhood (Solar street lighting is highly recommended).

iii. Designated pedestrian crossings (zebra crossing) to be provided with calming measures (rumble strips, speed bumps) to enhance the safety of crossing pedestrians.

iv. Develop a comprehensive traffic management plan during construction period to ensure safety and minimal disruptions to the existing traffic circulation.

The development will be served by both Public Service Vehicles (PSVs; involving matatus and buses) and is located approximately 170m to Nandi Road and 288m to A104 (Eldoret- Malaba Highway); presumably, at operation the residents will disembark at the bus stops and walk to the premises thus majority of the traffic will be non- motorized (NMT) while the smaller percentage will comprise of motorized traffic.
Provisions for the Non-motorized traffic should be made to allow for pedestrians access into the premises as well as allow for ease of passage for other road users.

Provisions will include;

1. Pedestrian walkways
2. Zebra/ pedestrian crossings
3. Bus stops and drop off zones
4. Street lighting ang signages.

The generated traffic due to the proposed development will not have a significant effect to the future traffic operating conditions in the area largely owing to the nature of residents within the hostels.

6. LEGISLATIVE AND REGULATORY FRAMEWORK

6.1. Constitutional and Legal Framework

6.1.1. Constitution of Kenya (2010)

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

- Have the environment protected for the benefits of present, future generations through legislative and other measures, particularly those contemplated in Article 69, and
- Have obligations relating to the environment fulfilled under Article 70 [3].

Article 43-Economic and social Rights

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

6.1.2. The Environmental Management and Coordination Act chapter 387

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

Section 58 (1) has underscored that any person being a proponent of a project Shall before financing, commencing or proceeding with submit an EIA report to the National Environmental Management Authority (NEMA) of Kenya[4].

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

Compliance with EMCA

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

---

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

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

- The proponent shall undertake Environmental audits for the project and submit the reports to NEMA as per the EIA/EA guidelines

6.1.3. Physical Planning and land use act (2019)

The Physical Planning Act (Cap. 286) aims at developing a sound spatial framework[5]. The plan proposals enhance and promote intergraded spatial/physical development. The Physical planning Act makes specific provisions in respect to the mandate of local authorities.

Section 24 (1): the Director may prepare with reference to any Government land, trust land or private land within the area of authority of a city, municipal, town or urban council or with reference to any trading or marketing center, a local physical development plan.

Section 24(3): the Director may prepare a local physical development plan for the general purpose of guiding and co-coordinating development of infrastructure facilities and services for an area referred to in subsection (1), and for the specific control of the use and development of land or for the provision of any land in such area for public purpose.

Section 25 (b): a local physical development plan shall consist of such maps and description as may be necessary to indicate the manner in which the land in the area may be used.

Section 29 (a): confers upon local authorities the powers to prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area.

Section 36: This section compels that if in connection with a development application, a local authority is of the opinion that proposals for industrial location, or any other development activities (such as building developments) will have injurious impact on environment, the applicant will be required to submit together with application an environmental impact assessment report.

Compliance with this legislation

- The architectural drawings (plans) of the proposed project have been submitted to the county government of Uasin Gishu for approval
- The proponent will ensure that the land is utilized in an ecofriendly manner and is restored to its original condition once the project is decommissioned.
- Ensure the development does not in away have injurious impact on the environment and that a developmental footprint of 75% is maintained.

[5] The Republic of Kenya, "The Physical Land Use & Planning Act, 2019" (Kenya law reports).

6.1.4. Physical Planning (Building and Development Control) Regulations

Under the provisions of the Physical Planning (Building and Development control) Regulations; The Director of Physical Planning shall refuse to recommend any new building or proposed development, or alteration or addition to any existing building if:

i. The proposal is not in conformity with approved development plan.
ii. Such plans disclose a contravention of the physical Planning (Building and Development) rules.
iii. The plans are not correctly drawn or omit to show information required.
iv. On such being required, separate application accompanied by sets of plans has not been lodged in respect of building on separate plots or subplots etc.

Compliance

- Change of use approval request has been submitted pending approval by the county government
- The proponent shall adhere to the recommendations given in the building order by the county physical planner
- The proponent shall ensure that the building plans are available on site for inspection by county officials during construction and at any other time.

6.1.5. The public Health Act (Cap 242)

Section 15 (1x) –Nuisance

Any noxious matter or wastewater discharged from any premise, such as a building constitutes nuisance. Any premise not kept in a clean and free from offensive smell such as gases which are injurious to health such as those from commercial establishments shall therefore generate nuisance. The Act therefore stresses that no person shall cause a nuisance to exist on any land or premise occupied by him.

The Act acknowledge that it shall be the duty of all local authorities to take all lawful measures for maintaining its district at all times in a clean and sanitary condition for remedy of any nuisance or condition liable to be injurious to heath. To safeguard against this, part X of the public Health Act states that where in the opinion of the Medical Officer of Health that food stuffs within a warehouse, or a building are insufficiently protected, the owner shall be compelled to observe the require regulations, else he shall be guilty of an offense[6].

Compliance

- The proponent will ensure solid waste shall be handled by a professional NEMA Approved garbage collector on regular basis and disposed appropriately as per the waste regulations.
- Sanitary facilities shall be in conformity with MOH standards and installation of standard fittings. Liquid wastes shall be contained in a waste treatment plant.

[6] The Republic of Kenya, "The Public Health Act Chapter 242" (Kenya law reports, 2012).

6.1.6. The County Government Act, 2012

It affirms that every municipal council has the power to establish and maintain sanitary services for the removal and disinfection, or otherwise dealing with or kinds of refuse and effluent, such as spent oil, and where any such services is established, to compel the use of such services by persons to whom the services is available

Section 166 – empowers the local authority to be responsible for local planning and development control in the city.

Compliance with this legislation

- The proponent is obligated to comply with EIA study report proposed potential mitigation measures in the EMP.
- Adhere to all directives from the County Government of Uasin Gishu as they may arise during the full cycle of the project

6.1.7. The OSHA, 2007

The Act aims at making provision for the health, safety and welfare of persons employed in factories and other places of work.

Section 13 – states that every factory shall be kept in a clean state and free from effluvia, arising from any drain, sanitary convenience or nuisance. Effective and suitable provisions is also proposed for securing, maintaining by circulation of fresh air in each workroom, the adequate ventilation of the room.

Section 36 –Provides for precautions with respect to explosive inflammable dust or gas. The section is specific that where in any building, if dust that could escape to work man's room and explode by ignition, steps must be taken to prevent such an explosion.

Section 41 – Compels that in every factory, there shall be maintained fire extinguishers, which shall be adequate and suitable in case of fire out breaks. Similarly, it mandates every factory to provide adequate means of escape in case of fire outbreak for the employees. The Act further requires that if a factory worker is employed in any process involving exposure to wet or to any Injurious or offensive substance, suitable protective clothing must be provided by the employer[7].

Compliance

- The proponent will appoint a reputable contractor who will be responsible for enforcing the requirements during construction and subsequent repairs and maintenance after project completion.

