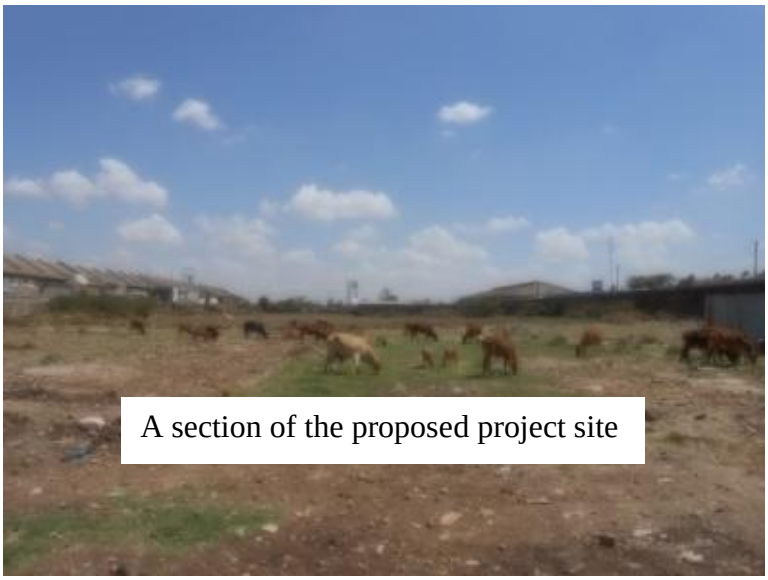
ENVIRONMENTAL IMPACT ASSESSMENT

STUDY REPORT

FOR

THE PROPOSED RESIDENTIAL CUM COMMERCIAL DEVELOPMENT ON L.R. NOS. DAGORETTI/RIRUTA/1230 – 1239 & 4813 OFF NGONG ROAD – NGANDO AREA,

NAIROBI COUNTY.



A section of the proposed project site

Proponent:

Eris Property Developers Ltd
P.O. Box 63612 - 00100
Nairobi.

The Environmental Impact Assessment (EIA) Study Report was conducted and report compiled by a team led by:

Name	**Designation**	**Reg. No.**	**Sign**
Wilfred M. Murigi	Lead Expert	0497	_____

Experts' Contacts: ***P.O.BOX 10067 – 00400, NAIROBI***
Tel: 0723 522 722

Signed: _____ **Date:** _____

For: **ERIS PROPERTY DEVELOPERS LTD (PROPONENT),**

Proponent's PIN No.**: P051614596S**

Disclaimer :
The EIA Study report is for the proposed the project envisaging construction of residential apartments/studios, a commercial block and a nursery school block and other associated facilities on L.R. Nos. Dagoretti/Riruta/1230 1239 & 4813 (to be amalgamated).

Copies of documents, details and information in the report are what were obtained from the proponent. Portions of this report are based on documents, data and verbal information provided by third party sources and reports prepared by others. The experts may not have independently verified all the information and accept no responsibility for the accuracy of information contained in such reports. Whilst this report and the opinions contained herein are accurate to the best of the experts' knowledge and belief, the experts cannot guarantee the completeness or accuracy of any description based on the supplied information.

Table of Contents

Table 1: Acronyms and Abbreviations Used in This Report

HA	Hectare
KM	Kilometre
WCC	Waste Collection Centre
°C	Degree Celsius
CGN	County Government of Nairobi City
COX	carbon oxides
EIA	Environmental Impact Assessment
EMCA	Environmental management coordination act
EMP	Environmental Management Plan
ERPS	Emergence Response plans
NEMA	National Environmental Management Authority
NOX	Nitrogen Oxides
PPE	Personal Protective Equipment
PV	Permanent vent
SOX	Sulphur Oxides
DSQ	Domestic servant quarter

Attachments:

Sketch map showing location of the proposed site
Copies of the proposed plans
Copies of Title deeds
Questionnaires filled during the consultation and public participation meeting

EXECUTIVE SUMMARY

Every activity or project is bound to have effects or impacts to one or many aspects of the environment. These impacts may be positive or negative, reversible or irreversible, short term or long term, significant or insignificant. The key objective of EIA is to mitigate conflicts with the environment at the vicinity during implementation and operation phases. Environmental management refer to the management of mans activities that depend upon the resources of the environment and which have an effect upon the state of the environment. Environmental management and development problems require an intergrated approach, as they are so intergrated with social, demographic, economic and political elements Housing is a basic human need but unfortunately there has always been a shortfall of the same which manifests in the proliferation of shanties all over the main urban centers. EIA process is an important tool of environmental management for sustainability but it is only successful with monitoring for flexibility to cater for any changes. **Eris Property Developers Ltd** hereinafter referred to as the proponent, propose to develop residential units whose summary details are given here below and full details in the report.

The proposed project site is situated off Ngong Road in Ngando location, Nairobi county and measures approximately 1.434 hectares (3.5434 acres) in total. The proposed site was vacant as at the time of the study.

The project mainly involve a multiple development of 7No. detached blocks of residential apartments, a commercial block and a club house. Each of the seven blocks of apartments shall each have the ground and typical 1st – 9th floors. The proposed project shall be implemented in three phases and shall inject a total of 345 residential units comprising of 63No. one-bedroom apartments, 63No. three-bedroom apartments, 195No. two-bedroom apartments and 24No. studios. The club house will be a simple structure mainly with gazebos. For shopping purposes and convenience, a commercial centre cum residential block is provided which shall have ground, 1st, 2nd, 3rd & 4th floor. The ground and 1st floors shall be similar each accommodating open commercial space suitable for a mini mart or supermarket and washrooms while the 2nd – 4th floors shall also be typical each accommodating 4No. studios and 1No. two-bedroom apartment. The proposed project shall also entail construction of parking, construction of surface drainage systems for management and disposal of surface runoff and also upgrading the internal access roads; power and water supply infrastructure. Since the proposed project is new, the proposed works shall include construction, electro-mechanical and civil works.

Adequate parking is provided for on the ground floor. Each of the apartments shall comprise of one, two or three bedrooms, lounge, kitchen, sanitary facilities and internal access/lobby while the studios shall have a one room plus cooking area and toilet.

The proposed project shall have a single access gate and shall be enclosed in a perimeter stone fence. There shall be protected dustbin cubicles. Other features include storm water drains and a guard house and landscaped gardens. The proposed project has also provided for cold water storage tanks.

The proposed designs/plans have been done by *Adventis Inhouse Africa* and have been submitted to the County Government of Nairobi seeking approval. (Please refer to the copies of attached plans/drawings in the annex for the finer details). The proposed site is within an area with mixed development. In general, the area is characterised by maisonettes, bungalows, apartments/flats and shanties, some of which are unfit for human use since they lack basic services. The limited supply of land especially near CBD and the ever-increasing demand for housing has fuelled the need the development of multi-dwellings in an effort to alleviate the housing shortage. The proactive designs has provided for adequate ventilation and natural lighting, parking, storm water drainage, water storage and waste water reticulation as well as open areas. The area is sewered and the proposed development shall be connected to the sewer. From the proposed designs, the essential set local standards (in terms of physical planning, minimum habitable rooms, basic facilities, health and safety) have been met. It is estimated that the on approval; the project will take approximately thirty six calendar months to implement and it is estimated that it will cost Kshs **nine hundred million (Kshs 900,000,000**).

The proposed site is within a well-developed area and all the major urban services (electricity, water, trunk sewer, storm water drains and road network) are available and connected to the site though there shall be realigned and expanded to cater for the potential population increase. The relevant legislation has been adhered to in the design (discussed in the body of the report). All wastewater shall be discharged to the existing public sewer system and water supply shall also be from NWSC supply. Power shall be from the KPLC supply but we recommend installation of a standby continuous prime generator. In addition to this, the development will include provision of key infrastructure including internal storm water drainage systems, driveway and parking, outdoor security lighting, and sewerage and water reticulation to the local authority's adoptive standards.

There is growing recognition of the importance of protection and management of the environment and the natural resources unlike in the past where policy makers directed all the efforts in economic development without due regard to the resource base on which the economic development depend on. As a result, there has been unprecedented environmental degradation due to the lack of environmental conservation resulting to unsustainable development. More recently developers, spurred on by regulators world over, have recognized the need for change in order to safeguard the environment

The major objective of the EIA study is to evaluate the effects/impacts of proposed development in relation to the entire environmental aspects aimed at influencing the protection and co-existence of the development with the surroundings as well as the compatibility of the proposed development to the area to ensure and enforce sustainable environmental management during site preparation (site clearance and foundations), construction, occupation and decommissioning phases. The scope of the assessment study covered the physical extent of the project site and its immediate environs, construction works of the proposed development (ground preparation, foundations, walling, finishes, roofing, fixtures and fittings among others), installation of basic utilities/facilities and services as required by the residential project. Characterization of the baseline information about the environmental, ecological, social and economic conditions around the proposed project area and the establishment of the potential environmental impacts or other environmental concerns of the project.

The output of the study was the production of a comprehensive Environmental Impact Assessment study report for submission to NEMA for the purposes of seeking an EIA license.

