# ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR THE PROPOSED RESIDENTIAL CUM COMMERCIAL DEVELOPMENT ON PLOT NO 3157/I/MN THIRD AVENUE ESTATE NYALI SUB-COUNTY MOMBASA COUNTY.



**GPS CORDINATES**

**-4°.019872"S**
**39°.721725"E**

## PROPONENT:

**THURAYA APARTMENT LIMITED**
**P.O.BOX 98341 - 80100**
**MOMBASA.**

**OCTOBER 2026.**

## DECLARATION

This comprehensive project report has been prepared and compiled by NEMA registered and practicing E.I.A/E.A Lead expert whose name and registration number appear below. It has equally been read and approved by the proponent whose name and other particulars appear below. The lead expert hereby certifies that the assessment criteria, methodology and content reporting conform to the requirements of the Environmental Management and Coordination Act, 1999 (Rev. 2015) and Legal Notice No. 101 of June 2003 (Environmental Impact Assessment and Audit Regulations) (Rev 2016).

**LEAD EXPERTS:**

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**NEMA LEAD EXPERT**

**REG: 0711**

**SIGNATURE:**_____




**NAME: BEN ARNOLD OPAPO**
**NEMA LEAD EXPERT**
**REG: 1014**
**SIGNATURE:** _____

**DECLARATION BY PROJECT PROPONENT:**

I Thuraya Apartment Ltd**,** hereby confirm that this environmental impact assessment project study report has been prepared and submitted to NEMA with my authority as the proponent and that the contents of this report are true to the best of my knowledge.

Signature……

……

DATE……08/10/2026…….

## LIST OF EXPERTS

The following tables present the List of all experts contributing to the development of the ESIA study.

| Name | Qualification |
|---|---|
| **Ojijo Fred** | Lead Expert (0711) – MSc Environmental science(2nd year research ongoing) |
| **Arnold Ben** | LEAD Expert(1014) |
| **Davies Kodi Mwachiro** | PHD in project Management and planning (JKUAT)<br>Masters in project Management and planning (JKUAT)<br>Senior Public Health Officer<br>Associate Expert (1312) |
| **Dan Kibet Kiso** | Registered hydrologist<br>Master of science in tropical hydrology and environmental engineering. |
| **Simon Wanduru Kamau** | Registered geologist. |
| **Irene Mwedi** | Laboratory analyst, Soil baseline |
| **Angela Olal** | Diploma in Environmental science |

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## Non-Technical Summary

This report is based on the proposed 13 double Storey Building Construction at the residence, Mombasa mainland north area in Mombasa County. The project is being developed by the proponent Thuraya Apartments Ltd.

An Environmental Impact Assessment was necessary for the works outlined in this report as they fall under EMCA 1999 (Rev. 2015). The Act provides guidelines on issues of environment, stipulates offences and penalties and establishes NEMA. According to section 58 and 138 of the Act (EMCA) and section 3 of the Environmental (Impact Assessment and Audit) Regulation 2003 (Legal No. 101). In addition to meeting the regulatory requirements, the report would further assist the proponent and important stakeholders to make decisions based on favorable environmental conditions with the main focus on sustainability. The project also adheres to several other rules and regulations in the Mombasa County and has obtained permit from the Ministry of Lands & Housing for the project to proceed.

The area the project is proposed to be undertaken is a heavily built area. The project is based in Nyali sub county Mombasa. The most prominent institution near the project location is City Mall, and Al Capone bar and restaurant.

The site is virgin land filled with lots of shrubs, and grass land. The existing environment therefore focused on the regional climate of Mombasa County and the traffic distribution, and noise pollution in the area. The project area does endure moderate traffic relative to the general traffic conditions in Mombasa County. A visual exterior inspection of the existing structures in the area was also observed. Serious structural defects are expected to be at a minimum, especially considering the standard foundation protection methods. The project location is also favorable with respect to the issue of damages to nearby buildings, as the 3 sides of the building faces away from the adjacent buildings. The condition of the road in the area is good as it is tarmac paved.

The overall environmental impacts of the project have been assessed using frameworks in literature. Since the development is undertaken in a moderately built area, the results

indicate that the proposed project has neutral impact. However, there are some significant impacts on the environment during the construction phase of the project and these needs to be mitigated to avoid any significant damage to the environment. Significance of the impacts and mitigation measures have been provided based on previous similar projects undertaken in the Mombasa island environment and based on literature.

The main cause for concern regarding such projects are the impact it will have on neighbours residing in this area. As such, several short-term impacts are envisaged including air pollution, noise pollution, aesthetic impacts, traffic issues and safety concerns. As there are numerous high storey building projects being undertaken in Nyali Mombasa County, there is no particular long term impact associated specific to this project, albeit an increase in cumulative impacts.

Most impacts that do occur can also be easily mitigated to minimise and/or completely nullify them as most similar projects in Mombasa County. Mitigation measure proposed includes creating awareness among the construction staff and neighbours regarding the scope of the project. Project vehicles and materials not taking up the parking space around the project area is also an important measure. Other measures include taking protective measures to ensure people residing and utilising the vicinity will not have to endure the impacts during the construction stage. Foundation protection measures are recommended and are provided as part of the project to prevent impact on neighbouring structures in addition to a 1m offset from the adjacent building. Care should also be taken to prevent any damage to the road and disruption to traffic during transport of machinery, material and equipment.

Alternatives, including the no project option and alternatives for some project components are also discussed. No project option is not viable at this stage of the project. Regarding construction methodology, a few alternatives are recommended. Regarding the design, there are recommendations to make the development greener. These include interior landscaping to incorporate plants, use of green walls, use of LED lights, rooftop solar panels, etc.

An environmental monitoring program is provided at the end of the report, which provides details on the parameters to monitor on site, and the frequency in which it needs to be done.

Estimated costs for the monitoring works are given. Implementation of the program is essential for the sustainable development of the project.

In conclusion, it is discussed, the impact such major housing projects have for the increasing population density in Mombasa County, and how it can be prevented at a policy level. However, taking this project as a standalone development project in an already heavily built island city, it can be concluded that no significant long-term project specific impacts are predicted, none that the mainland community is not currently enduring. The same conclusion had been derived for all similar building construction projects in Mombasa County. Therefore, it is recommended that the project go ahead as proposed with proposed precautions and mitigation measures as provided under the published guidelines and recommended in this study. Furthermore, it is discussed on the importance of strengthening legislation to ensure sustainability of these types of building projects and to improve the worsening living conditions in Mombasa County

# Introduction

## 1.1. Background

This Environmental Impact Assessment (EIA) report has been prepared in order to meet the requirements of the National Environment Management Act to assess the impacts of the proposed 13 storey building construction in Nyali Mombasa County.

The report will look at the justifications for undertaking the proposed project components and it will identify and determine the significance of the potential impacts of the proposed works. Alternatives to proposed components or activities in terms of location, design and environmental considerations would be suggested along with measures to mitigate any negative impact on the environment. Environmental monitoring programme is vital in order to demonstrate the long-term sustainability of the proposed project as well as to undertake mitigation measures before any impact leads to long-term significant effects. Long term monitoring helps to understand uncertainties in impact analysis improving future impact predictions and project implementation. Therefore, a building monitoring and management plan would be suggested.

The major findings of this report are based on qualitative and quantitative assessments undertaken during site visits on 9th July 2026. Available long-term data were collected from available sources, such as long-term data on meteorology and climate from local and global databases. Long-term data on the project site is lacking. However, to compensate for this, data collected over the years in Mombasa County for similar projects will be used.

## 1.2. Aims and Objectives of the EIA

This report addresses the environmental concerns of the building construction works and also those that will occur during the operational stage of the development. The report attempts to achieve the following objectives.

- Describe the project components to the relevant authorities and to the public
- Allow better project planning and decision-making based on the sustainable development.
- Identify environmental impacts that will occur and gauge their significance for such a project undertaken in the particular location.
- Mitigating impacts caused due to the works outlined in the project

- Promote informed and environmentally sound decision making
- To demonstrate the commitment by the proponent on the importance of environmental protection and preservation.

## 1.3. Methodologies

This EIA has been prepared by Ojijo Fred, a registered EIA Lead consultant with numerous years of experience in Environmental Impact Assessment in Kenya and has been actively involved in numerous coastal protection projects undertaken in the country. The consultant was assisted by Arnold Opapo and the developer's staff throughout the project. Internationally recognized and accepted methods have been used in this environmental evaluation and assessment. This EIA is based mainly on data collected during field investigation missions on September/October 2026. The data collection methods are described in detail under the following Section.

### 1.1 Methods of data collection

Conditions of the existing environment of the study area were analysed by using various surveying techniques and scientific methods. Field surveys were carried out to get a further understanding of the existing conditions at the project location, and were carried out during September/October 2026 to collect baseline data.

The following investigations were carried out on site.

- Existing noise pollution on site
- Traffic flow at the project site
- Socio-economic conditions in the area
- Visual exterior inspection of existing structural defects in nearby structures

### 1.1.1 Noise Pollution

Noise pollution at the project area was measured using a handheld noise measurement device using 'Science Journal' software. Noise measurements were undertaken at the locations shown under Existing Environment section.