- They will make provision for the health, safety and welfare of persons employed in factories and other places of work. Ensure that every work place shall be kept in a clean state and free from effluvia, arising from any drain, sanitary convenience or nuisance.
- Avail fire extinguishers, which shall be adequate and suitable in case of fire out breaks. Provide adequate means of escape in case of fire outbreak for the employees.
- Ensure factory workers are in any process involving exposure to wet or to any injurious or offensive substance, suitable protective clothing must be provided.
- The proponent shall ensure that the factories and other places of work abstract is displayed at a strategic place within the factory premises

6.1.8. Planning & Building Regulations 2009

These are regulations that set standards for the design and construction of buildings to ensure the safety and health for people in or about those buildings. The regulations are as follows;
Any developer, who intends to erect a building such as a residential block, must;

a) Seek for all approvals before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions

b) All plans must be drawn by registered architect/ structural designer

c) Give the concerned local authority a notice of inspection, before the erection of the structure. After erecting the building, a notice of completion shall be issued to the local authority to facilitate final inspection/approval.

d) No person shall occupy a building whose certificate of completion has not been issued by the local authority. As a precaution against fire breakout, the by-law states that the walls of any premise shall be non-combustible throughout, similarly, in every building, other than a small house, which comprises more than one storey, shall have fire resistance.

Compliance

- All approvals will be sought before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions.
- The proponent will obtain Certificate of Completion on decommissioning. They shall further provide fire-fighting equipment that may include one or more of the following: hydrants, hose reels and fire appliances, external conations, portable fire appliances, water storage tanks, dry risers, sprinkler, drencher and water spray spring protector system.

6.1.9. Penal code (Cap. 63)

The chapter on “Offences against Health and Conveniences” strictly prohibits the release of foul air into the environment, which affects the health of other persons. Any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwelling or carrying out business in the neighborhood or passing along public ways is guilty of misdemeanor, i.e. imprisonment not exceeding two years with no option of fine. Under this Act,

any person who for the purpose of trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commits an offences, and is liable to be punished for a common nuisance, i.e. imprisonment not exceeding one year with no option of fine.

Compliance

- The proponent will ensure using appropriate technology, foul air which affects the health of other persons will not be released into the environment, further they will for the purpose of trade or otherwise, using any appropriate systems and technology, ensure there is no loud noise or offensive awful smell in such places and circumstances that may annoy any considerable number of persons in the exercise of their rights.

6.1.10. Water Quality Regulations, 2006

The law is based upon the principle that everybody is entitled to a healthy and clean environment. Section 42, is pertinent to the implementation of this project. These Regulations shall apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife, and water used for any other purposes[8].

Compliance with this legislation

- The proponent shall strictly adhere to the provisions and requirements of these regulations. They must ensure all applicable water standards are observed to ensure clean, safe water for all purposes and prevent resources pollution by ensuring water disposed meet the allowable standards.
- The proponent shall carry out an initial environmental audit after the first year of operation. The report shall include analysis of effluent as stipulated in the second schedule of this legislation.

6.1.11. Noise and Excessive Vibrations Pollution (Control) Regulations

Part II of the rregulations[9] regulations; section 3 states:

1. Except as otherwise provided in these Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Compliance: The proponent shall take into concern the provisions of the local authority act to ensure that the development complies with the provisions of the Act.

[8] The Republic of Kenya, "The Environmental Management and Coordination, (Water Quality) Regulations 2006." 2006, www.nema.go.ke.

[9] The Republic of Kenya, "The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009." 2009, www.nema.go.ke.

6.1.12. Registration of Titles Act Cap 281

Section 34 of this Act states that when land is intended to be transferred or any right of way or other easement is intended to be created or transferred, the registered proprietor or, if the proprietor is of unsound mind, the guardian or other person appointed by the court to act on his/her behalf in the matter, shall execute, in original only, a transfer in form F in the First Schedule, which transfer shall, for description of the land intended be dealt with, refer to the grant or certificate of title of the land, or shall give such description as may be sufficient to identify it, and shall contain an accurate statement of the land and easement, or the easement, intended to be transferred or created, and a 27 memorandum of all leases, charges and other encumbrances to which the land may be subject, and of all rights-of-way, easements and privileges intended to be conveyed.

Compliance

- The proponent will ensure that all waste are segregated before being transported to a designated waste treatment facility by a contracted NEMA licensed waste transporter

6.1.13 Urban Areas and Cities Act No. 13 Of 2011

PART V – on Integrated Development Planning, section 36 sets the objectives of integrated urban areas and city development planning (1) Every city and municipality established under this Act shall operate within the framework of integrated development planning which shall— (a) give effect to the development of urban areas and cities as required by this Act and any other written law; (d) be the basis for— (i) the preparation of environmental management plans; (v) disaster preparedness and response; (vi) overall delivery of service including provision of water, electricity, health, telecommunications and solid waste management; (2) In addition to the objectives set out in subsection (1), an integrated urban or city development plan shall bind, guide and inform all planning development and decisions and ensure comprehensive inclusion of all functions.

Compliance; the proponent has given into consideration all the requirements of the act by getting the planning proposal in line with the planning requirements of the county integrated development planning.

6.1.14 NCA regulations 2014

This is an Act of Parliament that with a mandate to oversee the construction industry and coordinate its development.

Section 17 states that;

All construction works, contracts or projects either in the public or private sector shall be registered with the Authority in accordance with the Act. An owner shall make an application for

registration of a project to the Authority in writing within thirty days from the dare on which a tender for construction works, contract or project is awarded to a contractor registered under this Act. Also, an owner shall ensure that the tender for construction works, contract or projects is awarded to a person, firm or contractor registered under this Act.

The proponent will adhere to this regulation and award a reputable, NCA registered contractor.

6.1.15 National Construction Authority Act No. 41 Of 2011

Section 15 calls for the Requirement for registration

(1) A person shall not carry on the business of a contractor unless the person is registered by the Board under this Act.

Compliance; The proponent, once obtained all the requisite permits and licenses must ensure that they shall engage the services of a registered contractor.

PART IV-Addresses the identification and Reporting of Construction Works Contracts or Projects by the Owner.

Section 17. (l) All construction works, contracts or projects either in the public or private sector shall be registered with the Authority in accordance with the Act.

Compliance; *The proponent to obtain all the requisite permits and licenses and must ensure that they register the construction site with the Authority.*

6.1.16 Climate Change Act, 2016

These Regulations were published in the Kenya Gazette Supplement No. 68, Legal Notice No. 11 of 13th May, 2016. The Regulations provides for a legal framework to enhance response to climate change; to provide for mechanisms and measures to achieve low carbon development for connected purposes. Climate resilient development in Kenya, and is an important milestone on the country's path towards developing its economy while simultaneously reducing greenhouse gas emissions.

Part IV, Section 15 (5a) the act requires that public entities to integrating climate change plan into sectorial strategies and their implementation projections for the assigned legislative and policy functions

PART IV, Section 15 states that private entities that have a climate change obligation to submit reports the status of performance of climate change duties and prescribe the period of reporting.

Part IV, Section 17 (a) states that National Environment Management Authority (NEMA) has the duty of regulate, enforce and monitoring the compliance on levels of greenhouse emissions as set by the national council provided by the act.

Part IV, Section 23 a person in pursuant of article 70 of the constitution may apply the environment and land court alleging that the person has acted in a manner that has adversely affected efforts towards mitigation and adaptation of climate change

Part V, Section 24 Public participation shall be undertaken in a manner that ensures it makes an impact in the threshold of decision making on climate change.

Compliance; The proponent is advised to identify and asses residual climate risks and risk reduction measures, incorporate climate adaptation measures into the design and do follow-up assessments needed during the project operation phase.