The terms of reference were but not limited to:

- A critical look into project objectives.
- The proposed location of the proposed project site.
- Generation of baseline information, national environmental legislative and regulatory framework, and any other relevant information related to the project.
- Evaluation of the technology, procedures and processes to be used
- Evaluation of materials and their extended sources.
- Description, evaluation and analysis of the foreseeable potential environmental effects of the project broadly classified into physical, ecological/biological and socio-economic aspects (direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated)
- Evaluation of products, by-products and waste to be generated by the project.
- To propose/recommend a specific environmentally sound and affordable liquid and solid waste management system.
- Evaluation and analysis of alternatives

- An environmental management plan proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment,
- Propose measures to prevent health and safety hazards in the project cycle

The study also aimed at ensuring that the project would be implemented based on applicable building standards of Kenya and other international building codes i.e. British standards as well as incorporating environmental guidelines, and health and safety measures.

The following general steps were followed during the assessment to ensure comprehensiveness and completeness of the report:

- Environment screening and environmental scooping; Physical inspection of the site and its environs; Desk stop studies, consultations, questionnaires and extensive interviews with stakeholders (the local community, the neighbours, the proponent and his consultants among others);Public participation and consultation and Reporting.

Various alternatives were considered including the proposed site and project, alternative site and design, technology and materials and the proposed site, design, materials were chosen due to various factors among them the availability of land, demand for such apartments, proximity to the CBD, potential returns, infrastructure availability and the fact that the planning policy allows such kind of development.

The proposed development was noted to have positive impacts to the society both at local and national level. The benefits will be experienced during the entire project cycle. They include the following:

- Provisions of a basic need (housing) and thus increase in the national/local housing stock and quality thus contributing to easing housing problems.
- Increase in business premises, social and recreational facilities/opportunities and services
- The optimal use of the land
- Increase in land value of the subject plot and the nieghbouring plots
- The project will form a well-planned project and shall include key services and infrastructure.
- Increase in Government revenue and improvement of local and national standards of living of the society.
- Improvement of socio-economic services such as provision of recreational facilities have been incorporated in the proposed project.
- Economic-investment hence increases in wealth.
- Improvement of social interaction.
- Creation of market for goods and services
- Provision of employment.

Against the background of the above positive impacts, there are a few negative drawbacks that are anticipated mostly during the construction of the project. They include the following:

- Impact to soil (including soil erosion) especially when laying the foundation and other earthworks.
- Increased pressure to the existing infrastructure and services (roads, water, power, sewer etc)
- Increased noise and vibration mostly during construction phase

- Constraints to the existing infrastructure i.e. water, sewer system, power, surface drains, roads among others.
- Clearing of the existing vegetation from the site; which can result to land degradation (i.e. soil erosion) if not well managed.
- Increased storm water/ run off resulting from the roof catchments and as a result of decreased recharge areas after pavement of most areas thus hydrology and water quality degradation
- Air pollution as a result of dust particles emanating from excavation and construction activities. Exhausts from the involved machinery will lead to increased levels of noxious gases such as sulphur, carbon, and nitrogen oxides.
- The health and safety of workers and immediate residents and neighbours may be compromised due to accidents, pollution and disturbance
- Potential traffic accidents
- Increased waste generation (both solid and liquid) during construction and occupation.
- If the security measures are not fully heightened during occupational phase, the development may increase insecurity and other social crimes in the area due to sudden settlement by diverse people.
- Visual intrusion (views closed)

To minimize the occurrence and magnitude of the negative impacts, mitigation measures have been proposed against each of the anticipated impact. Other measures have been integrated in the project designs with a view to ensuring compliance with applicable environmental laws and guidelines.

The measures include the following:

- Careful sitting, planning and design of the development to ensure that it is compatible to the existing general environment
- Adherence to the provisions of Environmental Management and Co-ordination (Water Quality) Regulations 2006, Environmental Management and Co-ordination (Waste Management) Regulations 2006 and other relevant legislation
- Erection of warning / informative signs (bill boards) at the site during the construction phase, and traffic control along the connecting roads (the access Road).
- Soil compaction and watering of loose soils on all unpaved access roads, parking areas and staging areas and construction materials, at the construction sites to minimize air pollution and erosion by the agents of soil erosion i.e. water, animals and wind.
- To reduce noise pollution, portable barriers to shield compressors and other small stationary equipment generating noise should be installed; Sensitization of workers on the need to switch off engines whenever possible; ensuring that the machinery is well maintained to inhibit frictional noise; install silencers whenever possible and ensure that site works/operations is carried out between 8a.m. and 5p.m.
- Proper and prompt tuning and maintenance of construction plant and equipment to minimize emission of noxious fumes and noise emanating from friction of the rubbing metal parts. Vehicle/machinery idling time should be minimized. The maintenance will be conducted in appropriate and designated service bays to reduce chances of contamination of environment by resulting oils and greases. Any of such oils must be collected and disposed appropriately.

- Since large volumes of water may be required during the construction, the contractor may be required to source water elsewhere other than the municipal supply; such as portable water tankers, subject to seeking water abstraction approvals from the relevant government water departments. On the same note, roof catchments shall be provided with gutters to facilitate collection of the run-off. We recommend that this water be stored for general use i.e. cleaning, fire fighting, gardening etc. The developer should explore roof water collection systems to enhance harvesting of the run-off generated from the roof catchments. Standard gutters, down pipes and suitable water storage tanks should be provided for the run off generated within the project harvested and stored (in tanks) and used for general purposes.
- On a policy level, the government should make the rainwater harvesting facilities affordable through tax incentives such as scrapping of VAT on such facilities.
- To ensure further conservation of water in the units, the proponent shall install water-conserving taps that turn-off automatically when water is not in use.
- The vehicular access to the proposed project site is effectively provided and will be constructed to the satisfaction of the engineer.
- To cater for storm water drainage, well-designed concrete inverted channel drains shall be provided to harmonize management of the resulting surface water within the site. The drains shall effectively channel storm water into the area drainage systems. Storm water runoff will be greatly reduced through rainwater harvesting from the roof catchments. The drains will be regularly maintained.
- The entire project shall be connected to the existing NWSC sewer system. The internal sewer reticulation shall be concisely designed to enhance collection of the effluent from individual generation points into the sewer
- Workers shall be provided with full protective gear to beef up their health and safety standards and they should be sensitized on health, safety and environmental conservation aspects. The site should be fenced off during construction to keep off animals and the general public.
- To cater for constraints to the infrastructure, the proponent in liason with the neighbours, the CGN and the various agencies and service providers should explore opportunities available for expansion to cater for the increased demand by the proposed project and other upcoming projects in the area.
- To avoid constraining the existing energy infrastructure, the proponent shall liase with the sole power distributor KPLC to upgrade the power supply line and install transformers(s) to meet the anticipated increased demand. In addition, the proponent shall also explore installation of solar equipment for energy conservation and installation of standby prime generator.
- During the construction phase, the contractor shall put in place effective and efficient waste disposal systems. Wastes such excavated soil and debris will be recycled or properly disposed of by backfilling or dumping in approved grounds.
- The management of the solid waste mostly during occupation will be coordinated from individual generation points. The use of an integrated solid waste management system will facilitate this. This will involve a hierarchy of options: source reduction, recycling, composting and reuse, and sanitary land filling. Solid waste management shall be enhanced through involvement of individual units, segregation of waste at source and/or appointing a reputable garbage collector registered with NEMA.
- Comprehensive landscaping will follow on completion of the development to prevent soil erosion and upgrade the site to its appropriate environmental standard.

- Adapt Environmental Management and Monitoring Plans within the site involving all the residents.

From the study, a cost and benefit analysis indicates that the benefits far outweigh the associated costs and negative impacts. The proposed site is within a neighbourhood which makes it vulnerable to invasion by squatters who would definitely construct unplanned structures leaving no space for services such as access roads, water and sewer reticulation and power transmission. The housing situation in the neighbouhood is wanting in some situations where there are temporary shanties/slum like which dispose human waste directly into the surface water drains thereto creating a environmental health and safety hazard. It is our recommendation that the project proponent be allowed to go ahead with the implementation provided that the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close following and implementation of the recommended Environmental Management and Monitoring Plans (EMPs); which are strategically packaged with all environmental sustainability elements, tailored toward enhancing the adoption of Integrated Ecosystem Management (IEM). The proposed project is not unique in the area since there are existing blocks of apartments/flats and commercial blocks. The proposed project should be encouraged since it will greatly boost the housing stock while avoiding development of humanly-demeaning shanties as is the case in the neighbourhood which lack basic services including water and challenges of human waste disposal among others. Failure of the land to be developed is likely to encourage squatter settlements which are unplanned, congested and lack basic services. Various alternatives has been considered but the proposed alternative has been found the best available alternatives as it maximises the benefits to all beneficiaries and the potential negative impacts are not so significant and can further be mitigated by adherence to the proposed EMP. The project proponent shall continue to work closely with the environmental consultants, NEMA, residents and CGN to enhance the environment and to ensure that issues that the environmental concerns are well addressed and integrated into the project at every stage of successive implementation. This way, the co-existence of the proposed project with the environment during construction and occupation phases will have been achieved and shall influence the decommissioning phase.