### 1.1.2 Traffic flow

Traffic flow was measured by visual observation of traffic within a predetermined area at the project location within a specified period of time using a stop-watch. The number of heavy duty vehicles, cars, motor-cycles, and pedestrians at the area in a 15 minute period were

noted down by visual inspection. The data was extrapolated to a 60 minute period. Previous studies undertaken in the same area were also referred to.

### 1.1.3 Stakeholder consultations

Stakeholder consultations were mainly carried out for other similar recent projects and these have been refered to in this project. All stakeholders were notified again via email for any concerns/issues they may have regarding the project. Emphasis was given to get feedback from the project developer and contractor in addition and Project engineer. Regular communication was undertaken throughout the study with the developer.

### 1.1.4 Built Environment

An overview of the built environment around the project site was undertaken by visual inspection with the aid of photographs. It is advisable to undertake a thorough defects inspection of neighbouring structures by a civil engineer. Once the EIA has been submitted it is expected that the review process will not take more than 30 days. The review process may result in the request for additional information before issuing a decision statement. However, all efforts have been made to ensure that adequate information has been provided with specific attention paid to meet all requirements of the Terms of Reference (TOR). The TOR for this EIA is given below

## 1.2 Literature Review

As there have been several multi-storey building projects undertaken in Mombasa County, recently by various consultants. All building construction projects in Mombasa County are quite similar by nature as has been emphasised in these reports. The main building construction methodologies are similar including methodology for excavation, dewatering, and foundation construction. Afterwards, rest of the buildings are constructed in similar methods using similar if not the same materials.

Likewise, the environment is quite similar as well despite being constructed at different locations in Mombasa County. The main factors with respect to location is when project sites are located near public facilities, especially schools. Furthermore, other differences come into effect when project sites are located among other high rise buildings, where construction is difficult. Going through literature, major issues are when deep piling works are undertaken, which is a rarity in Mombasa County. Other notable impacts include

regarding waste management practices both during construction and operation and regarding safety measures. Rest of the impacts are quite similar among all these building construction works in Mombasa County and likewise mitigation measures are also similar.

### 1.3 The Proponent

The project is being proposed by the landlord, Thuraya Apartments Limited.

### 1.4 The Project Location

The project is based in Nyali area in Mombasa County about 5 meters from City Mall.

### 1.5 Need and Justification

Justification of the project is the same as for the other numerous similar building construction projects being undertaken in Mombasa County.

Mombasa County With a land area of 219.9km2 accommodating a population of 1,28,333 (Census, 2019), land scarcity is felt throughout the already vastly dense concrete island. The more recent studies gives its metropolitan population of about 3,528,940. With such a population concentration, and the need to continue living in the county, the solution had been to develop high-rise building to accommodate increasing number of people. With no land for horizontal development, the result had been to develop vertically.

This current project is also part of this continuing trend of vertical development to mitigate the issue of land scarcity. Upon development, the building would provide residential household units. The site will also provide much needed parking space in the basement.

Since this project is a commercial project, similar to other such developments in Mombasa County, constructing the building in the landlords privately owned land which the developer has attained, the project will be entirely commercial. It is not a government based social housing project, and the units will be used for residential purposes. The proposed project is expected to curb the housing demands within the county.

## 2. Project Description

The building design and attributes are quite similar to other high rise buildings being developed in Mombasa County with a unique architectural design comprising of two buildings adjoined at the base and at the top. The project proposes to develop a 13 storey building in Third Avenue Nyali sub county, Mombasa County. The buildings consists of 2 basement floors a ground floor level and subsequent 2nd -13th floors.

| Floor | Components apartment 1 | Components apartment 2 |
|---|---|---|
| **Basement floor level 1** | Parking lot accommodating 61 vehicles | |
| **Basement floor level 2** | -Parking lot accommodating 45 vehicles<br>-15 additional parking spaces outside the building | |
| **Ground floor** | -Restaurant & kitchen<br>-Juice bar & ice cream parlour<br>-Sitting area & outside dining<br>-Hall way | -Prayer hall with imams room<br>-Pre- entrance<br>-Waiting lounge / reception<br>-Mini mart<br>-Hall way<br>-Store<br>-Wash rooms (gents & ladies) |
| **First floor** | 2 commercial halls<br>lobby | 2 commercial halls<br>Washrooms(gents & ladies) |
| **Second-thirteenth floor** | 4 household units comprising<br>✓ two bedroomed<br>✓ Kitchen<br>✓ Lounge & dining<br>✓ Washrooms 2nos<br>✓ 3 balcony<br>3 household units comprising<br>✓ One bedroom<br>✓ Lounge<br>✓ Kitchen<br>✓ Washroom<br>✓ balcony | 4 household units comprising<br>✓ two bedroomed<br>✓ Kitchen<br>✓ Lounge & dining<br>✓ Washrooms 2nos<br>✓ 3 balcony<br>3 household units comprising<br>✓ One bedroom<br>✓ Lounge<br>✓ Kitchen<br>✓ Washroom<br>✓ balcony |

| | |
|---|---|
| **Rooftop** | ❖ Outdoor lounge<br>❖ Juice bar<br>❖ Padel court<br>❖ Management office<br>❖ General store<br>❖ Gym instructor office<br>❖ Swimming pool<br>❖ Gym<br>❖ Gents and ladies changing room |

## Project Cost

The estimated project cost as per the provided bill of quantities is Ksh 1,008,805,000 (One billion, Eight million, eight hundred and five thousand shillings)

## 2.1 EXCAVATION WORKS

It has been established that the depth of foundation will be 2.30 below the existing ground level. Therefore maximum depth of excavation will be at that depth. As the ground water table above the proposed foundation depth at nearly all tide levels, dewatering will have to be continuous throughout the period of casting the foundation. Excavation will be undertaken with a backhoe excavator. When all the necessary excavation is complete, a 50 mm thick lean concrete (Grade C15) layer will be laid to provide a level surface to assemble the reinforcement of foundation raft slab and beams.

## 2.2 Foundation, Shoring and Foundation Protection

Standard methodology for foundation construction, shoring and foundation protection will be in place for the project. Raft foundation structure will be built after excavation. This is currently the most commonly adopted method of construction in Mombasa. It enables to spread the load from a structure over a large area, minimizing the pressure exerted on the base. Beams will then be incorporated into the structure to stiffen the foundation. Foundation have been designed for a safe bearing capacity of 150 kN/m2. Backfilling will be undertaken using procured sand. Weak pockets found below the assumed foundation level shall be removed and replaced with soil or concrete. Excavation in loose sand requires continuous support, and therefore supports will be placed immediately as excavation commences. Concrete panels would be closely spaced and horizontal support bracings provided as excavation progresses. Supports and bracings will be placed concurrently with excavation, moving along the periphery of the plot successively. The concrete works for the raft foundation will be done using C30 Grade concrete. The contractor will maintain dry working conditions throughout the construction period. No backfilling shall be done against walls retaining earth unless the walls achieve sufficient strength to prevent movement or structural damage. Water proof membrane will be provided on top of the lean concrete. There will be an offset of 1m from the nearest adjacent building in the same block. Blocks are proposed to be placed and a protection wall built at 1m beyond foundation depth around the building structure. Scaffolding GI pipes, 48mm diameter shall be used at 600 mm spacing to prop the MS sheet wall and the wall shall be braced from all directions. A stepped excavation at 600mm centres shall be done to prevent destabilising of the soil from underneath the adjacent existing foundation.

### 2.3 Dewatering

Dewatering is the localized lowering of the ground water table from its natural level, in order to create a dry environment for construction works. This is a critical process for creating the correct working conditions to establish the building substructures. Dewatering will be a continuous process and will be on-going simultaneously while excavation is being undertaken. The process will be continued throughout until casting of the foundation. Contractors own pumps and pipe network will be used to pump out water. The County has informed the contractor that pipe network should be placed by contractor, and that pipe can be placed above ground with a steel casing speed breaker ramp if it crosses the road, which it will in this case. The water will be discharged out to bowsers. Dewatering pipes on the pavement may create a nuisance to the public recently due to the sheer number of the pipes causing obstruction to pedestrians. However, this is the only option offered by authorities currently, and the contractor for the proposed project is required to follow the same methodology.

### 2.4 Construction materials and machinery

The construction materials to be used are detailed in Table 1. All the materials such as cement, Aggregate and Sand will be delivered to site based on consumption. Steel and Plywood will be stored at the contractor's warehouse. Barb bending and carpentry work will be prefabricated at company work yard and transported to site. Concrete batching will not be undertaken at site. Concrete mixers will be used. Generally ready mix concrete made off site will be predominantly used.

### 2.5 Utilities

Water and sewerage facilities will be provided by MOWASCO.Electricity will be provided by Kenya Power mains. Backup generator will not be used at the site. It is anticipated that the project site will require approximately 30 kW of power during the construction phase, while 25 m3 per day of desalinated water is anticipated during the peak periods of construction stage of the development. During the construction, the amount of wastewater generated would be relatively low compared to its generation during the operation phase of the development.

## 2.6 Project Management

The project will be managed by contractor. Different components of the construction works may be subcontracted. All operations, work planning for the on-going construction work will be done at site office; Major operations will be done at company head office. Heavy machinery such as Excavator, Dump Truck, and Crane will be used during excavation and casting.