6.1.17 The Water Act, 2016

Part II, section 18, of the Water Act, 2016 provides for national monitoring and information systems on water resources. Section 73 of the Act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

6.1.18 Sustainable Waste Management Act no. of 2022

AN ACT of Parliament to establish the legal and institutional framework for the sustainable management of waste; ensure the realization of the constitutional provision on the right to a clean and healthy environment and for connected purposes.

Section **(3)** The objects of this Act shall be to—

a. Promote sustainable waste management;
b. Improve the health of all Kenyans by ensuring a clean and healthy environment;
c. Reduce air, land, fresh water and marine pollution;
d. Promote and ensure the effective delivery of waste services;
e. Create an enabling environment for employment in the green economy in waste management, recycling and recovery;
f. Establish an environmentally sound infrastructure and system for sustainable waste management;
g. Promote circular economy practices for green growth;
h. Mainstream resource efficiency principles in sustainable consumption and production practices; and
i. Inculcate responsible public behaviour on waste and environment.

Sections 12, 19 and 20 give certain duties regarding all waste producers thus; waste classification and segregation, duties of private sector entities and duty to segregate and dispose waste respectively.

Compliance; The proponent is advised to take cognizance of all requirement of the act so as to address all matters waste management sufficiently.

6.2. Institutional Framework

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

- National Environmental Management Authority (NEMA)
- The National Construction Authority (NCA)
- Director of Physical Planning
- The County Government of Uasin Gishu
- Ministry of Lands and Public Works, Housing and urban Development
- Ministry of Environment, Climate Change and Forestry

6.2.1 The National Construction Authority

The Mandate of the NCA is to regulate the construction industry and coordinate its development. The National Construction Authority empowers the Authority to "Accredit and register contractors and regulate their professional undertakings". The Authority publishes a Register of Contractors that contains the particulars of the construction firm, including the Class of Works and Category for which the firm is registered. The Executive Director is the Registrar of Contractors.

The NCA is also responsible for project registration; project registration is an important step towards streamlining of the construction industry. Developing a projects register will facilitate planning and maintaining of construction records that makes quality assurance not just easier but more systematic.

6.3. Development Policy Framework

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

6.3.1. The World Commission on Environment and Development

The commission commonly referred to as “the Brundtland Commission” is focused on the environmental aspects of development. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. Social sustainable development maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and wellbeing, adequate nutrition, shelter, cultural expression, and political involvement [10].

6.3.2. The Rio Declaration on Environment and Development

The Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nation Conference on Environment and Development, known as the earth summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992. Under Agenda 21, Principle No. 10 of the declaration underscores that environmental. Issues are best handled with

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

participation of all concerned citizens at all relevant levels. At the national level, each individual shall have appropriate access to information concerning environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy shall be provided.

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

6.3.3. Kenya Vision 2030

Kenya aims to be a nation that has a clean, secure and sustainable environment by 2030.The goals for 2030 are: (i) to increase forest cover from less than 3% at present to 4%; and (ii) to lessen by half all environment-related diseases. Specific strategies will involve promoting environmental conservation in order to provide better support to the economic pillar flagship projects and for the purposes of achieving the sustainable Development Goals (SDGs); improving pollution and waste management through the design and application of economic incentives; and the commissioning of public-private partnerships (PPPs) for improved efficiency in water and sanitation delivery. Kenya will also enhance disaster preparedness in all disaster-prone areas and improve the capacity for adaptation to global climatic change. In addition, the country will harmonize environment-related laws for better environmental planning and governance[11]

6.3.4 Sustainable development goals (SDGs)

Kenya ratified the sustainable development goals in august 2015. The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.
The proposed project will be guided by targets and indicators espoused in the following sustainable development goals. Whereas the time frame for achieving the SDGs has been set for year 2030, achievement for certain targets for the current project will be immediately during construction and occupation.

- **SDG 4** – Quality Education: Inclusive education to enable upward social mobility and end poverty

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

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

7. PUBLIC PARTICIPATION

7.1. Objectives of the consultation and public participation

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

1. Disseminate and inform the public and other stakeholders about the proposed project with special reference to its key components, location and expected impacts.
2. Create awareness among the public on the need for the EIA for the proposed project.
3. Gather comments, concerns and suggestions of the interested and would be affected/interested parties.
4. Ensure that the concerns of the interested and, would be affected/interested parties were known to the decision-making bodies and the proponent at an early phase of the project development planning.
5. Establish a communication channel between the interested, would be affected/interested parties, the team of consultants and the Government.
6. Incorporate the information collected in the project by EIA Experts.
7. Establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed
8. Obtain the socioeconomic information of the project area

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

7.2. Methodology used in the CPP

The Consultation and Public Participation (CPP) Process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA Cap 387 section 58, on Environmental Impact Assessment for the purpose of achieving the fundamental principles of sustainable development. The process is continuous and is on-going. Questionnaires were administered to the local community members (comprising of individuals and institutions) around the proposed project. The views and concerns have been incorporated into the impacts and mitigation measures in section 6 and 7 below. In addition, public meetings are to form part of the Consultation and Public Participation.

The following is a summary of the activities carried out in the CPP;

i. Key Informant interviews were used to get responses from key stakeholders in the project area
ii. No objection letters were obtained from the nearby institutions stating their support to the project.
iii. Open ended questionnaires were also gathered from the local community and affected stakeholders regarding the installation of the project.
iv. Proposed project will be advertised in two national newspapers, one radio station and one advertisement in the Kenya Gazette

v. As part of the stakeholder engagement a public meeting is planned to take place so as to disseminate information as well as gather opinion regarding the proposed project.

Table 6; Summary of Issues and Concerns raised by members of the public, Expectations and Mitigation Measures

Positive Expectations	Adverse Impacts	Proposed Measures proposed by stakeholders
• Employment opportunities to residents • Increased students' enrolment • Students' security and convenience • Students welfare improvement • Enhanced economy; national and county • Infrastructural development • Enhanced CSR within the project area • Reduced social evils within the community	• Air and dust pollution which may cause respiratory ailments to local residents during construction • Traffic snarl-up during construction and operation phases in the area. • Noise pollution during construction and operation. • Production of solid waste during the operation and construction phases • Increased resource exploitation during construction • Increased infrastructural resource demand; water, power, roads etc	• Ensure CSR activities are aimed at the locals' welfare • Ensure project site is fenced off to avoid intrusion by non-authorised persons • intrusion by non-authorised persons. • Ensure workers to the site are well trained and are always under strict supervision either. • Ensure registered waste handler is contracted to collect waste from the site for appropriate disposal in the designated dumping sites. • Ensure that exposed excavated soil heaps are covered and dampen to reduce dust emission. Similarly ensure that, the exposed soil surface is revegetated • Deploy adequate traffic marshals to the site to ensure there are no snarl ups.

8. POTENTIAL ENVIRONMENTAL IMPACTS

8.1. Positive Impacts during Construction

8.1.1. Employment Opportunities

One of the main positive impacts during projects construction phase is the availability of employment opportunities starting with the project inception having consultants of various disciplines to the implementation having casual workers and several other skilled workers such as building and construction engineers. Employment opportunities are of benefit both economically and socially.