The ideal strategy to counter identified adverse effects is avoidance but when this is not possible, alternative strategies of reduction, remediation and compensation should be explored. This can be achieved through primary measures that intrinsically comprise part of the development design; or secondary measures designed to specifically address the remaining (residual) adverse effects of the proposed project. The potential impacts can be greatly reduced and this will be much determined by the technology used, nature of the materials, equipment used and level of diligence among others. The foreseeable impacts identified that may not be completely avoided are addressed here below and potential recommended measures provided. As such, the proposed measures also explore opportunities available for improving the situation wherever possible. The initial design should facilitate a high degree of mitigation, built into the scheme from the onset so that the potential for adverse effects is substantially reduced. If consideration of mitigation measures is left to the later stages of proposed project design, it can result in increased mitigation costs because early opportunities to avoid the need for such measures have been lost. In general, primary mitigation measures are likely to be more effective and less likely to cause secondary adverse effects (i.e. the mitigation measures themselves may in turn cause adverse effects.

INTRODUCTION

Background and rationale for the EIA

Eris Property Developers Ltd *(herein referred to as the proponent)* has proposed to develop 345No. residential apartments and studios on 11No. adjoining plots L.R. Nos. Dagoretti/Riruta/1230 – 1239 & 4813 (to be amalgamated) that is situated off Ngong Road within Ngando location in Nairobi county. The proposed site as at the time of the study was vacant.

The proposed project is collaborated by the ever growing population coupled with growing economy among others, thus the need for increase in standard residential units, commercial premises together with auxiliary services/facilities and recreational facilities. Besides, the project brings forth various advantages as discussed elsewhere in this report. Housing is a basic need but unfortunately its supply has always lagged behind the demand. The additional units from the proposed project will go a long way to be developed, the contribution that the project shall make towards addressing the housing crisis cannot be overlooked.

The rationale for the EIA study report is to integrate environmental aspects in the planning and implementation processes of the proposed project to mitigate adverse impacts and enhance the positives. Besides, environmental impact assessment (EIA) for such projects is now a legal requirement. The ultimate objective an EIA is to provide decision makers, relevant institutions/organizations, proponent and other stakeholders with the foreseeable environmental impacts of a proposed activity and therefore enable planning ahead taking into account all predictable outcomes and adequately providing for them for sustainability.

The purpose of the study is to accommodate the potential environmental (physical, ecological and cultural/socio-economic) concerns and address them adequately throughout the project cycle. The study is expected to raise both the potential positive and negative impacts likely to emanate from the proposed project. Integrating *Sustainable Environmental Management principles* in the planning, implementation and throughout the project cycle is vital in reducing/mitigating conflicts and enhancing environmental conservation.

Kenya's framework environmental law, entitled The Environmental Management and Coordination Act (EMCA), 1999 is a product of a new methodology for the development of environmental law in the history of the country. Views and aspirations of a wide range of stakeholders both at national as well as at local levels were solicited and incorporated in the Act. This is a major shift from the traditional centralised mode of policy formulation that did not involve the public. The Act is thus designed to promote greater public participation in the management of natural resources and the environment in general.

The objectives of an EIA are:-

- To determine environmental compatibility of the proposed project
- To evaluate and select the best project alternative from the options available
- To identify and evaluate the significant environmental impacts of the project
- To incorporate environmental management plans and monitoring mechanisms
- To assess the environmental costs and benefits of the project to the community

Pursuant to the said prevailing legal requirements as envisaged in the EMCA and to ensure sustainable environmental management, *the proponent* undertook this EIA Study for the *proposed residential project*; and incorporated substantial environmental aspects as advised by NEMA. This EIA Study thus provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA for the implementation of the proposed project.

The Environmental approval of the project is sought on the grounds that no major predictable environmental harm is likely to ensue from the implementation works or occupation of the project and if any, stringent mitigation measures to counter them have been proposed and close monitoring is recommended to ensure that they have been implemented.

Scoping Process

The scoping exercise was conducted to evaluate the project in its entirety so as to identify areas of concern and the sources of potential environmental impacts that will be associated with the development.

The Environmental Impacts of the proposed project was carried out through the following process:

- Evaluation of the location, land ownership and land use/planning
- Evaluation of proposed design and construction materials and methodology
- Project site visits
- Discussion with neighbours/general public in the environs and the various stakeholders.

The study has assessed the impacts of the project development on the environment in accordance with existing guidelines; in compliance with Environmental Management and Coordination Act of 1999 and the Environment Impact Assessment guidelines.

Terms of Reference (TOR)

This Environmental Impact Assessment considered the following aspects and others that proved of significance during the study.

1. The ecological effects. This covered: -
    - Provision of background and baseline information
    - The effects of the development on biodiversity diversity both within and outside the project development site i.e. effects on flora and fauna, habitat quality and issue of habitat disruption.
    - Surface water run-off, containment and flood control
    - Sustainable use of resources and ecosystem maintenance and enhancement

2) Social implications of the development within the locality, region and nationally. These included: -
    - Economic implications of the development, employment and livelihoods
    - Security – threats, risks and enhancement
    - Public health implications
    - Social cohesion, culture, emigration and communication
    - Demand and development of infrastructure and social amenities

3. Determination of the effects on landscape and land use
    - Assessment of the effects on scenery modification
    - Analyzation of the compatibility of the development with the surrounding land uses.
4. Effects of the development on current demands on water resource as well as possible implications on surface and underground water qualities and quantities.
5. Proposition of mitigation measures to be taken during and after implementation of the project; and development of an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance.

Scope of EIA study

The EIA study includes an assessment of impacts of the construction, operations and decommissioning on the following: -

- Physical environment
- Biological environment
- Socio-economic environment

The study has assessed the impacts of the proposed project on the environment in accordance with Environmental Management and Coordination Act of 1999 and has covered the following activities:

- A review of the policy, legal and administrative framework
- Description of the proposed project
- Baseline information
- Assessment of the potential environmental impacts on the project area
- Development of the Mitigation measures and future monitoring plans
- Social Impact Assessment

Methodology

Literature review pertaining to the project activities and salient features of the project area was done. This covered the review of the Environmental Management and Coordination Act, relevant studies and reports on the construction including design works and other related sources of information.

During the field investigations, a survey was conducted in order to collect information on biophysical and socio-economic environment of the project development site area and its environs. The following steps were involved:

- Environment screening in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, 1999.
- Environmental scooping that provided the key environmental issues
- Physical inspection of the site and its environs.
- Desk stop studies, consultations, questionnaires and extensive interviews with stakeholders (the local community, the neighbours, the proponent and his consultants among others)
- Public participation and consultation
- Reporting.

Public participation was achieved through discussion and interviews with the help of tailor made questionnaires; which were evenly distributed to the area residents and neighbours to fill in their opinions and recommendations. The exercise generated primary data on the socio-economic impacts on the area; anticipated impacts and suitable solutions and recommendations. More details are given elsewhere in the report and as appendices in the *annex*

Objectives and scope of the proposed project

Whereas the main objective of the proposed project is development of residential apartments, commercial building and a club house, and the ancillary facilities for some economic gains to the proponent, the main objective of this EIA Study was to establish the baseline conditions of the proposed site, evaluate the existing and the anticipated impacts and propose measures to enhance the positive impacts and measures to attenuate the effects of the significant negative impacts. The main objective of the proponent is to develop a total of 345No. residential apartments/studios for rental or sale purposes plus the relevant services as described elsewhere in project description in this report. The scope of the project is limited to the geographical location of the L.R. Nos. Dagoretti/Riruta/1230 – 1239 & 4813. The site shall be enclosed in a perimeter wall fence and all

activities including construction material and construction waste storage shall be within the boundaries of the proposed site before unrecyclable wastes are disposed to approved dump sites. There may be minor disturbances or spillover effects to the neighbourhood due to such issues such as noise, dust, traffic etc especially during construction but they shall be reduced to the minimum possible as recommended in the mitigation measures. The proposed development shall entail the development of various detached blocks whose finer details are given in the description of the proposed project elsewhere in this report.

Justification of the project

Due to the rapid urbanization and higher population growth the housing situation in the county (Kenya) has remained under tremendous pressure. The provision of shelter has not kept pace with the phenomenon and this has resulted in the deterioration of living conditions, increased health hazards, and rapid growth of slums and squatter settlements. The improvement of slums and squatter settlements, and provision of affordable housing to shelterless population will help alleviate the condition of urban and rural poverty as well as increase the productivity of the low-income population through improved public health.

Of late, there has been a marked change in the approach to residential development in the urban areas and mostly in/near the major Kenyan cities. Increasingly, there has been a strong tendency to develop integrated, low cost and secure housing infrastructure; within the confines of fenced boundaries with restricted and well-guarded entrances.

The prevailing circumstances render this type of development popular in the cities. These types of development are a practical response to the growing insecurity in the urban areas. Such compounds with pooled security have relatively low incidences of robberies, break-ins or even attacks on people. The current practice in the old estates, to physically block some streets and to fix/erect-manned gates to curb insecurity is illustrative of the serious concerns of the urban society.