## 2.7 Waste Management

Sand excavated during foundation work will also be transported to a particular site. Upon completion of foundation works, sand will be brought back from same particular site for back filling. It is estimated that during the construction phase, the project will generate wastes around 2 – 4 tons per day, as is the general case for such construction projects and based on existing EIAs. Waste will be collected on site, transported to the waste collection centre at Mombasa County by contractor and finally disposed at Mwakirunge Dumping site. None of the waste will be placed outside the project boundary at any time. Temporary waste storage will be within the project demarcated area. The area will be cleared on a daily basis. All waste generated during concrete works phase and finishing phase will be collected at the end of each work day and temporarily stored in the ground floor. Construction solid waste will be transported to the contractors yard once a week or on a needs basis. Hazardous waste such as empty oil-cans (lube-oil), paint cans or strainers will be kept separate and disposed according to the standards established by relevant government authority.

For waste generated during operations, waste collection bins will be kept at ground floor garage area. Garbage chutes will be placed and ‘inlets’ will be provided in each floor. On a daily basis waste will be collected and dumped at Mombasa waste yard.

## 2.8 Road closure and traffic re-routing

The proposed building is located near City Mall about 5 m from the mall. Road closing will be based on guidelines set by KURA. In all cases the time will be minimized and for major construction works the Road will be closed at low traffic hours. Road closure will most likely occur during afterhours with bare minimum traffic. Road closures need to be undertaken for 2 major project components: foundation work and casting slabs. Based on existing

literature, maximum no of hours for foundation work will be 14- 15 hours. For each slab casting it will be 8- 10 hours.

### 2.9 Work Schedule

The project is expected to commence soon after the approval of this EIA report and NCA, which should take approximately 2-3 weeks from submission. Initially the architectural and structural design works had been completed and approved before undertaking the EIA. Once the EIA is completed. Dewatering is scheduled to commence next, which will be carried out by the contractor themselves. Upon completion of dewatering, foundation works will begin and soon thereafter structural works will be carried out. Masonry work and interior works will commence afterwards.

### 2.10 Safety on site

General precautionary methods applied for virtually all similar projects in Mombasa County will be implemented. Precautions will be taken for safety of workers during the construction stage. Barricades, warning signs or devices will be placed on the road during casting or road works (connection of water lines and sewer lines) for safety of pedestrians and vehicles. All workers are given instructions about the health and safety at site. The Site Engineers and Supervisors will give a brief on daily basis before the work starts to all workers and all proper health and safety precautions will be implemented on site. Safety signs will be used on site, some of which are shown in the following Figure.

Personal protective equipment will be available for all the workers, for falling objects, hazardous dust or chemicals, or high working areas. Emergency first aid kit will be at site for minor injuries. First aid kit will be provided in the temporary office on the ground floor, after completion of ground and first floor slab where all safety clothing and equipment will be held. All workers and personnel entering the premises will be given hard hats and safety shoes.







Figure above shows Some safety signboards to be used on site

Dust screens will be placed at the full height of the building as work progresses. Screens to stop falling objects and debris are required to be placed from 3 storey to 13 storeys.

### 2.11 Accident and hazard scenarios

Assessment for accident and hazard is given below. Accident and hazard scenarios are similar to most such developments in Mombasa County as the same type of hazardous threats are observed. The following hazard and accident assessment is based on the following 3 stages of the building lifecycle, including construction, use, and maintenance of building. Risk levels & probability are qualitatively assessed based on the following parameters; High, Moderate and Low.

# 3 Description of the Existing Environment

This section covers the existing environmental conditions of the project site. Since this is a residential project, the key components with respect to the project under consideration are described below.

• Climate • Existing structures • Vegetation • Traffic flow • Noise pollution • Water quality • Hazard vulnerability

3.1 Physical Environment

3.1.1 Climate

The County lies within the coastal strip in the hot tropical region where the climate is influenced by monsoon winds.

**Rainfall**

The rainfall pattern is characterized by two distinct long and short seasons corresponding to changes in the monsoon winds. The long rains occur in April – June with an average of 1,040 mm and correspond to the South Eastern Monsoon winds. The short rains start towards the end of October lasting until December and correspond to the comparatively dry North Eastern Monsoons, averaging 240mm. The annual average rainfall for the county is 640mm.

**Temperature**

The annual mean temperature in the county is 27.90C with a minimum of 22.70C and a maximum of 33.10C. The hottest month is February with a maximum average of 33.10C while the lowest temperature is in July with a minimum average of 22.70C. Average humidity at noon is about 65 per cent.

### 3.2.2 Terrain and drainage

The project area is generally flat gently sloping towards the rear side of the plot. This offers ample grounds for construction works. Development of the proposed project in the site will not require extensive leveling works as the slope difference is minimal and unrestrictive to construction works. The area is well drained given storm water drains naturally.

### 3.3.3 Soils

These soils have good load bearing capacities reducing the cost immensely in foundation designs.

### 3.3 Biological Environment

#### 3.3. 1 Flora

The site is currently not developed having lots of grass and few shrubs.

#### 3.3.2 Fauna

The site falls within a middle urbanized area which support existence of fauna.

### 3.4 Socio-Economic Environment and Settlement Patterns

Mombasa county owing to its unique geographic, historic and socio-economic and political situation has a number of strategic advantages and opportunities key among them Tourism, fishing and port operations are the major economic activities due to its extensive white sandy shores along the Indian ocean which occupies 109km2 of the total county surface area the county boasts some of the best white sandy beaches popular resorts and villas along the Kenyan coastline. Deep sea fishing is a lucrative venture due to high demand for fish from the hotel industry. The county has 14 landing beaches and over 5,000 fishermen. Sport fishing has also taken root with fishing clubs established at various spots along the coastline associated with tourist resorts and hotels.

### 3.5 Infrastructure: -

The infrastructural services available on the site are as outlined hereunder:

#### 3.5.1 Road and Accessibilities

The proposed site is highly accessible via a cleared road which is well paved from the main Mombasa Malindi road to the site.

#### 3.5.2 Sewerage and Solid Waste Disposal

The proposed site mainly will use Septic and Soak Pit tank to dispose of the sewage as the area lacks a sewer system. The proponent shall put a waste receptacle for managing solid waste. In each classroom solid waste shall be temporally stored in solid waste bins and emptied to the main waste receptacle on a daily basis. Depending on volume of waste generated, the proponent shall make appropriate arrangements with private garbage collection firms/individuals transport waste from the waste receptacle to a dumpsite designated by Mombasa County Government.

### 3.5.3 Electricity and Telecommunication:

Electricity supply is accessible from KP mains serving the area thus any future demand can be met by Kenya Power as and when needed. All mobile telephone providers can be accessed at the site without any difficulties.

### 3.5.3 Water Supply:

The project area has piped water connection from the Mombasa Water and Sewerage Company. There is old existing borehole that will supplement water supply to proposed development.

### 3.6 Existing structures

The critical infrastructure with regards to projects such as these are the adjacent structures to the proposed site, which may incur some damages especially during the excavation and foundation process. There are high rise building in the direct vicinity of the area.



Figure Neighboring buildings to the proposed structure

The most prominent structure is behind the proposed building. It is a 3 storey structure. From our inspection, it could be observed that there are no major exterior defects in the building. The building is also a similar type structure although it is 3 storeys high instead of 13. There are no visible defects in the exterior. Directly opposite the entrance of the proposed site is an open space which provides access to the site and other high rise development in the area. These are relatively new structures thus fully cladded and therefore it is not possible to observe any exterior cracks along the structures.



*Figure 1: The proposed site*




*Figure 2: Access road*

### 3.7 Vegetation

The site is virgin land with little vegetation as it is predominant with few shrubs and majirity being grass land.

### 3.8 Noise Pollution

Noise pollution can be an environmental and health hazard, and is an important parameter to measure. However, guidelines with regard to noise for residential areas as set by World Bank Environmental Health and Safety guidelines for noise at residential areas are: Daytime reference value for noise as set by the bank is 55 dBA while night time value is set at 45 dBA. For industrial area the noise reference level is set at 70dBA.Average noise around the project site was remarkably low. This would mean the noise that occurs during construction will have a significant effect. Sudden spikes in noise is expected to occur during construction which will go beyond the threshold levels.

### 3.9 Hazard Vulnerability

Mombasa in general does not experience natural disasters and hazards on a frequent basis. However, the Indian Ocean Tsunami in 2004 was a momentous reminder on potential hazardous threats the country faces. However, as stated in the report, sea level rise due to climate change is a uniform hazard throughout the world, and will have high impact on Mombasa as well.The proposed building being located in the central parts of Nyali area will

not be vulnerable to inundation during any standard storms. In an event of a disaster such as a tsunami, where the impact will be felt throughout the island, the project site will be vulnerable and will likely endure flooding.

### 3.10 Socio – economic Environment

The population of Mombasa County 1,208,333. Mombasa County is home to the main sea port activities in the region. Tourism being the biggest industry in Mombasa, as most major beach resort are located in the County. There are a large number of Café and restaurants. Major schools and colleges are also located in the County. However, such educational institutions are not located relatively near the project site. Main mode of transport is by matatu. However, due to varying type of industries located in the county, heavy duty vehicles are also mixed along with the rest of the traffic. Due to lack of a proper land use plan, land use is also significantly mixed, with residential areas, industrial sites, and commercial areas all inter mixed together. However, the large population in such a small land mass had been a persistent issue with no immediate solution. Due to the population density, a large percentage of people live in poor conditions. However, due to ease of accessibility to facilities and economic activities, migration to Mombasa County continues. And with development projects such as these, more vertical housing space is created for more residents. In terms of living conditions in the vicinity of the project site, most of the houses have spacious living conditions as is the general case in Nyali sub- County. The area is predominantly commercial.