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

8.1.2. Optimal use of land

In Africa the UN predicts that the current 400 million urban citizens will exceed 750 million by 2030 and will reach 1.2 billion by 2050. It is also plausible to note that while urban population increases the size of land available for development will continue to decrease. The effect of this trend has been the reduction of farmland and encroachment into animal habitats and migration routes. Thus, it is highly recommended that land being a finite resource must be optimally utilized. The proposed project will see conversion of land currently occupied by a lone house being converted to a home for over one thousand students. The new design will also make it easier for provision of services such as waste management, piped water and electricity. It will save on land that could be underutilized; in place of having a few families housed/ a few commercial entities, a big number of students will be accommodated in the proposed units once complete for the betterment of the quality of education.

8.1.3. Economic Growth

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

8.1.4. Improvement of the Informal Sector

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

8.1.5. Market for Supply of Building Materials

The project will require supply of large quantities of building materials some of which will be sourced within the town and surrounding towns. This provides ready market for building material suppliers such as quarrying companies and hardware shops.

8.2. Negative Impacts during construction

8.2.1. Noise pollution

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

8.2.2. Disposal of excavated soil

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

8.2.3. Soil Erosion

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

8.2.4. Dust Emissions

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

8.2.5. Increased Water Demand

Both the workers and the construction works will create an increased demand for water in addition to the existing demand. Water will be mostly used in the creation of aggregates for construction works and for wetting surfaces for softening or hardening (curing) after creating the formworks.

8.2.6. Generation of Exhaust Emissions

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

8.2.7. Building Materials and Energy Consumption

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

8.2.8. Generation of solid wastes

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

8.2.9. Risk of accidents

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

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

8.2.10. Oil spills

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

8.2.11. Energy consumption

The project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil fuel is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. The project will also use electricity supplied by KPC. Electricity in Kenya is generated mainly through natural resources, namely, water and geothermal resources. In this regard, there will be need to use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and their sustainability.

8.2.12 Potential Traffic Increase

The property is served by Makasembo Road a bitumen standard road which branches off the main A8 Road. Road traffic will be generated to and from site during the construction stage owing to the following reasons; Transportation of construction workers using the existing road network. Transportation of imported construction materials using the existing road network; i.e. imported mound fill, ready mixed concrete, reinforcement, road materials and other building materials. Transportation of exported fill to an agreed reclamation site or other licensed dumping ground.

8.3. Positive Impacts during Operation Phase

8.3.1. Increased student enrolment due to accommodation availability

The proposed development seeks to address the evident gap in the market and align with the Kenyan Government's commitment to alleviate the accommodation shortage in Kenya. Increased enrolment in universities over the past decade has subsequently augmented demand for accommodation. Most universities in Kenya do not have adequate facilities for the increasing numbers. Shortage of accommodation facilities in public and private universities is forcing students to live in residencies outside the campuses, exposing them to insecurity and at the mercy of unscrupulous landlords and criminals. University enrolment has for a long time been curtailed by the lack of student accommodation. At times, the expensive accommodation available makes the cost of higher education unaffordable to the majority.

The proponent has been working to meet the high demand for student accommodation facilities. Their model seeks to not only provide accommodation but to do it the right way. This model includes providing among others comfortable, secure, standard, affordable residencies. The initiative will give parents some form of relief knowing that their children are living in secure environments as they study. The proposed project will add over one thousand accommodation units for at least ten institutions in the project area which goes a long way in supplementing the already available accommodation facilities.

8.3.2. Building Friendships and Networks

Among the benefits of student accommodation are the social opportunities such as living arrangements foster and the network of friendships built. While it is certainly possible to form lasting friendships with peers in lectures and tutorials, longer friendships can be formed at the

halls of residence. These proposed students' accommodations are usually equipped with common areas where students can socialise together in a safe and supportive environment. Due to the household's strong focus on study, living together makes group work and collaborative study easier to achieve. These friendships will ultimately translate into future career networking opportunities.

8.3.3. Employment Opportunities

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

8.3.4. Increased Revenue generation

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

8.3.5 Reduction of traffic and increased security within the Eldoret CBD

Majority of the student population live in and around the CBD of Eldoret while some live with parents and relatives in the nearby estates, hence the need to commute daily to school. This poses a security risk for the students as they do so everyday especially for those with who have evening classes and risk commuting with valuables which are essential for their learning. With the increase in commuting time, students are subjected to higher commuting costs as they subject the area residents to increased traffic and proliferation of public transport (matatus). The proposed student residences will help curb this as the students will all be within short distances to their respective campuses.

8.4. Negative Impacts during operation

8.4.1. Increased Pressure on Infrastructure

The proposed development project will lead to increased pressure on existing infrastructure such as roads, service lines, water and others due to the increased number of people using the facilities.

8.4.2. Increased water demand

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

8.4.3. Heightened Solid Waste Generation

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

Even the biodegradable ones such as organic wastes may be harmful to the environment because as they decompose, they produce methane gas, a greenhouse gas known to have a high warming potential.

8.4.4. Increased storm water flow

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

8.5. Positive Impacts during decommissioning

8.5.1. Rehabilitation

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

8.5.2. Employment Opportunities

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

8.6. Negative Impacts during decommissioning

8.6.1. Noise and Vibration

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

8.6.2. Generation of Solid Waste

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

8.6.3. Increased dust emission

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

8.7. Climate change impacts

Climate change poses great challenges since it has adverse effects in form of floods, landslides and prolonged drought, which are difficult to manage.

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

The project's impact on climate will largely depend on energy consumption, material extraction, water use, food waste and other wastes generated, type of solid waste treatment among others. Consumption of fossil fuels to power machinery and vehicles will lead to direct emission of greenhouse gases (GHGs) to the atmosphere.

Another source of methane will be decomposition of food waste in landfills and waste treatment sites. About 11% of all the greenhouse gas emissions that come from the food system could be reduced if we stop wasting food. When we waste food, we also waste all the energy and water it takes to grow, harvest, transport, and package it. And if food goes to the landfill and rots, it produces methane. Thus, it will be important to advise incoming occupiers of the residencies to reduce food waste and or donate leftovers.

The project will also be impacted by climate change. These impacts include increased surface temperatures and excessive rainfall. Increased surface temperatures occasioned by positive radiative forcing associated with anthropogenic GHGs may make it uncomfortable for construction workers. Additionally, high surface temperatures may increase room temperature in the residencies making it uncomfortable for students. Some students may resort to using air conditioning at these times thus increasing electricity demand and associated grid emissions. On the other hand, excessive rainfall may cause flooding within the compound as well as increase surface runoff that may damage infrastructure e.g. roads.

It is important that climate change impact mitigation measures are incorporated into the project design.

8.7.1 Climate proofing measures

The proposed project was designed to mitigate and adapt to the impacts of climate change. Globally, the building industry consumes 38% of the total primary energy[12]. Thus, the design principles incorporated i) energy efficiency, ii) utilizing natural lighting, iii) utilizing sustainable materials and iv) water conservation.

Energy: The proponent proposes installing solar systems on the rooftop to supplement grid electricity. Solar power is sufficiently adequate in the project site and 100% clean at the point of use, thus reducing grid emissions[13] associated with thermal electricity generation. The Ministry

[12] Laeeq, M. Y., Ahmad, S. k, & Altamash, K. (2017). Green building: Concepts and awareness. International Research Journal of Engineering and Technology (IRJET), 4(7), 3043–3048. https://www.academia.edu/download/54181236/IRJET-V4I7614.pdf

[13] Kenya's grid emission factor according to the United Nations Framework Convention on Climate Change is 0.4999 tCO2/MWh.

of energy is also developing the Energy (Net Metering) Regulations, which will enable the proponent to cut its energy bill once enacted.