The new developments are coming up with modern and efficient drainage and sewerage systems; with *high factors of safety* to handle the ever escalating volumes of waste materials. They are also installed following guidelines from NEMA; which aim at improving the general environmental quality. This EIA in its widest sense is the means by which environmental concerns shall be taken into account throughout the life of the development from the initial concept through detailed design, construction and operation to eventual restoration and reuse of the land. Landscaping, ecology, and waste management are given first hand consideration to facilitate adoption of Integrated Ecosystem Management (IEM) and thus sustainable *use of the environment.*

In the near future, statistics have shown that nearly half of the world population will be living in urban areas. The government has realised this changing trend which helps in determining the overall requirement of housing units and ultimately provides a base for policy formation and future planning at macro and micro level in the country. These kinds of developments are therefore backing up the government's initiative and policy to providing 150,000 new houses per year. It is a great initiative aimed at providing affordable housing to the urban society. The development therefore is a welcome idea that will go along in easing pressure to the existing housing infrastructure. The development will go along in increasing the national/local housing stock and quality.

Urbanization is increasing at a high rate. This brings in new classes of people with specialized demands for new and sophisticated lifestyles. People are considering living in houses with standard infrastructure i.e. water, power and modern house design. Again they desire living as a group to enjoy much security and socialism.

The proposed project site conforms to the permitted densities in terms of land use, ground coverage, plot ratio and minimum health and safety requirements. Lack of adequate and affordable housing is clearly exhibited in the entire city in slums and informal settlements such as those that can be seen in the neighbourhood.

DESCRIPTION OF THE PROPOSED PROJECT

Nature, design and description of the proposed project

The project mainly involve a multiple development of 7No. detached blocks of residential apartments, a commercial cum residential block and a club house. Each of the seven blocks of apartments shall each have the ground and typical 1st – 9th floors. The proposed project shall be implemented in three phases and shall inject a total of 345 residential units comprising of 63No. one-bedroom apartments, 63No. three-bedroom apartments, 195No. two-bedroom apartments and 24No. studio apartments. The club house will be a simple structure mainly with gazebos. For shopping purposes and convenience, a commercial cum residential block is provided with ground, 1st, 2nd , 3rd and 4th floors. The ground & 1st floors of the commercial cum residential block shall be typical each accommodating open commercial space suitable for a minimart or a supermarket while the upper floors from 2nd to 4th shall also be typical each accommodating 4No. studio apartments and 1No. two-bedroom apartments. The proposed project shall also entail construction parking, construction of surface drainage systems for management and disposal of surface runoff and also upgrading the internal access roads; power and water supply infrastructure. Since the proposed project is new, the proposed works shall include construction, electro-mechanical and civil works.

Adequate parking is provided for on the ground floor. Each of the apartments shall comprise of either one, two or three bedrooms, lounge, kitchen, sanitary facilities and internal access/lobby while the studios shall have a one room plus cooking area and toilet. A summary of the proposed project is as in the table below:

Unit Type (size)	1-bedroom unit(s)	2-bedroom unit(s)	3-bedrooom unit(s)	Studio unit(s)	**Total**
No. of units	63	195	63	24	**345**

1) Typical residential apartment block

There will be a total of 7No. detached blocks of residential apartments. The blocks shall be typical with each of the blocks accommodating parking on the ground while the upper floors from 1st to 9th shall be typical each accommodating 3No. two-bedroom apartments, 1No. three-bedroom apartments and 1No. one-bedroom apartment thus each block shall have 27No. two-bedroom apartments, 9No. three-bedroom apartments and 9No. one-bedroom apartments.

2) Commercial block:

The commercial cum residential block shall have the ground, 1st, 2nd, 3rd & 4th floor with the ground and 1st floors being typical and each accommodating open-plan commercial space suitable for a supermarket or a minimart. The 2nd, 3rd & 4th floors shall be typical each accommodating 4No. studio apartments and 1No. two-bedroom apartments.

3) Club house

The club house shall be a small facility with a simple open plan kitchen and gazebos.

The proposed project shall have two access gates with a guard house, landscaped gardens and shall be enclosed in a perimeter stone fence. There shall also be protected dustbin cubicles and driveway and parking.

In addition to this, the development will include provision of key infrastructure including power connection and installation of transformer(s), storm water drainage systems, outdoor lighting, and sewerage and water reticulation to the local authority's adoptive standards..

As at the time of the study, the land was undeveloped (vacant). The suitability of this kind of development can therefore be justified on diverse of use. This include the demand based on nature and trend of developments in most areas, policy focus, plot area and zoning regulation, land-use and infrastructural compatibility, socio-economic impacts and environmental impact assessment among others.

Location of the project

The proposed project site is eleven (11No.) adjoining plots which are to be amalgamated and identified as L.R Nos. Dagoretti/Riruta/1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239 & 4813, which is situated off Ngong Road (to the right of *Toyota Kenya*'s Ngong Road branch) within Ngando location, Nairobi County. GPS readings on a section of the site are S 01^0 18' 02.8'' and E 036^0 44' 56.0'' and in UTM the defining coordinates are 37M 0249506 & UTM 9856113; the site is at an average elevation of approximately 1815m ASL *See sketch plan of the proposed project location (not to scale) attached in the annexe and in the proposed project site in the proposed plans.*

Site ownership, zoning and land use

The proposed site is L. R. Nos. Dagoretti/Riruta/1230 – 1239 & 4813 whose total area measures approximately 1.434 hectares (3.54 Acres). The parcels of land measures different areas; all registered in the name of the proponent who will consequently amalgamate all into one. *Please refer to attached copies of Title deeds.* The details of each of the eleven (11) individual plots are as below:

Plot number (L.R. No.)	Registered proprietor	Area (Hectares)
Dagoretti/Riruta/1230	Eris Property Developers Ltd	0.113
Dagoretti/Riruta/1231	Eris Property Developers Ltd	0.113
Dagoretti/Riruta/1232	Eris Property Developers Ltd	0.106
Dagoretti/Riruta/1233	Eris Property Developers Ltd	0.106
Dagoretti/Riruta/1234	Eris Property Developers Ltd	0.110
Dagoretti/Riruta/1235	Eris Property Developers Ltd	0.114
Dagoretti/Riruta/1236	Eris Property Developers Ltd	0.107
Dagoretti/Riruta/1237	Eris Property Developers Ltd	0.105
Dagoretti/Riruta/1238	Eris Property Developers Ltd	0.106
Dagoretti/Riruta/1239	Eris Property Developers Ltd	0.109
Dagoretti/Riruta/4813	Eris Property Developers Ltd	0.345
Total area (hectares)		**1.434**

The area is generally under residential and commercial land use with almost all plots developed with residential houses (terraces, bungalows, maisonettes, townhouses), offices and high-rise blocks of apartments/flats and some commercial developments, social institutions such as schools, hospitals, places of worship e.t.c

The proposed site is within an area formerly zoned for single dwelling in the past but the revised zoning policy for the area allowed for multi-dwellings and commercial developments. There are similar blocks of residential flats in the neighbourhood and the area is now opening up for multi-dwellings. The proponent has already been submitted the proposed drawings to the CGN seeking approval. The area also has numerous plots developed with shanties including the immediate neighbouring plots most of which lack basic amenities and services. Wastewater from the shanties can be seen flowing in open surface drains making the place look very filthy.

Construction Inputs and Activities

Construction inputs (materials) include:

- ※ Construction raw materials i.e. sand, cement, stones, crushed rock gravel, murram, ceramic and glazed tiles, clay tiles, glass, steel metals and metal products, plastic and PVC pipes and materials, ceiling materials (soft board panels), steel pipes, timber and timber products, precast and insitu concrete products, iron sheets and iron products, electric cables and conduits, painting materials among others. Other inputs shall include necessary fittings and fixtures such as electrical gadgets (switches, sockets, lamps etc), water closet sets and other bathroom accessories, water taps, sinks and kitchen equipment and furniture and general household furniture among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies. It is worthwhile noting that most of the construction materials are locally available.
- ※ Construction machines including machinery such as excavators, graders, mixers, and bulldozers and other tools and equipments. These will be used for the transportation of materials, clearing of the vegetation and debris, in the construction of the project site. Such machinery will use petroleum products to provide energy.
- ※ A construction labour force of both skilled and non-skilled workers. These will require services such as energy, water supply and sanitation facilities.
- ※ Large volumes of water for construction purposes. It will be supplied from the local area supply mains.
- ※ Power from the mains grid or provided by generator.

Construction activities include the following: -

- ※ Construction of temporary construction office(s) and store
- ※ Procurement of construction materials from approved dealers.
- ※ Transportation of construction materials using heavy and light machinery.
- ※ Storage of the construction materials.
- ※ Site clearing, excavation and filling, laying of foundation, building works, disposal of the resulting construction wastes.
- ※ Disposal of the existing debris/ materials. All debris and excavated materials will be dumped on approved sites.
- ※ Electrical, civil, and water engineering works. These will be done by registered expertise
- ※ Landscaping works and earth works.
- ※ Completion of the development and occupation.