## 4.0. Legislative and Regulatory Considerations

The legislative and regulatory consideration the project adheres to is mostly at a national level, since it takes place on a local scale within the coastal environment. The extent to which the project conforms to existing plans, policies, guidelines, regulations and laws of Mombasa county are considered in this Section. Some of the more important regulations are stated within the context of this project scope. The regulatory context in which the project activities take place and the legal and policy aspects relevant to those activities will be discussed in the Section. The Government regulates construction projects through various statutes. The purpose is to ensure that structures meet the expected standards on zoning requirements, safety, health and convenience to the occupants. The laws have comprehensive provisions that cover both the structure and activities undertaken therein. These Accords:

- Orderly development
- Compatibility
- Safety requirements
- Standard service expected

The major regulations governing housing development include:

1) The Environment Management and Coordination Act, 1999.
2) The Public Health Act Cap.242
3) The Physical and Land Use Planning Act NO.13 of 2019
4) The County Government Act (2012)
5) The Building Codes (adoptive by laws) order 1968
6) Environment and Development Policies Sessional Paper No. 6 of 1999.
7) Occupational Safety and Health Act 2007
8) Water Act 2016
9) The National Construction Authority Act NO.41 OF 2011.

### 4.2. The Environment Management and Coordination Act, 1999

Environmental Impacts Assessments are undertaken under the provisions of amended Act, 1999. The act provides guidelines on issues of environment, stipulates offences and penalties and establishes NEMA. According to section 58 and 138 the Act (EMCA) and

section 3 of the environmental (Impact Assessment and Audit) Regular 2003 (Legal No. 101). Construction projects have a bearing on environmental quality including destroying the physical environment and destruction of habitats for biotic organisms. The Act also lists the type of projects, which must be subjected to the EIA process.

In compliance, the proponent appointed experts to conduct this EIA project report to seek approval before implementation of the proposed project. The proponents will have to undertake an environmental audit for the development and prepare a related report for submission to NEMA in the first year of project operation to confirm the efficacy and adequacy of the Environmental Management Plan contained in this EIA project report. Other acts that compliment EMCA 1999 are briefly discussed in the following sections of the report.

## 4.3. Environmental Management and Coordination (Waste Management) Regulations, 2006

Part II, 4 (1) of the Regulations states that no person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated receptacle. Regulation 4 (2) further states that a waste generator shall collect, segregate and dispose such waste in the manner provided for under these regulations. Regulation 5 (1) provides for cleaner production methods.

The act requires the proponent to institute measures that shall minimise the waste generated by its premises by adopting the following cleaner production methods:

a) Improvement of production process through:
   - Conserving raw materials and energy;
   - Eliminating the use of toxic raw materials; and
   - Reducing toxic emissions and wastes.

b) Monitoring the product cycle from beginning to end by:
   - Identifying and eliminating potential negative impacts of the product; and
   - Enabling the recovery and re-use of the product where possible.

Incorporating environmental concerns in the design and disposal of a product

## 4.4. **Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009**

The gazzetted noise and excessive vibrations regulations require that noise and excessive vibrations should be minimized to the largest extent possible and that this should not

exceed particular decibels. The following factors may be considered: -

- Time of the day;
- Proximity to residential areas;
- Whether the noise is recurrent, intermitted or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and
- Whether the noise can be controlled without much effort or expense to the person making the noise.

To minimize the impacts of noise and vibrations from the proposed activities, the activities will be limited to working hours between, 8.00 am and 5.00 pm. All possible care will be

undertaken to ensure that the machinery are properly greased and oiled to reduce friction and possible noise emission. The proponent shall strictly adhere to the provisions and requirements of these Regulations*.*

### 4.5. Public Health Act (Cap. 242)

The Act regulates safety, health and orderly development. The Act devoted a proportional part of section (ix) on sanitation and living. Section 115 prohibits conditions that could subject occupants to nuisance. The urban County Government is mandated under this provision to ensure that all premises are kept clean to prevent occurrences that could create inconveniences to residents. The nuisance as per the act is listed as:

- Vessels that could be injurious.
- Drillings liable to promote infections.
- Emissions from Septic and Soak Pit tank, water closets, dustbins, urinals, cess pools, among others that pose offensive smell.
- Noxious water flowing from premises.
- Accumulation of stones or timber that is likely to harbor rats.
- Overcrowded dwellings that impair light and good ventilation.
- Chimneys sending forth smoke in quantities that pose danger to health.

The components listed here require the developer or project proponent to ensure that the project meets public health requirements. All developers are therefore under obligation to observe public health provisions. Any project falling short of this could be disqualified.The Act promotes safety provisions expected within the building. It empowers the medical officer of health to close any premise considered as a nuisance to the public and which poses danger to public life.

The Act empowers local County Governments to prepare by laws to:

- Control the construction of buildings.
- Control space about dwellings.
- Control the height of buildings.
- Prohibit erection of temporary buildings.
- Ensure adequate provision for fire escape.

It comprehensively covers aspects that ensure safety of construction and operational premises within County Governments.

## 4.6. County Government and Planning Powers

The Mombasa County has the statutory mandate to undertake development planning and control land and building development within its area of jurisdiction. Particular reference is made to the County Government Act (2012) and the Physical and Land use Planning Act No. 13 of 2019).

### 4.6.1. The County Government Act

Section 109 helps counties to ensure effective co-ordination of spatial developments. Subsection (2) part C states in part; a spatial county plan shall;

i. Indicate desired patterns of land use within the county;

ii. Address the spatial construction or reconstruction of the county;

iii. Provide strategic guidance in respect of the location and nature of development within the county;

iv. Set out basic guidelines for a land use management system in the county taking into account any guidelines, regulations or laws as provided for under Article 67(2) (h) of the Constitution;

v. Set out a capital investment framework for the county's development programs;

vi. Contain a strategic assessment of the environmental impact of the spatial development framework;

*The proponent shall strictly adhere to the provisions and requirements of this Act.*

### 4.6.2. Physical and Land Use Planning Act, 2019

The Physical and Land use Planning Act provides for orderly development. The Act sets designation of development in urban areas into zones. Each zone has a specific use. Developments in areas not designated for the same purpose are supposed to undergo change of user.

In part (IV) the Act empowers local authorities to: -

- Prohibit or control the use and development of land and buildings in the interest of proper and orderly development of the area. Under this provision applications that do not conform to zoning regulations can be disqualified.
- To control and prohibit sub-division of land or existing plots into small areas.

- To consider and approve all development applications and grant all development permission.
- Ensure the proper execution and implementation of approved physical development plans.
- To formulate by-laws to regulate zoning in respect of use and density of development.
- To reserve and maintain all land planned for open spaces and urban forests.

The Act provides for orderly development and respect of existing development plans. It essentially guides the developer on what should be constructed, where, the space to be constructed and the type of buildings.

*The proponent has abided by the provisions of this Act; submitting all development proposals to the Mombasa County Government to seek development permission before commencement of the works.*

## 4.7. The Building Codes

The codes complement provisions in the Public Health Act. The building codes provide building standards expected within the buildings. Aspects covered include setting of premises, conveniences, sitting and space in relation to infrastructure. The codes define users of building material, height of wall fences and the type of access provisions to ensure that no plot is rendered land locked. The types of soils and their load bearing capacities have also been defined. The soil type where the project falls is in the medium category that has stable properties and medium load bearing capacities. The codes provide a basis on which building projects could be monitored to achieve the standards set. These codes are the basis on which the contractor to the building shall be measured. The use of concrete, cement and other material must respect provisions given in the building code.

*The proponent shall abide by the provisions of the Code and all approvals will be sought before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions.*

## 4.8. Occupational Safety and Health Act 2007

### 4.8.1. Part II- General Duties of the Occupiers

In Section 6 (1), it is stated that the occupier shall ensure the safety, health and welfare at work of all persons working in his work place.

Without prejudice to the generality of an occupier's duty under sub-Section 1 above, the duties of the occupier includes; -

- The provision and maintenance of plant and systems and procedures of work that are safe and without risk to health;
- Arrangements for ensuring safety and absence of risks to health and connection with use, handling, storage and transport of articles and substances;
- The provision of such information, instruction, training and supervision as is necessary to ensure the safety and health at work of every person employed;
- The maintenance of any workplace under the occupier's control, in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks to health;
- The provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employee's welfare at work;
- Inform all persons employed of: -
    - Any risks from new technologies; and
    - Imminent danger.

## 4.9. Water Act of 2016.

The act provides for the regulation, management and development of water resources, water and sewerage services and other connected purposes. Section 5 states that every water resource is vested in and held by the national government in trust for the people of Kenya. Section 30 mandates National Water Harvesting and Storage Authority to issues permits to any other purpose, to be carried out in or in relation to a water resource, which is prescribed by Regulations made under this Act to be a purpose for which a permit is required. Section 63 states that every person in Kenya has the right to clean and safe water in adequate quantities and to reasonable standards of sanitation as stipulated in Article 43 of the Constitution. On the other hand section 108 makes it an offence for any person to discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee which should be sought by making an application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary.