Lighting: The project design promotes energy efficiency using light control and smart meters. These systems, equipped with sensors, automatically switch off lights in unoccupied spaces. Smart meters track and analyse energy usage, pinpointing areas for improvement in efficiency. Additionally, electricity consumption will be reduced by adopting improved Light Emitting Diode (LED) lighting, maximizing natural light and using energy-efficient appliances. LED lights provide superior brightness and contrast while being ten times more efficient than traditional bulbs, resulting in a 75% reduction in electricity demand when employed[14].

Materials and narrow design: The design utilizes locally available materials with low embodied energy, requiring little to no maintenance. It prioritizes sustainably harvested materials, is non-toxic, minimally contributes to internal pollution and health issues and is easy to recycle or reuse. Moreover, the design includes narrow walls to reduce heat gain and facilitate natural cooling, optimizing natural light penetration and cross-ventilation in the buildings.

Water conservation: The design allows for water harvesting from the roof. The harvested water would be used for cleaning, flushing toilets, watering plants etc. Installation of motion-sensing water taps will further reduce on water consumption. Water from clean hands can be recycled and used to flush toilets, reducing clean water usage.

Greening: Several studies have investigated the impacts of greening on thermal comfort and energy consumption in buildings in the face of climate change. Greening is understood as green roofs, facades, plants and trees in the outdoor environment. During the seasons with extremely high temperatures, the greening will generate cooling between 0.5 and 20°C and green roofs help reduce energy consumption all year around. Green roofs work as a repository of solar heat.

[14] Byun, J., Hong, I., Lee, B., & Park, S. (2013). Intelligent household LED lighting system considering energy efficiency and user satisfaction. IEEE Transactions on Consumer Electronics, 59(1), 70–76. https://ieeexplore.ieee.org/abstract/document/6490243/

9. MITIGATION MEASURES AND MONITORING PROGRAMMES

9.1. Mitigation of Construction Related Impacts

9.1.1. Air Quality

Controlling dust during construction is useful in minimizing nuisance conditions. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (greenhouse gases, and diesel related particulate matter) that would occur in the exhaust from heavy equipment are also included. The proponent is committed to implementing measures that shall reduce air quality impacts associated with construction.

All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained regarding the minimization of emissions during construction. Specific training will be focused on minimizing dust and exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips and minimize idling of engines.

Dust emissions will be controlled by the following measures:

- Watering all active construction areas as and when necessary to lay dust.
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with physical sweepers) all paved access roads, parking areas and staging areas at construction sites so that debris and mud left on pavement by trucks is removed.

9.1.2. Minimize the Effects of Noise Emitted from the Site

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

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

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

- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Establishment of noise buffer to mask the traffic noise.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Co-ordinate with relevant agencies regarding all substation construction activities in commercial area.
- Install sound barriers for pile driving activity.
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Construction/Demolition works should be done during the day when people are away and also the outside environment is also noisy.
- Adhere to the provisions of Noise Prevention and Control Rules 2009 Legal notice no. 24 regarding noise limits at the workplace.

9.1.3. Minimise the Effects of Exhaust Emission

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

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

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

9.1.4. Hydrology and Water Quality Degradation

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

9.1.5. Worker Accidents and Hazards

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

9.1.6. Increase of disease Vectors

Disease vectors such as rats, flies, and cockroaches increase where refuse is exposed or uncollected and can be a hazard. Complete refuse collection and handling service will be provided by the proponent so that this is not a hazard in compliance with the Public Health Act and as also required in the Occupational Safety and Health Act, 2007 regarding hygiene at the workplace.

9.1.7. Possible Exposure of Workers to Diseases

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

9.1.8. Worker Accidents during Construction and Operation

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

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

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

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

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

9.1.10. Minimization of Run-off and Soil Erosion

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

9.1.11. Minimization of Construction Waste

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

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

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

a) Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time
b) Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements
c) Purchase of consumable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
d) Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
e) Use of construction materials containing recycled content when possible and in accordance with accepted standards.

9.1.12. Reduction of energy consumption

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

9.1.13. Minimization of Water Use

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

9.1.14. Controlling Oil Spills during Construction Phase

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

9.1.15. Public Health, Safety and Awareness

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

9.1.16. Minimization of traffic increase impacts

a) Deliveries should be made to the site outside of the periods of high congestion on the public road system (i.e. early morning, late afternoon off peak hours).
b) Materials haulage companies to use competent drivers and ensure that shift patterns do not result in excessive working hours resulting in compromised road safety
c) All haulage vehicles shall be maintained in good working order and should comply with the requirements of Road Traffic Act.
d) Should the surface materials at site generated by preliminary earthworks and piling be of suitable quality these materials shall be reused and the volume of imported materials diminished.
e) Where feasible and to limit the number of movements of haulage vehicles to and from the storage warehouses, bulk materials will be transported directly to site.

9.2. Mitigation of Impacts during Operation Phase

The project will be developed and operated into a student accommodation facility similar to the currently operating properties in Nairobi City. (Students accommodation located in Parklands, Jogoo Road, Hurlingham and Outer-ring ring road among others upcoming ones). The existing facilities have co-existed with the neighboring communities harmoniously due to the stringent regulations governing student's behaviour and activities within the premises. No noise, parties or alcohol are allowed within the premises and entry is strictly via student's biometrics scan / card access thus no strangers can access the premises. Safety measures including fire protection; smoke detectors in every room, portable fire extinguishers and Fire hose reels, are of the highest standards.

9.2.1. Ensuring Efficient Solid Waste Management

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

An integrated solid waste management system is recommended. First, the proponent will give priority to Reduction at Source of the materials. This option will demand a solid waste management awareness programme in the management and the residents. Recycling, reuse and compositing of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The recyclables will be sold to waste buyers within the project area. The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy. Finally, sanitary land filling will be the last option for the proponent to consider. The proponent will adhere to the Environmental Management and Coordination (Waste Management), Regulations 2006.

9.2.2. Wastewater Management

The proponent will ensure that there are adequate means for handling the large quantities of effluent generated from the facility. It will also be important to ensure that sewage pipes are not blocked or damaged so that the waste can be directed to the sewer line since such omissions can lead to release of the effluent, resulting in land and water contamination. Such blockages or damages will be fixed expeditiously. Waste water shall be disposed in compliance with the provisions of the Environmental Management and Coordination (Water Quality), Regulations 2006.

9.2.3. Ensure Efficient Energy Consumption

The property with be equipped with Solar panels. The energy generated will be used for lighting of common area spaces to reduce the over reliance of grid power. Furthermore, security lights that have to be kept on throughout the night will be powered by solar. Incandescent bulbs will be highly discouraged as they consume more power compared to energy saving bulbs.

9.2.4. Ensure General Safety

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

9.2.5. Ensure Efficient Water Use

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

9.3. Mitigation of Impacts during Decommissioning Phase

9.3.1. Efficient solid waste management

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

9.3.2. Reduction of Dust Concentration

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

9.3.3. Minimization of Noise and Vibration

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

10. ANALYSIS OF PROJECT ALTERNATIVES

10.1. Relocation Option

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

10.2. No Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the landowner and the community as a whole. The landowner will continue to pay rent for the plot while the plot remains idle hence no income to the owner. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors among others:

- It will jeopardize the goal of creating more student residences (accommodation) for the increasing tertiary students' population within and around Eldoret town.
- No employment opportunities will be created for thousands of Kenyans who will work in the proposed project area and the wider Uasin Gishu County at large.