The buildings will be constructed based on applicable building standards of Kenya. These include but not limited to the Building Code and the British Building Standards *BS 8110* and *BS 5950, BS4449, BS446, BS5255, BS497, BS556, BS4466, BS4461 etc*. The constructions will as well incorporate environmental guidelines, health and safety measures.

Activities during operation phase

The activities to be conducted in the proposed project's operation phase are various business activities and accommodation related activities similar to what has been going on in the neighbourhood. The normal related activities which include provision of accommodation and all human related activities for the well being and quiet enjoyment of the residents and their potential guests. Other support services include the general maintenance and cleaning of the premises and laundry. The human activities shall definitely generate some liquid and solid waste. Liquid waste shall include wastewater from the sanitary facilities, kitchen, dhobi and general cleaning activities among others. Solid waste is mainly from the kitchen, discarded clothing, packaging materials, vegetative matter, construction waste and debris during repairs, papers, waste from the commercial premises e.t.c. These wastes shall be handled as recommended in mitigation measures in handling wastes. Since all residents have a right to quiet enjoyment of the unit, all practical and reasonable measures shall be to ensure peaceful and harmonious co-existence. Other related activities include those in the gym and socialization in the club house.

Activities during decommissioning phase

Decommissioning is an important phase in the project cycle and comes as the last to wind up the operations/activities of a particular project. The main purpose of decommissioning is to restore/rehabilitate the site to acceptable standards.

Quality and standard projects (buildings) of this nature have a lifespan of between 50 and 100 years which is much dependent on the maintenance quality. This is long period of time and there may be many changes which may not be foreseeable including the technological and legal aspects. The decommissioning may also come earlier than the lifespan of the buildings again due to various reasons like change in physical planning policy or the discovery/realization of a more optimal use of the land. It is therefore recommended that an EIA be conducted when the time for decommissioning comes so that all aspects will be looked at against the prevailing conditions and requirements. However, the purpose of decommissioning is mainly to rehabilitate the project site to an acceptable standard and all efforts should be geared to making the site as close as possible to its original state before the project was implemented.

The decommissioning will in brief involve demolitions of the structures, removal of debris and landscaping. The other social implications involve the laying off workers who may be employed thus will loose their income, issues of safety and health etc. due to the fact that nobody knows the future, it is highly recommended that an EIA be prepared when the time comes since quit may come earlier or later due to the vagaries of weather, human behavior and policy changes among other factors and quantification and accurate prediction of the likely potential impacts is quite difficult.

In view of the foregoing and in line with the principles of sound environmental management, it is paramount that the appropriate controls and procedures be put in place at the design, implementation and operational phases of

the proposed project to control environmental degradation as this is the only way of simplifying the decommissioning. These measures are recommended elsewhere in the report and in the EMP.

Construction products, by-products and wastes

Construction products is the final usable premises in the case of the proposed project is residential apartments, commercial business premises and some recreation. The residential apartments and the commercial premises shall have all the basic facilities to the local standards including connection to the sewer for waste water disposal. The final product shall have all necessary accommodation details as described elsewhere in this report and in the architectural drawings. Construction process does not produce and by-products. Wastes from construction activities are diverse. They include excavated soils, vegetative materials extirpated from the site, wastes (pieces) from iron sheets, timber, glass, plastic and PVC materials, steel metals, broken stones; tiles and debris not to mention packaging materials. Wastes during occupation is mainly in the form of general municipal refuse, wastes from commercial premises and the waste water from the washrooms and general cleaning. All wastes shall be disposed off appropriately as discussed in mitigation measures elsewhere in this report.

Project Budget and project duration

The construction is estimated to cost approximately Kenyan shillings nine hundred million (Kshs 900, 000,000) and is estimated to take approximately thirty six calendar months to complete.

INFRASTRUCTURE AND SERVICES

A summary of the various support infrastructures and services is here presented below.

Roads and Accessibility

The property lies on a murram road off the tar-surfaced access road (Ngong Road). The road is well connected with other tar surfaced roads and therefore the site is accessible and within close proximity to the CBD and other commercial centres.

Water supply

The proposed project site shall be connected to the NWSC water supply network. It is proposed that the proposed development will have cold-water storage tanks to the specifications of the mechanical engineer. It is recommended that the proponent explore harnessing rainwater for general use to minimize pressure on the existing water supply.

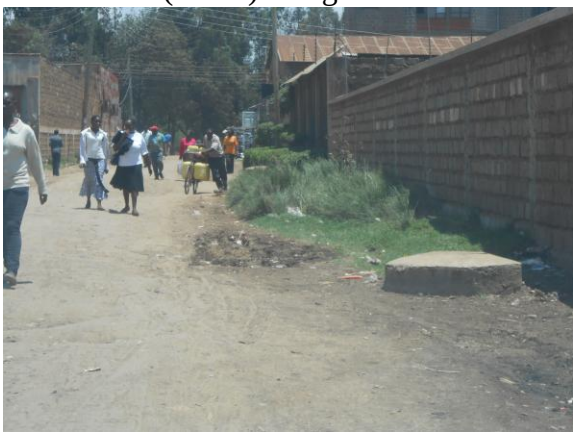
It is recommended that appropriate and preventive measures be taken at the design stage to provide for rain water harvesting system and storage which shall otherwise reduce the full dependency on the NWSC supply. This will include gutters, down pipes and suitable water storage tanks for the harvested rainwater.

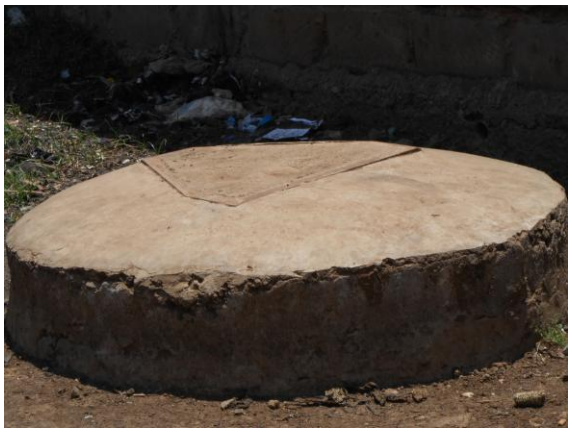
The use of run off generated within the project area shall be put into consideration, whereby it shall be harvested and stored. This can be used in flashing out toilets thus supplementing the use of normal water supply. The run off can suitably be stored in underground tanks and then pumped/lifted to the sanitary facilities (toilets)

Sewerage system

The area within which the proposed project site lies is served by NWSC sewer and shall therefore be connected to the same. The sewer system reticulation has been effectively designed in the proposed plans and will be connected to each unit and to the existing sewer system with approval from the NWSC.

A man-hole (sewer) along the immediate access road





Source: Field Survey

Surface Drainage

The area is generally drained by the existing public drainage system along the road. The proposed design has provided for internal drains to collect the surface run-off and safely dispose to the existing drainage system which shall require expansion and some sections construction.

Solid waste Management

Wastes from the project will be many and especially during construction (clearing of the existing debris) and occupation phase. The area is within the jurisdiction of the CGN, which has the responsibility of disposal of waste. However, the proponent/contractor has an option of contracting a private garbage collecting company. The proposed project has included dustbin cubicles (protected from rain and animals) but this cannot handle construction solid waste - arising from the demolition debris, vegetation materials to be cleared, and construction material wastes (wooden, glass, plastics, sanitary litter e.t.c.). This calls for sound waste management system especially during construction. All solid wastes should be dumped in approved dumpsites and in accordance with the regulations.

Proper Handling of solid wastes mostly during occupation will be enhanced by the inclusion of sound property management system.

As is the case in other similar integrated schemes, it is anticipated that a professional garbage collector will be contracted to supplement the efforts of the CGNl in garbage collection, transportation and disposal.

Energy supply and use

Construction machinery will require fuel during construction. This will be sourced from legalized dealers.

Electrical power will come in handy in driving the selected construction machinery. It will also be needed on occupation of the completed project. The power (electricity) is connected to the site. The proponent shall apply for upgrading of the power supply from KPLC to accommodate the anticipated demand such that transformer(s) shall have to be installed within the project but this shall be determined in liason with the KPLC. In addition to the above, the need for energy conservation will be emphasized mostly during construction and occupation phases. During occupation phase, the use of renewable energy sources such as solar will be encouraged.