*The main contractor will be required to implement necessary measures to ensure water conservation and also to prevent potential for water contamination during the construction phase to comply with this the developer will use a channel to direct water to the improved Septic and Soak Pit tank.*

## 4.10. National Construction Authority Act No. 41 of 2011

This act provides for National Construction Authority to oversee the construction industry and coordinate its development, quality assurance in the construction industry, encourage the standardization and improvement of construction techniques and materials, initiate and maintain a construction industry information system and to accredit and certify skilled construction workers and construction site supervisors. The act clearly states that a person shall not carry on the business of a contractor unless the person is registered by the Board under this Act.

## 5.0. Identification of Impacts & Significance

This section is based on the potential environmental impacts due to the project components including:

- Excavation and Dewatering
- Material sourcing, transport and storage
- Construction of the foundation
- Super structure construction and masonry works
- Waste management
- Establishment of utilities
- Building operation
- Building maintenance

The section describes the mitigation measures for each identified impact. Building construction methodology and practices in Mombasa County are quite standard and therefore the impacts of all building construction projects in the same environment are quite similar. There will however be highly localised minor impacts. Likewise, the same applies for the mitigation measures. Methods of identification of potential impacts and assessing the significance of the impacts are described in the following sections.

### 5.1. Identification of Impacts and their Significance

Impacts on the environment from various activities of the proposed project have been identified through:

• Public consultation with important stakeholders. Including during the scoping of the project and formulation of the Terms of Reference for the EIA.

• Using decision frameworks for assigning significance to impacts

• Existing environmental studies carried out in similar developments in other similar environments

• Research data that has been accumulated specific to Nyali area.

• Baseline environmental conditions collected.

• Past experience of the consultant with similar projects.

Possible negative impacts on the environment have been considered in worst-case scenario to recommend mitigation measures in the best possible ways so that these impacts would be minimized and perhaps eliminated in the implementation phase. The impacts highlighted in the TOR for this EIA has been used as a guideline in identifying important impacts. However, this was not used as a strict instruction for the identification. Once new impacts not highlighted in the TOR were foreseen, they were given equal importance. Following are the major types of negative impacts foreseen due to the implementation of building construction projects in Mombasa County

- Loss of visual amenity in the area during construction
- Groundwater degradation
- Mosquito growth
- Noise Pollution
- Air Pollution
- Traffic disruption leading to congestion
- Generation of building and construction waste
- Impact on adjacent structures
- Health and safety of workers and neighbours

## 5.2. Description of Impacts

### 5.2.1. Loss of visual amenity during construction.

There are numerous high-rise buildings in the area, and the demolition works is not expected to have any impact on these.

### 5.2.2. Loss of vegetation and impact on terrestrial habitats

There are no significant vegetation surrounding the project site in the built area, therefore, there is no notable impact on any vegetation. Smaller vegetation in the area can be easily transported to another site.

### 5.2.3. Mosquito growth

Mosquito growth has become a significant issue at all major construction sites, mostly due to negligence. After foundation is laid, and construction takes place at ground floor and beyond, the elevator pit is usually left without any such construction. As a result, water gets accumulated in the area; and if left untouched, provides a favourable environment for

mosquito growth. Additionally during dewatering work; if the process is suspended midway, it provides a favourable medium for mosquito growth. There have also been cases where rainwater has been collected in open buckets by construction staff and left standing. Increase in mosquitoes in the neighbourhood will increase probability of spreading diseases, which is a notable impact if left unattended.

### 5.2.4. Noise Pollution

As stated previously under Description of the Environment, ambient noise pollution in the area is moderate due to relatively moderate traffic, with high peaks as is the case for most of Mombasa County. Construction activities will nevertheless increase the amount of noise, especially during transportation of materials and concrete mixing operations. Also, there will be consistent noise emitted from stationary equipment such as air compressors, cranes, and generators. They generally run continuously at relatively constant power and speed, although sound levels may vary according to the work cycle (e.g., loading). These types of noises are temporary and are relatively intermittent. Due to the high peaks already endured in the neighbourhood and the common occurrence of construction projects throughout the capital, it is not anticipated noise from this particular project will be perceived as an impact on the community.

### 5.2.5. Air Pollution

Air pollution is an issue during excavation when debris maybe seen accumulating in the project area. Impact of debris on human health is significant. Pollutants will include dust from excavation, movement of transportation vehicles, loading and unloading of materials, earthwork and during concrete mixing work. Dusts may also be transported to surrounding areas by wind, affecting residents and workers of surrounding areas. In addition to dusts and debris, harmful gases released by heavy machineries and vehicles and other construction work include carbon monoxide, carbon dioxide, hydrocarbons, and nitrogen oxides. However, this impact is less significant. Other harmful gases can be released from vapors of oils, glues, thinners, paints and wood treatment during construction and interior finishing. These are all atmospheric pollutants and can also cause respiratory problems and other detrimental health issues upon repeated inhalation. The main direct concern is the amount dust that will be produced during construction.

### 5.2.6. Lead based paints

Using lead based paints could have very serious cumulative long term impacts on the residents of the apartment building during operation stage. Children and Pregnant woman are especially vulnerable to the effects of lead. This is important to consider as families will be occupying the building after construction is completed. Prolonged exposure to lead based solvents also leads to high blood pressure, hypertension, and issues with the kidney and reproductive system in healthy adults. Furthermore, the impact on children include mental and growth issues.

### 5.2.7. Traffic Congestion

From the numbers obtained during the observation of traffic, it can be seen that this project will not have a significant impact on Mombasa County traffic, as the area is relatively secluded from heavy traffic areas. There will inevitably be road closures at different times of the project, which would lead to some negative traffic impacts. In addition to road closures, the movement of heavy-duty vehicles such as cranes and excavators would also disrupt the traffic at the project site. From the previous section, it can be seen where potential road closures are going to take place.

### 5.2.8. Generation of building and construction waste

There will be a significant volume of building and construction waste generated from the approximately 0.064ha land area.This would result in a negative input to the environment and can be a nuisance to the neighbourhood. Construction waste such as wood, concrete, metals, bricks, plastic and domestic waste will be generated in addition to excavated waste and municipal waste. This impact will be felt especially during and straight after the demolition stage and is therefore short-tem.

### 5.2.9. Impact on adjacent structures

Mombasa County, being overcrowded as it is, structures are constructed side by side. This project site is no different as there are numerous structures around the area. However, the number of structures nearby is relatively less. There is probability that there will be some impact on these structures especially during the excavation, and foundation construction works. The impact will certainly not be as high as construction with deep piling. There is a perimeter wall seperating the building adjacent to the proposed site, and therefore impact on a third party will be at a minimum. It is recommended to avoid any claims in the future is

to ensure the current status of the facilities. This can be done by carefully and properly investigating the structures before construction commences so that any potential defects can be compared to the pre-existing defects of the respective buildings. Although this is not strictly a mitigation measure, it is a necessary process to identify potential impacts. A visual defects inspection by a Civil Engineer is therefore highly recommended before project commencement. Such an assessment is important in order to establish the conditions of the buildings for structural monitoring purposes, in case if there is any failure as a result of undertaking this project. Avoiding all impact to neighbouring sites may not be possible, and under such circumstances compensation will need to be paid to the relevant landowners. It is recommended that 3rd party insurance will be taken for the project with respect to any damage that may occur from this project. The site offset, foundation protection methods and shoring methods proposed for the project will ensure that the surrounding buildings will not be affected during construction, especially since similar methods have been used on numerous occasions in Mombasa County with success,therefore, with the effective mitigation measures in place, the impact on adjacent structures is expected to be low.

**5.2.10. Health and Safety issues**

Health and safety of workers and neighbours have been discussed to some extent under noise pollution and air pollution. As stated in the preceding sections, the construction site will indeed be a health hazard and care must be taken at all times while at or near the site. Moreover, in addition to impacts arising from noise and air pollution, there is also the significant possibility of direct impact from accidents from the work area. This could occur due to falling objects, misplaced equipment and materials, temporary structures not properly fixed, etc. Awareness of the works on site is the first and foremost mitigation measure that can be taken to reduce any risk of accidents and other minor health impacts. For awareness, the commonly used method is to put up warning signs around the project area. These include ‘Caution: Construction works in progress”. “Warning: No entry beyond this point”. “Wear Safety Hats”, etc. Further to this, it is also recommended to send leaflets to neighbouring houses and shops to inform them of the construction work schedule and warn neighbours to stay away from the site while construction is in progress for their safety. Aside from awareness, second method is to encourage wearing safety clothes and equipment at the construction site at all times. This applies more to construction workers. As such, they should be instructed to wear safety helmets at all times, dust masks during

sensitive work, conspicuous fluorescent clothes, earmuffs, etc. One of the major health and safety issues is with respect to fire hazards. There are numerous ways in which fire hazards may occur. Following fire safety standards will ensure probability of impact is minimal.