The No Project alternative is the least considered option to the proponent, local people, and the government of Kenya.

10.3. Alternative project scope and scale

The project proponent has the option of reducing the project scope to cater for a smaller population of students by reducing the scale of the development. In the project conceptualization, the proponent considered that university enrolment in Kenya has increased from 27,000 in 1989 to over 489.3 thousand students in public universities in the academic year 2020/21 (statista.com). It is also noteworthy to consider the UN population projections for Africa whereby the UN predicts that the current 400 million urban citizens will exceed 750 million by 2030 and will reach 1.2 billion by 2050. The increasing population will require adequate facilities at learning institutions that are mostly located in cities. It is also plausible to note that while urban population increases the size of land available for development continues to decrease.

To decrease the project scope, the proponent would not have made a futuristic investment that can respond to the current student needs while anticipation the future student population needs too as advocated by Environmentalists under the concept of ―sustainable development.

The Universities Act Cap 210B, Seeks to promote university education for the benefit of the people of Kenya through the establishment and progressive development of public universities. ‖ However, the Government is not expressly obligated to provide residence for students. A student without accommodation cannot concentrate on his studies and one with a safe residence will be keen to ensure that the areas general security is guaranteed. Qwetu and Qejani seeks to fill the lacunae in the Universities (Establishment of Universities) Standardization, Accreditation and Supervision Rules, 1989 which does not list housing and/or accommodation as a resource to be considered by the Commission for University Education (CUE) when reviewing an application for the establishment of a university. The project will support the existing and licensed higher education institutions within the project area.

10.4 The proposed development alternative

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

10.5. Analysis of Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

Beautiful and durable re-enforced concrete roofs because they are good in heat insulation with minimal iron sheet roofs. Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise. However, this construction methods and technologies to be used will require very little timber.

10.6 Analysis of Alternatives

It can be concluded that if the proposed development is not implemented, some low environmental impacts could be avoided, though the development of the area and socio-economic condition will be impeded. Considering rational design decisions and appropriate mitigation measures that will be put in place, the proposed development construction and operation will result in important socio-economic benefits, rather than the no-action alternative, hence, the latter was ignored. Construction of the project is of notable importance for the improvement of the student enrolment and in the economic situation in the local area and country at large.

11. ENVIRONMENTAL MANAGEMENT/MONITORING PLAN

11.1. Introduction

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

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

11.2. Construction Phase Environmental Management Plan

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase the proposed project are outlined in the table 5 below.

Table 7: EMP for Construction Phase

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
1. Curb project associated conflicts and Lost Time Injuries (LTI) e.g. land ownership disputes.				
Project implementation disputes	Sufficient planning for adequate resources required i.e. financial, personnel and equipment	Proponent & Contractor	Project planning phase	In progress
	Land transfer agreements should be formalized before the project start as per the laws of the land	Proponent/Government of Kenya	Project planning phase	Done

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Community support mobilization and sensitization through consultative forums or questionnaire methods	Proponent & EIA Experts	Project planning phase	Ongoing
	Change of use from single dwelling to multiple residential dwelling	Proponent & County government	Project planning phase	Done
2. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High Demand of Raw material	Source building materials from local suppliers who use environmentally friendly processes in their operations	Project Manager & Contractor	Throughout construction period	
	Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered	Project Manager & Contractor	Throughout construction period	10,000
	Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Project Manager & Contractor	Throughout construction period	8,000
	Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills whenever possible.	Project Manager & Contractor	Throughout construction period	0
3. Minimize vegetation disturbance at and or around construction site				
Vegetation disturbance	Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor, Civil engineer & Project Manager	1 month	10,000
	Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage	Civil Engineer, Architect and Project Manager	1 month	5,000
	Designate access routes and parking within the site	Civil Engineer, Architect and Project Manager	1 month	5,000
	Introduction of vegetation (trees, shrubs and grass) on open spaces and their maintenance	Architect & Landscape specialist	Monthly to Annually	10,000

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction	Architect & Landscape specialist	2 months	7,000
4. Reduce storm-water, runoff and soil erosion				
Increased storm water, runoff and soil erosion	A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed	The Civil Engineer, Mechanical Engineer and Project Manager	1 month	15,000
	Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.	The Civil Engineer, Mechanical Engineer and Project Manager	1 months	
	Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site	The Civil Engineer, Mechanical Engineer and Project Manager	Throughout construction period	
	Ensure that any compacted areas are ripped to reduce run-off.	The Civil Engineer, Mechanical Engineer and Project Manager	2 months	
	Open drains all interconnected will be provided on site	Civil Engineer	Throughout construction period	5,000 per unit
5. Minimize solid waste generation and ensure efficient solid waste management during construction				
Increased solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling	Project Manager & Contractor	Throughout construction period	10,000

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed rather than cutting them to size, or having large quantities of residual materials	Project Manager & Contractor	One-off	0
	Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.	Project Manager & Contractor	One-off	0
	Ensure that damaged or waste construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects	Project Manager & Contractor	One-off	0
	Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or homeowners.	Project Manager & Contractor	One-off	0
	Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time	Project Manager & Contractor	Throughout construction period	–
	Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements	Project Manager & Contractor	One-off	20,000
	Purchase of consumable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials.	Project Manager & Contractor	Throughout construction period	0
	Use building materials that have minimal or no packaging to avoid the generation of excessive waste	Project Manager & Contractor	Throughout construction period	0
	Use construction materials containing recycled content when possible and in accordance with accepted standards.	Project Manager & Contractor	Throughout construction period	0

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	0
	Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	10,000/ month
	Waste collection bins to be provided at designated points on the site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	15,000
	Private waste disposal company to be contracted to transport and dispose the solid waste from site	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	
	Running educational campaigns amongst employees, e.g. through use of posters, to encourage reuse or recycling of the solid waste	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	
6. Reduce dust emissions				
Dust emission	Ensure strict enforcement of on-site speed limit regulations	Project Manager & Contractor	Throughout construction period	15,500
	Avoid excavation works in extremely dry weathers	Project Manager & Contractor	Throughout construction period	
	Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles	Project Manager & Contractor	Throughout construction period	

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Personal Protective equipment to be worn always when at workplace	Project Manager	Throughout construction period	
7. Minimization of exhaust emissions				
Exhaust emission	Vehicle idling time shall be minimized	Project Manager & Contractor	Throughout construction period	0
	Alternatively fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained	Project Manager & Contractor	Throughout construction period	0
	Sensitise truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off vehicle engines at these points	Project Manager & Contractor	Throughout construction period	0
8. Minimization of noise and vibration				
Noise and vibration	Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager & Contractor	Throughout construction period	0
	Sensitise construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals	Project Manager & Contractor	Throughout construction period	0
	Ensure that construction machinery are kept in good condition to reduce noise generation	Project Manager & Contractor	Throughout construction period	25,000
	Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels	Project Manager & Contractor	Throughout construction period	10,000
	The noisy construction works will entirely be planned to be during daytime when most of the neighbours will be at work.	Project Manager & all site foremen	Throughout construction period	0