Communication

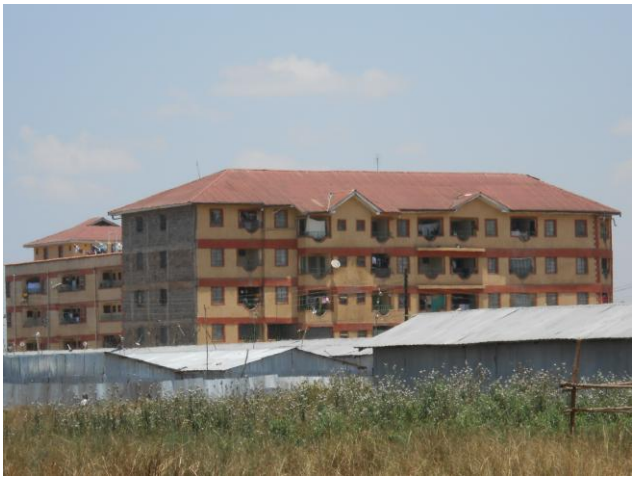
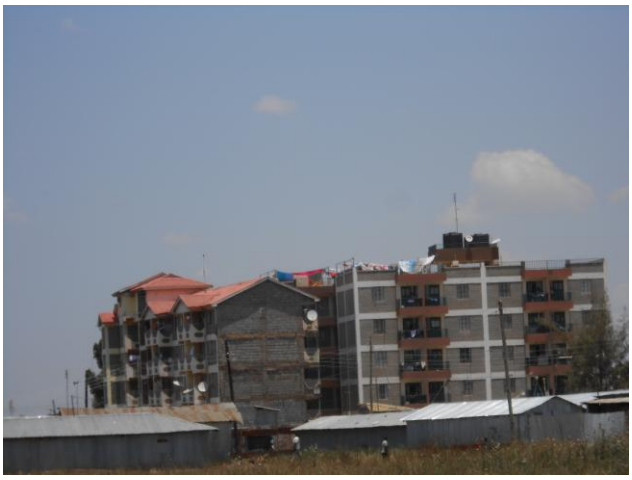
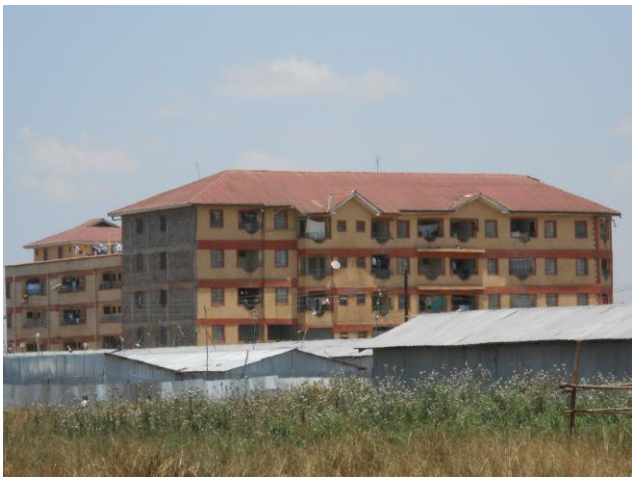
The area is well covered by communication facilities such all mobile and fixed telephony service providers. All these will facilitate communication during the implementation and on occupation of the project.

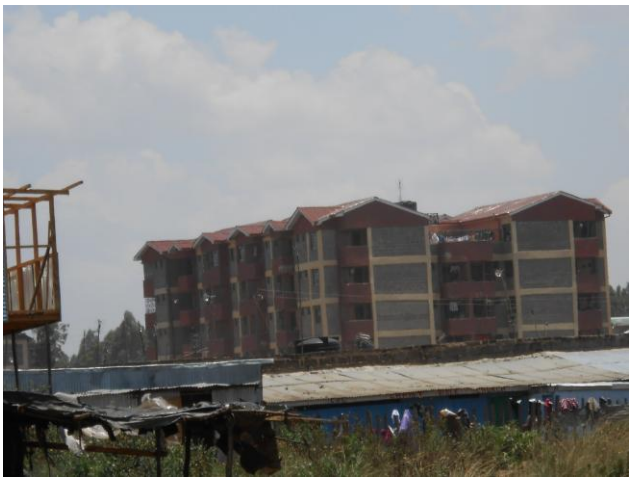
Security

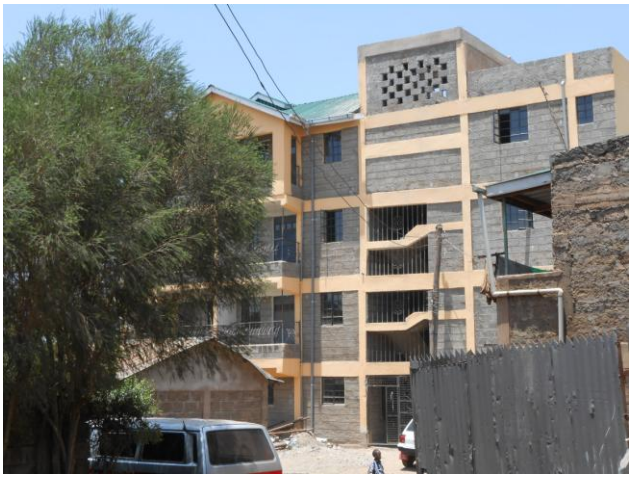
There will be gates to the project site, which will be fully manned 24 hours. The entire area of the project will also be banded with a full stone perimeter fence. Streetlights will as well be installed sufficiently within the project area. The property management is anticipated to engage security firms to beef-up security.

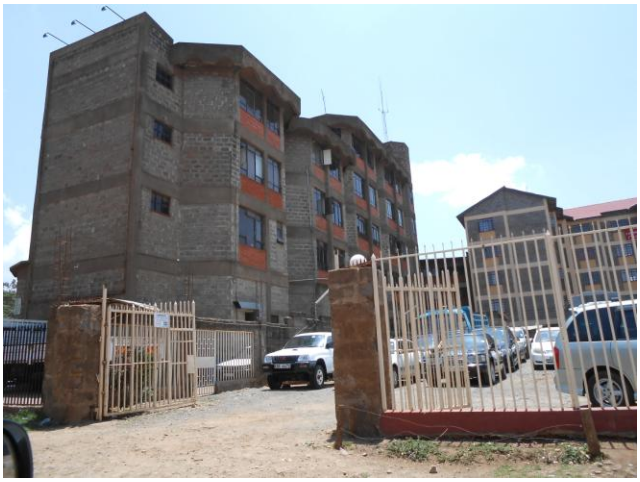
Some of the existing developments in the neighbourhood

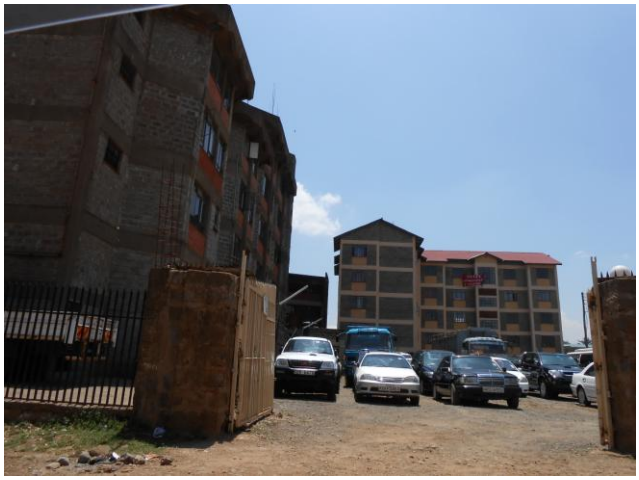


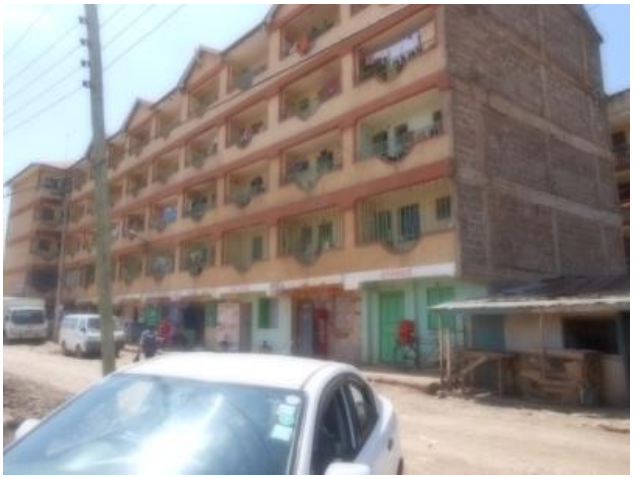















Source: Field Survey

ENVIRONMENTAL SETTING OF THE PROJECT AREA AND ENVIRONS

Climate

The climate of Nairobi is pleasant for most of the year experiencing a double (bi-modal) seasonal rainfall pattern (which peaks during the months of April and November) with high to moderate rainfall from April-May and November-December. Mean annual rainfall range is 500-1000mm/year. Relative humidity mean values range from 70 to 80%. Temperature fluctuates between 15^{o}C and 32^{o}C in most areas. Areas to the north and west of the city center (CBD) tend to enjoy cooler temperatures and are relatively wet while dry conditions prevail the further to the east and south. The proposed project site is to the south-west of the CBD.

Geology, Soils and topography

The subject proposed site is gently sloping and the general area in the environs is in some places characterized by both steep and gentle slopes in others. It has an underlying rock of tuff and trachytes and soils vary in depth, black cotton soils.

Flora

The general area is planted with vegetation (trees) mostly along the roads, plot boundaries and in designated gardens within the respective plot boundaries. The proposed site had a few trees as at the time of the study none of which were not of any significant conservation value. Those along the boundaries shall be preserved.