### 5.2.11. Cumulative impact due to congestion in Mombasa County

This is a general impact that would occur due to any similar building development work in Mombasa County. Mombasa County is already among the most densely populated island cities in the world. Based on the 2019 census. Currently over one third of the total population lives in Mombasa island. Moreoever, there are large number of expatriates residing in the City. It is a widely held belief that projects of these types contribute to the ever increasing population in Mombasa County. More housing have traditionally resulted in more migration to the county, and the process has continued to grow exponentially. While it is not the intention of the developer to encourage more migration to the city, it is very much an indirect impact from projects such as these. The cumulative impact from all similar projects will be significant. Since there is no policy in place discouraging migration to Mombasa County such as a more decentralised policy and/or development of other regions in Kenya, the process looks to continue for the foreseeable future. However, decentralisation is a key policy for all the major government stakeholders and policy makers and this has resulted in reducing the increase in the population density. From the developer's side, there is no measure that can be taken to mitigate this issue, and is beyond the interests and abilities of the client.

## 5.3. Uncertainties in Impact Prediction

The impact prediction has been carried out based on literature and tested methods. However, the prediction relies heavily on the judgement of the consultant, and would therefore lead to uncertainties. Alternatively, such projects as has been described in this report have been carried out on numerous occasions in Mombasa County. Therefore, observing past literature on a local context, the uncertainty would be reduced. Based on this, the level of uncertainty in the case of the proposed project may be expected to be low as similar projects in similar settings have been carried out. Uncertainties will be further reduced by undertaking the monitoring program and reanalysing impacts, after comparing the monitoring data with the baseline data in this report and previous recent environmental studies done for Mombasa County. The lack of such monitoring reports is one of the main

reasons for persistent uncertainties from similar projects. Likewise, there has not been any significant large scale study on the impacts of continuous building construction in a small area such as Mombasa County. Results from such a study would greatly reduce impacts compared to the impact from the results of project specific EIAs.

## 6.0. Environmental Management and Mitigation Measures

Mitigation measures are proposed where significant impacts are expected. Once an impact is identified to have ‘moderate’ or ‘major’ impact, appropriate mitigation measures are given for the project, if possible. Impacts such as the project contributing to the congestion in Mombasa County will have no mitigation under the scope of this project. Successful implementation of the measures given would lead to a major reduction and/or nullification of the impacts on the environment and thereby ensuring that the project is environmentally sustainable.

### 6.1. Loss of visual amenity during construction

Major impacts from the excavation generally arises due to poor project planning. To avoid loss of visual amenity and also other such minor impacts, it is recommended that the project site be hidden to the public by means of a temporary boundary wall. Dust screens with height more than 5ft should be erected around the project site to limit dust and debris impact. Warning signs should be placed which states that only staff is allowed within the boundary wall. The wall height should not be less than 10ft, and it could be made of wood or roofing materials. The boundary fencing should not expose any of the ground works that are being undertaken at site.

### 6.2. Mosquito growth

As a mitigation measure, some project managers put an oil layer on top to make the area inaccessible for mosquito growth. However, this also leads to groundwater contamination. Open water should not be left exposed overnight under any circumstances. Water that may accumulate at the elevator shaft space should be drained or lidded at all times. Construction site should be fumigated on a weekly basis.

### 6.3. Noise Pollution

Noise protection gears such as ear muffs are to be used by workers on site. Components that require heavy vehicles such as casting of the slabs and columns are scheduled to be

undertaken during morning or at noon as to minimize the impact of noise to the shops, offices, mosques. Works emitting noise at high decibels are not to be undertaken during night time or during the weekends when the public gathers in this area. Furthermore, the boundary wall should be able to contain some amount of noise within the project site.

### 6.4. Air Pollution

For mitigation, dust screens that has been erected during demolition should be in place. If screen is damaged, need to be repaired or replaced before proceeding with works. Regular water spraying and dampening should also be practiced to reduce the spread of dust to surrounding areas. All heavy machineries should be inspected and fine-tuned to make sure the harmful gases released to the atmosphere do not exceed allowed standards. Building materials should be covered or contained during loading, unloading and storage. The boundary wall or fence should also be able to restrict the movement of dusts and debris within the project site. Dust presence outside the project boundary should be regularly monitored. Construction workers should wear dust masks during dust sensitive work.

### 6.5. Lead based paints

Use of lead free paints is recommended. If under any circumstances, lead based paint is used, the tenants should be well informed and the painted surfaced in the housing units should be inspected and maintained regularly. It is recommended not to use lead based paints altogether.

### 6.6. Traffic Congestion

Permission will be obtained from the authorities before works commence in order to arrange road blocks and place relevant signboards and notices for pedestrians and drivers. The relative width of roads leading to site would accommodate movement of large vehicles usually, as vehicles can take the outermost roads and to access the site. Transport of such vehicles should also be undertaken during off peak hours. This would mitigate congestion during peak hours. It is important to ensure the parking spaces nearby is not being utilised by the project team to keep construction material or otherwise.

### 6.7. Generation of building and construction waste

It is recommended to re-use as much construction waste as possible, although this may be difficult to manage. The reusable waste includes wood and blocks. Reusing formwork

material as much as possible is another measure that can be taken to reduce waste. Metals can be recycled, and a recycling group can be contacted to remove such materials. All such recyclable or reusable wastes should be segregated on site. Waste that cannot be reused or recycled (which will be in the majority) are to be taken away from site for disposal. Such waste will be taken straight to the contractors yard in Mombasa County.

### 6.8. Impact on adjacent structures

For mitigation, soft/silent piling can be used for foundation protection as an alternative to the proposed measured. This would be approximately 6m of piles at regular intervals around the land plot for retaining the earth to a depth of 10 metres below the ground level. As added horizontal protection, compacted soil should be placed along the periphery of the construction area, preferably in gunny bags, to minimize stress and risk of overturning. The construction methodology adopted for the proposed project has been decided in order to minimise the impact on the adjacent buildings. Unlike the deep pile foundation, the raft foundation is shallow and does not require deep piling. Furthermore If rainfall does occur, sufficient cover should be provided. This is to avoid rainwater percolating into the soil beneath the foundations of adjacent buildings. If it does occur, measures should be taken to reduce the amount of water to the site, as the water particles may loosen the soil reducing its shear strength. Third party insurance is recommended to have be in place to compensate any possible defect to neighbouring structures. Furthermore, it is recommended to inform all neighbouring structures within a 30m radius of the project work schedule and especially when excavation, dewatering and foundation works are about to commence.

### 6.9. Health and Safety measures

Awareness of the works on site is the first and foremost mitigation measure that can be taken to reduce any risk of accidents and other minor health impacts. For awareness, the commonly used method is to put up warning signs around the project area. These include:

‘Caution: Construction works in progress”.

“Warning: No entry beyond this point”.

“Wear Safety Hats”, etc.

Further to this, it is also recommended to send leaflets to neighbouring houses and shops to inform them of the construction work schedule and warn neighbours to stay away from the site while construction is in progress for their safety. Aside from awareness, second method is to ensure all construction staff is wearing safety cloths and equipment at the construction site at all times. As such, they should be instructed to wear safety helmets at all times, dust masks during sensitive work, conspicuous fluorescent cloths/vests, earmuffs, etc. General fire safety measures will be incorporated in the project. These include placing fire extinguishers as per the requirements. Furthermore, fire evacuation processes need to be made aware for the construction staff as well as future tenants.

## 6.10. Waste Management

Waste management is the main issue during the operational stage of the project. A large number of wastes will be generated from over 20 apartments in a concentrated area. Currently the proponent has proposed a waste transfer system for all wastes including recyclables and non-recyclables. Waste will be collected in ground floor and arrangements will be made with a registered waste picker to collect waste and transport to Mwakirunge. During the construction phase Big columns should be broken down, the transfer vehicles should not be over loaded, and it has to be ensured at all times that waste does not spill on to the roads during transfer. It is recommended to transfer the waste daily and not stockpile waste at site for a prolonged period. In addition to the general waste management method, it is recommended to separate recyclables from non-recyclables. This will reduce the total no. of waste produced and the system will be easier to manage ensuring sustainability. Furthermore, it is recommended for the developer to put in place a system for hazardous wastes and large waste collection. It is recommended to collect such large wastes on a quarterly basis. Generally it is recommended to hire a building maintenance firm to manage waste and undertake other small maintenance works in the building.