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Comply with the provisions of Noise Prevention and Control Rules 2009, Legal notice no.24 regarding noise limits at the workplace	Project Manager & all site foremen	Throughout construction period	0
9. Minimization of energy consumption				
Increased energy consumption	Ensure electrical equipment, appliances and lights are switched off when not being used	Project Manager & Contractor	Throughout construction period	0
	Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy	Project Manager & Contractor	Throughout construction period	5,000
	Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts	Project Manager & Contractor	Throughout construction period	5,000
	Monitor energy use during construction and set targets for reduction of energy use.	Project Manager & Contractor	Throughout construction period	5,000
10. Minimize water consumption and ensure more efficient and safe water use				
High water demand	Install water conserving taps that turn-off automatically when water is not being used	Project Manager & Contractor	One-off	10-40 % higher
	Promote recycling and reuse of water as much as possible	Project Manager & Contractor	Throughout construction period	2,000
	Install a discharge meter at water outlets to determine and monitor total water usage	Project Manager & Contractor	One-off	2,000
	Promptly detect and repair water pipe and tank leaks	Project Manager & Contractor	Throughout construction period	5000 per month
	Sensitise staff to conserve water by avoiding unnecessary water use	Project Manager & Contractor	Throughout construction period	0

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Ensure taps are not running when not in use	Project Manager & Contractor	Throughout construction period	1,500
11. Minimize release of liquid effluent				
Generation of wastewater	Ensure that liquid effluent generated by construction workers is directed to the sewer line.	Mechanical Engineer & Project Manager	One-off	15,000
	Conduct regular checks for pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies	Mechanical Engineer & Project Manager	Throughout construction period	3,000/ month
	Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated	Mechanical Engineer & Project Manager	Throughout construction period	3,000/ Month
12. Minimize occupational health and safety risks				
Approval of building plans	Ensure that all building plans are approved by the Local Authority and the local Occupational Health and Safety Office	Developer	One-off	Dependent on M^2
Registration of the premises	Registration of the premises under the Occupational Safety and Health Act, 2007 Laws of Kenya is mandatory	Developer	One-off	5,000
General register	A general register should be kept within the facility as stipulated in Sec 122&123 of the Occupational Safety and Health Act, 2007.	Project Manager & Contractor	One-off	500
Posting of abstract of Act, rules and notices	There shall be displayed at prominent places within the site the prescribed abstract of the OSHA and the relevant notices as stipulated in section 121 of the OSHA, 2007.	Project Manager & Contractor	One-off	2,000
Incidents, accidents and dangerous occurrences.	Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	Project Manager, Developer & Contractor	Continuous	5,000/ month

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.	The Contractor, Project Manager& Site Safety Officer	Continuous	11,600
Insurance	Ensure that the premises are insured as per statutory requirements (third party and workman's compensation)	Developer	Annually	Insurers quote
Safety, health and environment (SHE) policy	Develop, document and display prominently an appropriate SHE policy for construction works	Project Manager, Developer & Contractor	One-off	2,300
Health and safety committee	Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer and the workers are represented	Project Manager	One-off	30000
Sanitary conveniences	Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers	Project Manager	One-off	9,000
Medical examination	Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment	Project Manager, Developer & Contractor	Continuous	500 per examinatio n
Machinery/equipment safety	Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded	Project Manager, Developer & Contractor	One-off	_
	Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain	Project Manager, Developer & Contractor	Continuous	_
	All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury	Project Manager	One-off	_
	Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Project Manager	Continuous	5,000 per training

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued	Project Manager	Continuous	5,000 per examinatio n
	Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register	Project Manager	Continuous	3,000 per examinatio n
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse	Project Manager	Continuous	5,000
	Ensure that items are not stored/stacked against weak walls and partitions	Project Manager	Continuous	_
Safe means of access and safe place of employment	All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained	Project Manager & Contractor	Continuous	_
	Securely fence or cover all openings in floors	Project Manager & Contractor	One-off	_
	Provide all staircases within the premises with suitable handrails on both sides	Project Manager & Contractor	One-off	
	Ensure that construction workers are not locked up such that they would not escape in case of an emergency	Project Manager & Contractor	Continuous	_
	All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained	Project Manager & Contractor	One-off	_
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency	Project Manager & Contractor	One-off	4,000
	Such procedures must be tested at regular intervals	Project Manager & Contractor	Every 3 months	4,000
	Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers	Project Manager & Contractor	One-off	6,000

EXPECTED NEGATIVE IMPACTS	RECOMMENDED MITIGATION MEASURES	RESPONSIBLE PARTY	TIME FRAME	COST (KSHS)
	Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site	Project Manager & Contractor	One-off	2,000
	Provide measures to deal with emergencies and accidents including adequate first aid arrangements	Project Manager & Contractor	Continuous	5,000
First Aid Administration	Well stocked first aid box which is easily available and accessible, should be provided within the premises	Project Manager & Contractor	One-off	5,000
	Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Project Manager & Contractor	One-off	5,000
13. Ensure the general safety and security of the site and surrounding areas				
Increased Pressure on Infrastructure	Coordinate with other planning goals and objectives for the region	Architect, Project Manager, Contactor and the Developer	Continuous	18,000
	Upgrade existing infrastructure and services, where feasible.	Architect, Project Manager, Contactor and the Developer	Continuous	
Insecurity	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site.	Security Officer, Project Manager & Police	Continuous	15,000
	Body-search the workers on entry, to avoid getting weapons on site, and leaving site to ensure nothing is stolen.	Security Officer	Continuous	
	Ensure only authorised personnel get to the site	Security personnel	Continuous	
	Security alarms will be installed	Security personnel	Continuous	
14. Environmental monitoring of the project				
Environmental concern during the construction phase	Due to the magnitude of the project the proponent will liaise with the environmental consultants throughout the construction phase and ensure that the conditions of approval are adhered to.	Proponent, Contractor and Consultant	Throughout construction phase	

11.3. EMP for operational phase

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 office project are outlined in the table 5 below.

Table 8: EMP for Operation Phase

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	COST (KSHS)
1 Minimization of solid waste generation and ensuring more efficient solid waste management				
Solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary landfilling.	Proponent/Property Managers	One-off	5,000/Month
	Provide solid waste handling facilities such as waste bins and skips	Proponent/Property Managers	One-off	10,000
	Ensure that solid waste generated is regularly disposed of appropriately at authorised dumping sites	Proponent/Property Managers	Continuous	10,000/month
	Donate redundant but serviceable equipment to charities and institutions	Proponent/Property Managers	Continuous	0
	Comply with the provisions of Environmental Management and Co-ordination (Solid Waste) Regulations 2006	Proponent/Property Managers	Continuous	0
2 Minimise risks of liquid waste release into environment				
Liquid waste release into the environment	Provide adequate and safe means of handling liquid waste at the premises	Proponent/Property Managers	One-off	

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	COST (KSHS)
	Conduct regular inspections for pipe blockages or damages and fix them appropriately	Proponent/Property Managers	Continuous	500 per inspection
	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/Property Managers	Continuous	500/parameter
	Comply with the provisions of Environmental Management and Co-ordination (Water Quality) Regulations 2006	Proponent/Property Managers	Continuous	0
3 Minimize energy consumption				
Energy Use	Switch off electrical equipment, appliances and lights when not in use	Proponent/Property Managers	Continuous	–
	Install occupation sensing lighting at various locations such as the parking areas which are not in use all the time	Proponent/Property Managers	One-off	10-40 % higher than ordinary lighting
	Install energy saving fluorescent tubes at all lighting points within the building instead of bulbs which consume higher electric energy	Proponent/Property Managers	One-off	10-40 % higher than ordinary lighting
	Monitor energy use during the operation of the project and set targets for efficient energy use	Proponent/Property Managers	Continuous	5,000/month
	Sensitise workers on how to use energy efficiently	Proponent/Property Managers	Continuous	500/month
4 Minimize water consumption and ensure more efficient and safe water use				
Water management	Promptly detect and repair water pipe and tank leakages	Proponent/Property Managers	Continuous	5,000/month