Fauna

The site is situated within an area zoned for residential and commercial use where human activities have altered the natural habitat for wildlife over the years. Consequently, there are no major animals in the environs except may be birds, insects, and small rodents. Therefore there is no fauna threatened by the proposed project.

Socio-economic environment

The proposed project site is within an area predominantly residential with commercial activities and therefore almost every other plot in the neighbourhood is residential and/or commercial or residential/commercial related activities. Some residential houses in the neighbourhood have been officially or unofficially turned into offices and other commercial uses. The location is well accessible via good roads from several routes and in close proximity to the City Center and the general area has several pockets of commercial centres primarily to serve the residents. All social amenities (hospitals, schools, religious places, shopping areas etc.) are within easy reach. All major urban infrastructures (water, electricity, sewer, roads, and landline telephony) are connected to the proposed project site. All emergency facilities (fire brigade, ambulances etc) are within easy reach from the various providers. There are no sites of cultural, historic or traditional significance in the immediate neighbourhood. The area is within the County Government of Nairobi City's jurisdiction and therefore served by the CGN's infrastructure and is also bound by the CGN's by-laws. The area is a high density residential area with many kinds of housing ranging from bungalows, maisonettes, apartments/flats and shanties. The residents either work around the area or travel to other areas including the CBD for work and come back. Other conduct various small scale or large businesses.

RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORK

The Environment Management and Co-ordination Act, 1999
The Act entitles every person in Kenya to a clean and healthy environment and aims to safeguard and enhance the environment. Though there are other sectoral laws on environmental conservation, this is the supreme legislation. It provides guidelines on issues of environment, stipulates offences and penalties and establishes NEMA. The Act also lists the type of projects, which must be subjected to the EIA process and establishes NEMA. *In compliance, the proponent appointed experts to conduct the EIA Study to seek approval before implementation of the proposed project.*

The Environment (Impact Assessment and Audit) Regulations, 2003
These are entrenched under section 147 of the EMCA. The regulations provide the framework for carrying out EIAs and EAs in Kenya. *This EIA Study is conducted in conformity with these regulations and EMCA, 1999.*

The Environmental Management and Co-ordination (Water Quality) Regulations, 2006
These regulations set the standards of domestic water and waste water. The regulations are meant for pollution control and prevention and provides for protection of water sources. *The proposed project will connect to the NWSC supply; sewer and the proponent shall take appropriate measures as provided in the regulations. The sewerage system in particular must be sound to prevent leaks and blockages.*

Environmental Management and Co-ordination (Waste Management) Regulations 2006

These regulations define the responsibilities of waste generators and define the duties and requirements for transportation and disposal of waste. It provides for mitigation of pollution and provides for hazardous and toxic wastes. The regulations require a waste generator to dispose waste only to a designated waste receptacle. *The proponent shall adhere to the regulations and proposes to contract a NEMA registered waste transporter.*

Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) (Control) Regulations, 2009.
The newly gazzetted noise and excessive vibrations regulations require that noise and excessive vibrations should be minimized to the largest extent possible ant that this should not exceed particular decibels.

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.*

National Environmental Action Plan (NEAP)
According to NEAP, 1994 the Government recognized the negative impacts on ecosystems emanating from development programmes that disregarded environmental sustainability. Established in 1990, the plan's effort was to integrate environmental considerations into the country's economic and social development. Under the NEAP process EIA was introduced.

The world commission on environment and development–the brundtland Commission of (1987)
The Brundtland Commission addresses the environmental aspects of development. It has emphasized on sustainable development that produces no lasting damage to the biosphere and to particular ecosystems. In addition to environmental sustainability is the economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resource. *The proponent is committed to adhere to the proposed EMP to ensure environmental enhancement and this would first be monitored through the initial environmental audit.*

National Policy on Water Resources Management and Development
It enhances a systematic development of water facilities in all sectors for the promotion of the country's socio-economic progress, and also recognizes the by-products of these processes as wastewater. It calls for development of appropriate sanitation systems to protect people's health and water resources from pollution. *The proponent has provided for sewer articulation in the design and has connected to the NWSC sewer system.*

OSHA
The Act makes provision for the health, safety and welfare of persons employed in various places of work. The Act is the repeal of the Factories and other places of work Act. The provisions of the Act require that all practicable measures be taken to protect persons in places of work from dust, fumes or impurities originating from any process within the workplace. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site. The Act provides for all necessary safety precautions to ensure the health and safety of workers. *The proponent will appoint a reputable contractor who will be responsible in enforcing the requirements during construction and subsequent repairs and maintenance after project completion.*

The Physical Planning Act of 1996
This is the principle Act governing land planning and the project proponent is required to acquire a Certifiate of Compliance or approval letter from the relevant institutions as set out in the Act. The sole objective of the Act is to harmonize development. *The drawings (plans) of the proposed project has been submitted to the CGN seeking approval*

The County Governments Act
The Act empowers county governments to make by-laws in respect of suppression of nuisances, imposing fees for any license or permit issued in respect of trade or charges for any services. County Governments are given power to control or prohibit all developments which, by reason of smoke, fumes, chemicals, gases, dust, smell, noise, vibration or other cause, may be or become a source of danger, discomfort or annoyance to the neighbourhood, and to prescribe the conditions subject to which such developments shall be carried on. *In compliance, EIA Study has proposed potential mitigation measures (in the EMP and monitoring plan; and the environmental management Framework in the report.*

Building code 2000
This provides the basic rules, guidelines and standards for construction. It is a comprehensive document, which every developer/proponent/ contractor should have. *All approvals will be sought before commencement of the work and regular monitoring will follow to ensure compliance with set standards and conditions.*

Public Health Act- (Revised 1986)
The Act demands the adoption of practicable measures to prevent injurious and unhealthy conditions in the site. The Act requires the proponent to enhance effective management of Nuisances i.e. noxious matter or wastewater as will be discharged from the proposed project throughout the project cycle. To achieve this, systems on the management of both solid and liquid waste (effluent) will be adopted as proposed in the report. *For instance, the effluent will be discharged into public sewer line. The solid waste shall be handled by a professional and NEMA registered waste handler on regular basis and disposed appropriately as per the waste regulations. Sanitary facilities shall be in conformity with MOH standards and installation of standard fittings.*

National shelter Strategy to the Year 2000
This strategy was formulated to advocate a change in policy in order to allow investors to come in and give the government a hand in providing housing. The government's role was to simply facilitate. *This is the role the proponent wishes to contribute to by investing and reaping some economic returns in the process.*

The Water Act, 2002
Part II, section 18, of the Water Act, 2002 provides for national monitoring and information systems on water resources. Section 73 of the Act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 and sub-section 1 allows the licensee (CGN in this case) to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction. *The proponent is connected and will remain connected to the NWSC water supply and sewer for liquid waste disposal (read soil and waste water) and the NWSC takes responsibility from there.*

Public participation

It is important that the general area residents be made aware of the proposed housing project and submits their opinions at the initiation stage. The public awakening was facilitated through consultations and discussions (more participatory, interactive and intensive processes of stakeholder engagements) undertaken in the neighbourhood of the proposed development site.

The objectives of the public consultation were to inform the stakeholders in the area about the project; gaining their views, concerns and values, taking account of neighbours and general public inputs in decision making; obtaining local knowledge, reducing conflict, improving transparency and accountability in decision making, and increasing public confidence and awareness. It was relatively easy to acquire the reservations of the community since these kinds of developments are welcome. The community could therefore understand easily the potential impacts that could result from the implementation of the project i.e. through comparative analysis. The public participation was facilitated through a public meeting on site and interviews. The key respondents included among others the neighbours and individuals who would directly or indirectly be affected by the implementation of the proposed project. The participants were various stakeholders within the area and at the proximity of the proposed development site including the area assistant provincial administrator.