# 7.0. Environmental Management Plan

## 7.1. General

This section outlines a vital EMP output which constitutes the final output of the environmental impact assessment exercise. The EMP extended herein outlines 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. Noteworthy is the fact that considerable provisions have been made for dynamism and flexibility of the EMP thus the EMP outlined herein will be subject to a regular regime of periodic review

## 7.2. Construction phase EMP

This table outlines the necessary objectives, mitigations measures, allocation of responsibilities and cost pertaining to prevention, minimization and monitoring all potential impacts associated with the construction phase of the project.

| **Environmental/social impact** | **Proposed mitigation measures** | **Responsibility** | **Monitoring** | **Approx. Cost (Ksh)** |
|---|---|---|---|---|
| Air Pollution | ➢ Control speed and operation of construction vehicles<br>➢ Prohibit idling of vehicles<br>➢ Spray water on excavated areas<br>➢ Maintenance of construction plant and equipment<br>➢ Sensitize construction workers | Contractor | Amount of dust produced | 150,000 |
| Noise Pollution | ➢ Maintain plant equipment<br>➢ Construction should be carried only during day time (8.00am to 5.00pm)<br>➢ Management to ensure that noise from the development is kept at reasonable levels | Contractor | Amount of noise | 150, 000 |
| Traffic Density | ➢ Proper signage put in place to notify neighbor of activity and presence of heavy vehicles and to direct traffic<br>➢ Strict adherence to traffic rules<br>➢ Presence of boards directing patrons to the site | Contractor<br><br>Management | Clear well-maintained sign boards along roads. | 50,000 |

| Environmental/social impact | Proposed mitigation measures | Responsibility | Monitoring | Approx. Cost (Ksh) |
|---|---|---|---|---|
| Soil Erosion and compaction | ➢ Provide soil conservation structures on the areas prone to soil erosion reduce impact of erosion<br>➢ All bare areas should be well landscaped after completion<br>➢ There should be designated path ways and drive ways for movement within the compound to avoid unnecessary compaction | Contractor | Paved area and landscaped areas | 100,000 |
| First Aid | A well-stocked first aid kit shall be maintained by qualified personnel. | Contractor | Contents of first Aid kit | 40,000 |
| Solid waste | ➢ Excavation wasted should be re-used or backfilled<br>➢ Construction debris should be collected by a licensed private waste collection company<br>➢ Waste generated should be collected by a privately contracted waste collection company.<br>➢ The site should have waste receptacle with bulk storage facility at convenient points to prevent littering during occupation | Contractor<br>Management | ➢ Amount of waste on site.<br>➢ Presence of well-maintained receptacle and central collection point | 100,000 |
| Security | ➢ Control of secondary business<br>➢ Round the clock security for the facility<br>➢ Adequate lighting on strategic points | Contractor<br>management | Level of crime in the area | 100,000 |

### 7.2.1. Operational phase EMP

| Environmental/social impact | Proposed mitigation measures | Responsibility | Monitoring<br>Plan /indicator | Approx. Cost (Ksh) |
|---|---|---|---|---|
| Solid waste | ➢ Waste generated should be collected by a privately contracted waste collection company.<br>➢ The site should have waste receptacle with bulk storage facility at convenient points to prevent littering during occupation | Management | ✓ Amount of waste on site.<br>✓ Presence of well-maintained receptacle and central collection point | 100,000 |
| Soil erosion & compaction | ➢ Provide soil conservation structures on the areas prone to soil erosion reduce impact of erosion<br>➢ All bare areas should be well landscaped after completion<br>➢ There should be designated path ways and drive ways for movement within the compound to avoid unnecessary compaction | Contractor | ✓ Paved area and landscaped areas | 100,000 |
| Waste water Disposal | ➢ Waste water should empty to Septic and Soak Pit tank<br>➢ Conduct inspection for sewer pipe blockages or damages and fix them | Contractor/<br>Management | Effluent presence on open pipes | 150,000 |
| First Aid | ➢ A well-stocked first aid kit shall be maintained by qualified personnel. | Contractor | Contents of first Aid kit | 40,000 |
| Security | ➢ Control of secondary business<br>➢ Round the clock security for the facility<br>➢ Adequate lighting on strategic points | Contractor<br>management | Level of crime in the area | 50,000 |
| Fire preparedness | ➢ Firefighting drills carried out regularly<br>➢ Firefighting emergency response plan<br>➢ Ensure all firefighting equipment is regularly maintained, serviced and inspected<br>➢ Fire hazards signs and directions to emergency exit, route to follow and assembly point in case of any fire incidence | Management | Proof of inspection<br>Firefighting equipment<br>Fire signs put up in strategic places | 50,000 |

| Environmental/social impact | Proposed mitigation measures | Responsibility | Monitoring<br>Plan /indicator | Approx. Cost (Ksh) |
|---|---|---|---|---|
| | | | Availability of firefighting equipment | |
| Water consumption | ➢ Avoid unnecessary toilet flushing<br>➢ Promptly detect leaking pipes and repair them<br>➢ Turn off taps when not in use<br>➢ Install water conserving taps that turn off immediately when water is not in use<br>➢ Install a discharge water meter in the premises to check on total water usage | Management<br><br>Contractor | Presence of water meter<br>Presence of automatic water taps | 50,000 |
| Energy Usage | ➢ Erect a meter in the premises to check on total kilo watts used and for billing<br>➢ Apply for connection from Kenya power<br>➢ Switch off lights that are not in use<br>➢ Use of energy conserving bulbs/tubes<br>➢ Use of natural lights for lighting purposes<br>➢ Use of natural ventilations from windows and doors and avoid using air conditioner that use electricity | Management<br><br>Contractor | Presence of PLC meter Electricity bills | 50,000 |
| Washrooms | ➢ Provide sufficient and suitable sanitary conveniences<br>➢ Washrooms should be kept clean and in good working condition<br>➢ Provide water tank for the washrooms | Management | Separate washrooms (Gents & Ladies) | 30,000 |

### 7.2.2. Decommissioning Phase

This table outlines some basic mitigation measures that will be required to be undertaken once all operational activities of the project have stopped. The necessary objectives, mitigations measures, allocation of responsibilities and cost pertaining to prevention, minimization and monitoring all potential impacts associated with the decommissioning and closure phase of the project.

| Environmental/social impact | Proposed mitigation measures | Responsibility | Monitoring<br>Plan /indicator | Approx. Cost (Ksh) |
|---|---|---|---|---|
| Noise & Air pollution | Enough space must be provided within the premise to allow for adequate natural ventilation through circulations of fresh air<br>Demolition works to be carried out only during daytime<br>Workers to be provided with adequate personal protective equipment like dust masks, ear muffs<br>Spraying dusty areas with water<br>install dust trappers around the site | | | 50,000 |
| Solid waste | ➢ Waste generated should be collected by a privately contracted waste collection company.<br>➢ Excavation waste should be collected reused or backfilled<br>➢ Debris should be collected by NEMA licensed waste collection company. | Management<br>Contractor | Amount of waste on site | 50,0000 |
| Occupation healthy and safety | ➢ Provide personal protective equipment<br>➢ Train workers on personal safety and how to handle equipment and machines<br>➢ A well-stocked first aid kit shall be maintained by qualified personnel<br>➢ Demarcate area under demolition with Danger tapes to control access. | Contractor | Workers on site using protective equipment<br>Presence of a First Aid kit Box | 50,000 |

## 8.0. Alternatives

This section looks at different alternatives for the proposed project. The entire section is quite similar to all similar project EIAs as alternatives are quite limited in these typically designed buildings. The main alternative is the no project option. After discussion of this alternative, then options for the project components are investigated. Alternatives are given for each component based on location and design. Each alternative is discussed based on economic, social, and environmental factors. Finally, the recommended alternatives are suggested to assist in the project decision-making process. These alternatives are not as intensively investigated as the original scope of the project. However, investigating and discussing alternatives is important so that it is ensured that the best available option(s) is/are chosen.

### 8.1. No project option

No project option analysis is quite similar to all similar projects being undertaken in Mombasa County as there is no particular major difference between the project designs and/or environment. Initially the no project option is discussed in order to hypothesise whether the project should be taking place first of all. Carrying out this exercise is important to ensure that undertaking this project at this stage makes good socio-economic sense without any significant impact on the environment.The advantages and disadvantages of not undertaking each project component is given below. The points noted are similar to all similar developments that are currently being undertaken in the same environment.

Table : Advantages and Disadvantages of the no project option

| Advantages | Disadvantages |
|---|---|
| 1. Will not contribute to any groundwater degradation | Will be a missed opportunity for the developers to develop their land and increase the value of their land |
| Will not lead to health and safety concerns at project site | Will not be able to alleviate the issue of people living in small crowded places in |

| | |
|---|---|
| | Mombasa County |
| Will not contribute to structural issues of neighboring buildings. | Will decrease economic opportunities for construction companies and their employees |
| Will not cause any noise and air pollution at project location | |
| Will not cause any traffic disruptions (traffic disruption will be minimal and very short term) | |
| Will not have any contribution to the increasing population in Mombasa County | |

A comparison of the no project option with the project going ahead as proposed, indicate that the no-project option is practicable, and environmentally favourable but involves losses to the developers. The other major disadvantage of the no project option is that in such a case, there won't be further housing options for people living in crowded areas in Mombasa County, which the project will provide. However, on the other side, it may also discourage more people migrating to Mombasa County. However, this is a very indirect effect, and the significance of which from this project alone is quite negligible. There are a few advantages of the no project option from an environmental perspective. However, local environmental impact from this project is small in nature, and the advantages stated is not significant, since most of the environmental impacts can be properly mitigated. Alternatives for components of the project are discussed further.

## 8.2. Project Alternatives

Alternative options; mainly based on design and methodology for the construction are given below.

### 8.2.1. Project Location

Alternative locations analysis is not practical for this project, as the location cannot be changed under any circumstances. The government could provide the developers with an alternative land of similar size from a similarly lucrative location in Nyali. As things stand, proceeding with the construction in this exact location will be the most favourable for the developers.