Expected Negative impact	Recommended Mitigation Measures	Responsible Party	Time Frame	COST (KSHS)
	Workers/visitors to conserve water e.g. by avoiding unnecessary toilet flushing	Proponent/Property Managers	Continuous	500/month
	Ensure taps are not running when not in use	Proponent/Property Managers	Continuous	500/month
	Install water conserving taps that turn-off automatically when water is not being used	Proponent/Property Managers	One-off	10-40 % higher than ordinary taps
	Install a discharge meter at water outlets to determine and monitor total water usage	Proponent/Property Managers	One-off	5,000
5 Minimization of health and safety impacts				
Implement all necessary measures to ensure health and safety of workers and the general public during operation of the accommodation rooms as stipulated in the Occupational Safety and Health Act,2007		Proponent/Property Managers	Continuous	–
6 Ensure the general safety and security of the premises and surrounding areas				
Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises		Proponent/Property Managers	Continuous	10,000/month
7 Control of informal activities around the project site				
Mushrooming of Informal Settlement		Local Administration; Local Authority	Continuous	0
8 Ensure environmental compliance				
Undertake an environmental audit within 12 months after operation commences as required by law		Consultant	12 months after operation commences	40,000

11.4. Decommissioning Phase

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

Table 9: EMP for Decommissioning Phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (KShs)
1. Demolition waste management				
Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	Once-off	5,000
	All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Project Manager & Contractor	Once-off	20,000
	All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Project Manager & Contractor	Once-off	7,000
	Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Project Manager & Contractor	Once-off	0
	Donate reusable demolition waste to charitable organizations, individuals and institutions	Project Manager & Contractor	Once-off	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (KShs)
2. Rehabilitation of project site				
Site degradation	Implement an appropriate re-vegetation programme to restore the site to its original status	Project Manager & Contractor	Once-off	50,000
	Consider use of indigenous plant species in re-vegetation	Project Manager & Contractor	Once-off	0
	Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent area and the development.	Project Manager & Contractor	Once-off	50,000

12. CONCLUSION AND RECOMMENDATION

12.1. Conclusions

1) The proposed development is in line with Kenya's goal to build safe learning and accommodation facilities for student in higher/ tertiary education.
2) The project goes a long way in promoting students enrolment which currently has been limited by low accommodation units in the subject institutions.
3) Key positive impacts that will result from the project include; students' enrolment in institutions of higher learning, growth of the economy though employment, boosting of the informal sector during the construction phase, provisionof market for supply of building materials, employment generation, increase in government revenue and optimal use of land.
4) Negative environmental impacts that will result from establishment of the proposed project which include pressure on the existing facilities, noise pollution, dust emissions, solid waste generation, increased water demand, increased energy consumption, generation of exhaust emissions, risk of workers accidents, possible exposure of workers to diseases.
5) Negative impacts can be sufficiently mitigated by implementation of the proposed Environment Management Plan
6) The building will be IFC Edge compliant with applications that can support the environmental aspect of the project i.e. low flow taps, low flow shower heads, LED lighting among others.

12.2. Recommendations

1) The proponent should strictly implement the measures outlined in the EMP as well as adhere to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.
2) Maximize positive impacts as much as possible as exhaustively outlined within the report. These measures will go a long way in ensuring the best possible environmental compliance and performance standards.
3) The developer be licensed to implement the project.

REFERENCES

Abdul Hamid, Abdul R., Yusuf, W., & Singh, B., (2003), Hazards at Construction Sites, Proceedings of the 5th Asia-Pacific Structural Engineering and Construction Conference, 26 – 28 August 2003, Malaysia.

Alhajeri, M. (2011). *Health and safety in the construction industry: Challenges and solutions in the UAE*. Unpublished Thesis. Coventry: Coventry University.'

Al-Kasasbeh, M., Abudayyeh, O., Olimat, H., Liu, H., Al Mamlook, R., & Alfoul, B. A. (2021). A Robust Construction Safety Performance Evaluation Framework for Workers' Compensation Insurance: A Proposed Alternative to EMR. *Buildings*, *11*(10), 434. https://doi.org/10.3390/buildings11100434

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

Byun, J., Hong, I., Lee, B., & Park, S. (2013). Intelligent household LED lighting system considering energy efficiency and user satisfaction. IEEE Transactions on Consumer Electronics, 59(1), 70–76. https://ieeexplore.ieee.org/abstract/document/6490243/

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

https://weatherandclimate.com/kenya/uasin-gishu/eldoret

https://en.climate-data.org/africa/kenya/uasin-gishu/eldoret-926351/

https://www.weatherbase.com/weather/chart.php?type=Average+Wind+Speed&units=kilometers+per+hour&location=Eldoret%2C+Kenya&symbol=km%2Fh&data=17,17,17,16,12,9,8,9,12,16,17,17

https://cgspace.cgiar.org/server/api/core/bitstreams/e74c4bab-1de8-4c66-8f89-9477cdf14573/content

https://weatherspark.com/y/98718/Average-Weather-in-Eldoret-Kenya-Year-Round

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

Kenya's grid emission factor according to the United Nations Framework Convention on Climate Change is 0.4999 tCO2/MWh.

Laeeq, M. Y., Ahmad, S. k, & Altamash, K. (2017). Green building: Concepts and awareness. International Research Journal of Engineering and Technology (IRJET), 4(7), 3043–3048. https://www.academia.edu/download/54181236/IRJET-V4I7614.pdf

MacDonald, Jamie P. “Strategic Sustainable Development Using the ISO 14001 Standard.” *Journal of Cleaner Production* 13, no. 6 (2005): 631–43.

Satterthwaite, David, Hannah Reid, and Stephen Bass. *Reducing Poverty and Sustaining the Environment: The Politics of Local Engagement*. Routledge, 2013.

———. “The Environmental (Imapct Assessment and Audit) Regulations, 2003,” 2003. www.nema.go.ke.

———. “The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.,” 2009. www.nema.go.ke.

———. “The Environmental Management and Co-Ordination (Waste Management) Regulations, 2006.,” n.d. www.nema.go.ke.

———. “The Environmental Management and Coordination, (Water Quality) Regulations 2006.,” 2006. www.nema.go.ke.

———. “The Public Health Act Chapter 242.” Kenya law reports, 2012.

Vision, Kenya. “2030: A Globally Competitive and Prosperous Kenya (2007).” *Ministry of Planning and National Development and the National Economic and Social Council (NESC), Government of Kenya, Nairobi (GOK, 2007)*.

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

Washington D.C, (1985), US Congress, office of the Technology Assessment, OTA-H-256. Preventing illness and injuries in the workplace

Weeks J.L. (2011) *Health and safety hazards in the construction industry*, Geneva, ILO

Winnie V. Mitullah (Ed.). *(*2021), *Construction workers in Kenya Straddling with formal and informal social protection,* United States: Taylor & Francis. Lone, et.al.

Yao, G; Sun, W T; Yang, Y (2022), Analysis and Identification of Building Construction Accident Risk in China basing Exclusively Database. IOP Conference Series. Earth and Environmental Science; Bristol Vol. 1101, Issue 7, IOP Publishing