## 8.3. Project components

Several component of the project design can be changed, taking the community more into consideration, such as changes to space use, alternatives to specific components and materials. These are alternatives that were discussed in the previous similar projects as well. The only way these can be enforced is if it is required as part of the Building Code or as part of the drawing set approval requirements. As this will all incur greater capital costs to developer, they are mostly forgone. However, on the long term, they will have beneficial reduction of the recurrent operational costs in addition to being environment friendly. Provide a larger parking space within the building, as Mombasa County is in general very congested with plenty of vehicles parked illegally due to virtually non-existent parking spaces available. Providing such a space in the building will be an important service to the community, and assisting to alleviate the crowding issue. Such a parking should cater for the residents of the building in addition to providing parking space for guests. Design for a rooftop garden area, instead of an empty terrace, which will contribute to making the city greener, while continuing with the infrastructure development in the given area. This can be extended further to incorporate green walls. This will help significantly to cool down and insulate the building which will reduce the electricity generation for building cooling. Ensure all electrical appliances and equipment is energy efficient. This including lighting in the building is energy efficient LED lights. Air condition and refrigerators to be invertors. Reflective point on the exterior to reduce energy consumption to cool down premises inside the building. These project designs are given as suggestions, the feasibility of which the developer should take into consideration before implementation. Considering the high land value, developers in general will not ‘sacrifice’ any piece of land that could

potentially be leased. Therefore, incentives to incorporate such recommendations are very limited, and requires government interventions to ensure the good of the community. It is recommended for such suggestions to be incorporated into similar developments at a planning level with government intervention.

### 8.3.1. Foundation

Main alternative to the proposed foundation type is deep pile foundation. It will provide more stability to the 13 storey structure in the long term, especially considering the narrow width of the building. However, considering the land area and size, piling is not absolutely necessary as the engineer has designed for a raft foundation. Moreover, even though piling would improve stability of the proposed structure, piling may cause damage to neighbouring old structures due to vibrations. If under any circumstances, piling is incorporated into the project, the developer should have a system in place to compensate neighbours for any damage as detailed under the Mitigation section. Permanent piling would also be regarded as a major deviation of the construction methodology and will require an EIA addendum to take place in addition to this study.

## 8.4. Stakeholder Consultations

Stakeholder consultations were carried out with the developer, engineer and contractor. General random consultations were carried out with public in the neighbouring area in addition to the landlord of the adjacent property. EIA for

The most significant sentiments from the walking public around the area regarded noise and traffic issues during construction. As the road is always busy with lots of vehicles consistently moving back and forth, they can envisage disruption to traffic flow during the construction times. They had notified that they do not want construction materials and waste to be placed on the roads.

## 9.0. Environmental Monitoring

This section deals with the Environmental Management and Monitoring plan for the proposed construction project with respect to the developments proposed in this EIA. The proposed monitoring plan is for the construction and operation phase of the project. The data collected for this assessment will be used as baseline data while undertaking the monitoring plan. Undertaking environmental monitoring is essential for several reasons including:

- To ensure that potential impacts are minimized and to mitigate unanticipated impacts.
- To aid in impact management,
- To improve impact prediction and mitigation methods.
- To gather long term data to minimise uncertainty for this project as well as other similar projects.
- To ensure sustainable development

Environmental monitoring has traditionally been a component that has been overlooked by most proponents. However, it is vitally important for an environmentally sustainable project as well as to better understand impacts and reduce uncertainty in impact prediction. The proposed monitoring programme will yield beneficial results if it is undertaken for a long period. As required in the TOR, the monitoring is to take place during the construction phase once every 3 months until construction is completed, and then on an annual basis for 5 years during operations. The operational stage monitoring can be undertaken at a broader level by the regulatory authority which includes all such developments. The monitoring can perhaps be more effective then. However, the monitoring program given in this report is based on this project alone. The proponent expressed their full commitment to carry out the monitoring program outlined in this report. The proponent's

commitment to undertake the environmental monitoring and mitigation measures is given in the Annex.

## 9.1. Monitoring Methodology

The methodology used for monitoring will be similar if not the same as those used in this environmental assessment. The costs given in following tables are calculated for monitoring to be undertaken by hiring environmental consultants for each monitoring program. However, field data collected for the proposed environmental monitoring program can be carried out by an in house team of engineers and/or technical assistants since most of the parameters are to be investigated monthly and quarterly, and therefore hiring a consultant for each occasion may not be feasible. Nevertheless, if the contractor does not employ environmental experts among its staff, it is highly recommended that an arrangement is made with an environmental consultant on a long term basis to carry out and supervise the execution of the monitoring program. Additionally, it is a NEMA requirement that the annual environmental monitoring report needs to be compiled and formulated by a registered environmental consultant with a permanent EIA consultant license.

The parameters that are most relevant for monitoring the impacts that may arise from the project are included in the monitoring plan. Therefore, the monitoring programme will cover the following aspects of the project:

- Ground water quality
- Defects in neighbouring structures
- Generation of wastes
- Noise pollution
- Traffic congestion

## 9.2. Recommended Monitoring Programme

As instructed in the TOR, the monitoring programme will be divided into 2 stages.

Stage 1 - Once every 3 months until construction completes

Stage 2 - Once each year for 5 years

**Stage 1**

Ground water quality for pH, temperature, EC, salinity, Feacal coliform at project site

Determine number, type and respective quantity of waste produced

Noise measurement at the same location as undertaken for this EIA

Survey the traffic within the same area as undertaken for this EIA

Quantify number of accidents that had occurred at site with cause.

Visual inspection of structure exterior of nearby buildings.

**Stage 2**

a) Ground water quality for pH, temperature, EC, salinity, Faecal coliform at project site
b) Determine number, type and respective quantity of waste produced.
c) Noise measurement
d) Determine quantity of accidents and/or safety related incidents with cause.
e) Survey the traffic within the same area as undertaken for this EIA

This data would be collected from secondary sources, i.e. the building management and maintenance group.

## 9.3. Monitoring Report

Monitoring report should be compiled based on the baseline data collected. This report should be submitted to NEMA and any other relevant government agencies for compliance, if requested. The report structure may include but not limited to;- Introduction, Details of the site at the time of investigation, Data collection and analysis, Details of methodologies and protocols followed, Quality control measures, Sampling frequency and monitoring analysis, Conclusion and recommendations

## 10.0. Conclusion

The conclusion is the same as for other similar projects. There are numerous similar developments being undertaken throughout Mombasa County and this project is not an exception. Due to the location in which the project site is located, it is easier to proceed with the project with less impacts. As noted in the literature review, the components of the project, the existing environment, the subsequent impacts are generally quite similar. With the continued problem of land scarcity faced in Mombasa County, projects of this nature is inevitable. More high-rise buildings continue to be developed as more and more developers focus on vertical development. This land scarcity issue had also exponentially increased the cost of land in Mombasa County, and therefore it is very financially attractive for developers to invest huge sums to construct such large structures. Approval for the construction is obtained without any significant issues if the land area is favourable for development, as is the case for the proposed development. From a regional environmental perspective, Mombasa County is in quite a poor state. From a land use perspective, more parks, more pedestrian areas and empty spaces are what is required to make the city more liveable and less crowded. However, specific developments such as these cannot be stopped or altered on this basis. Such restrictions would need to come at a policy level. Looking at the norms and trend of development in Mombasa County, it can be argued that this project alone will contribute little to an already bad situation. From this projects perspective alone, the environmental impacts from the project is minor to moderate and can be easily mitigated as has been the case for all similar projects in more or less the same environment. Apart from an indirect contribution to congestion at ground level, the only other concern is the impact on neighbouring buildings due to the construction of this new building. However, the probability of any significant impact occurring is low, while this can be mitigated by providing adequate foundation protection and other such measures as provided in this report and as already planned to be undertaken as part of the project. The socio economic benefits to the developer and also to the area are reasonably high. The project also provides additional learning opportunities, which would contribute to alleviating the deteriorating moral issues in Mombasa County. Therefore, after consideration of all these perspectives and the fact that numerous such developments are continuously being undertaken, it is recommended that this project proceed as planned. As had been stated for all similar studies, it is also recommended that regulations for such developments in Mombasa County come at a policy level in the near future, to decrease the

worsening congestion issue in the County. Moreover, the regulations previously Referred should be in place soon. It is recommended for the project to proceed as planned after incorporating the mitigation measures given in this study with the commitment to implementing the monitoring plan given.

## 11.0. References

Republic of Kenya, (1968) The Building Code.

Republic of Kenya, (2012) The County Government Act 2012**.**

Republic of Kenya, (1972) The Public Health Act, CAP 242.

Republic of Kenya, (1996) The Physical Planning Act No 13 of 2019.

Republic of Kenya, (1999) The Environmental Management and Coordination Act 1999.

Republic of Kenya, (2003) Legal Notice No. 101. The Environmental (Impact Assessment and Audit) Regulations, 2003.

Republic of Kenya, (2016) The water act, 2106

## Annex 1 – Terms of Reference

The following is the Terms of Reference (ToR) issued for undertaking the EIA of the Proposed 13 Storey Building in Third Avenue Nyali Mombasa County. The proponent of the project is Thuraya Apartments Limited. The EIA consultant of this project is Mr. Moses Kololo. While every attempt has been made to ensure that this TOR addresses all of the major issues associated with development proposal, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them, or matters currently unforeseen, that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIA report.