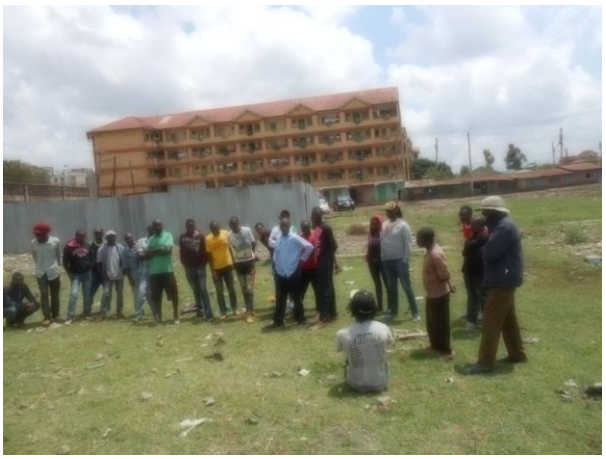
During public participation process, the public and neighbours in particular appreciated the initiative of the project proponent in taking a step forward to initiate the proposed project with regards to the *General Environmental Management* and involvement of the residents in giving out their views. However, more emphasis (by residents) was put towards ensuring that the proposed development would facilitate sustainable use of environment and also revitalization of the current environmental situations in the area; as regards public

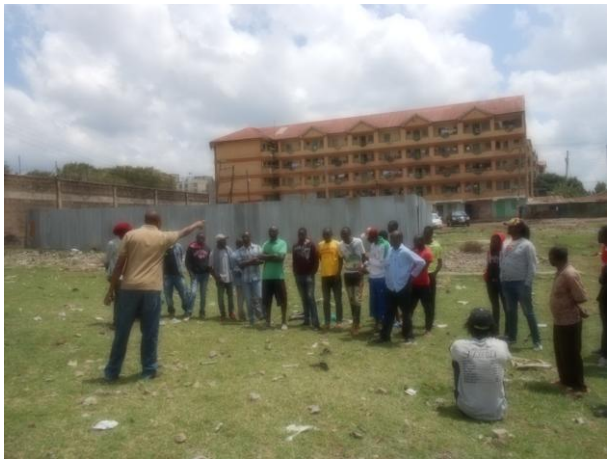
amenities. The issue of potential road damage and congestion was also mentioned. They also insisted on conducive environment during construction and therefore avoidance/control of dust and noise or any other form of pollution. The main concerns are clearly infrastructure which the relevant responsible service providers and agencies mainly the NWSC, KPLC and CGN should address urgently and comprehensively for the entire areas of jurisdiction. They also raised the need to improve the area security. Those with reservations clearly indicated that the big challenge is the constraints to the infrastructure. This is a major issue all over Nairobi city which is clearly reflected in the acute water shortages, power rationing, traffic congestion etc which is caused by failure of proper planning by the various departments/local authority and relevant service providers and its therefore a wakeup call since the ever increasing population shall have to be sheltered. The community insisted on getting the first priority when it comes to job opportunities whether skilled and unskilled arguing that amongst them are all technical people including plumbers, artisans, drivers etc. They also requested to be considered for a space where the local physical education trainer (who was present in the meeting) could be using to train the youth as he currently meets the biggest challenge of not having such a permanent space thus hindering delivery of service which is a major boost to the area youth as it equips them and enables them to get livelihood after training. They also indicated that they have seen and/or experienced harassment by contractors (especially Chinese) in other construction sites in the neighbourhood and also delayed payment of their salaries and wages which they indicated offends them. They thus requested that such incidences should be avoided in the proposed project. Area residents clearly indicated that they should be given priority in available jobs.

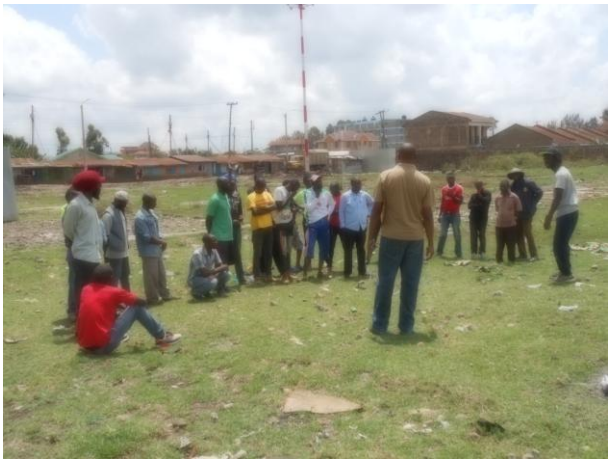
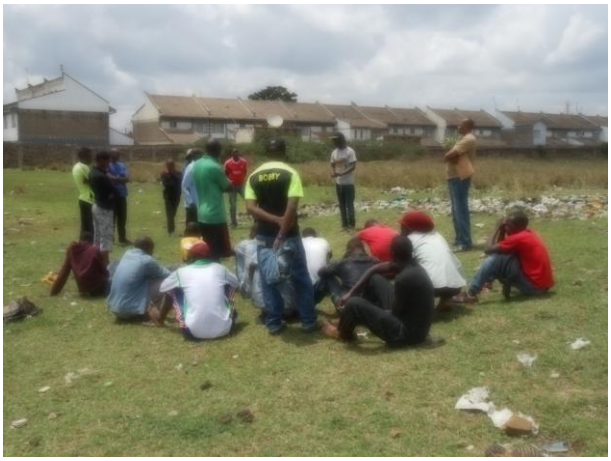
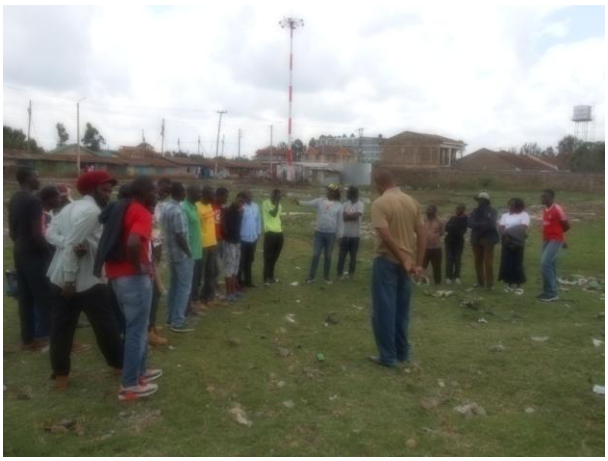
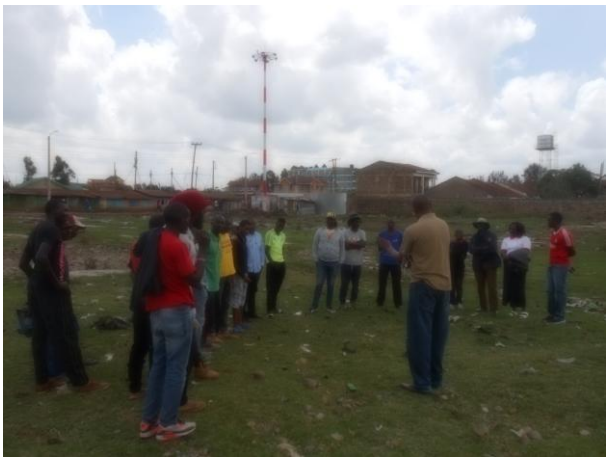
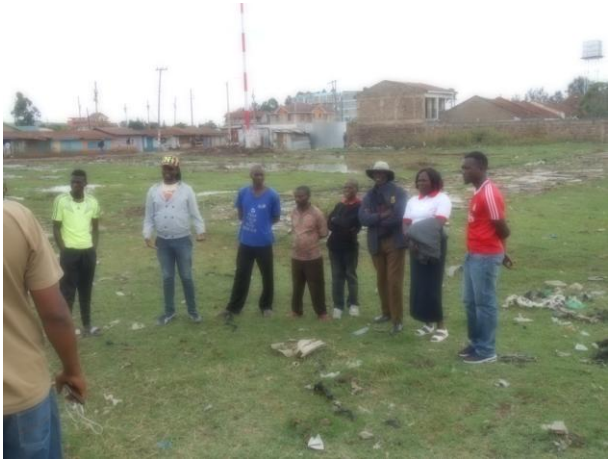
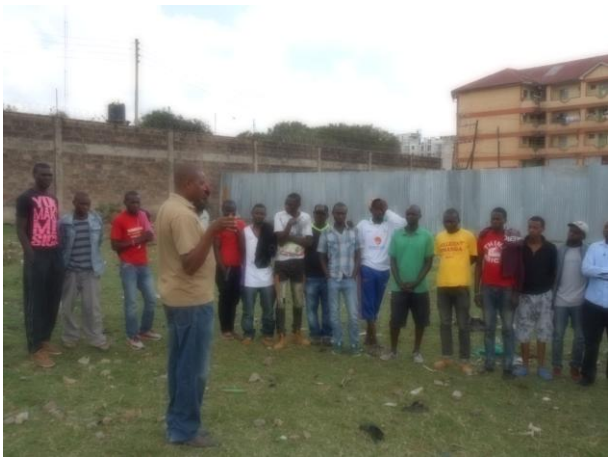
In principle, there was no objection to the proposed project. The most important thing is to appreciate that even if the potential population is not accommodated within the proposed site, they will have to be accommodated elsewhere and wherever that will be is likely to exhibit the same challenges of inadequate services and infrastructure. There is urgent need for the CGN and other relevant government departments and service providers to address issues of infrastructure mainly water, energy, wastewater disposal and roads.

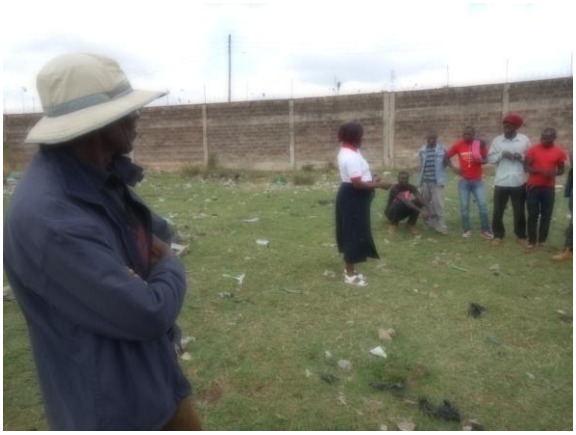
They hailed the proposed project in that it shall create employment, improve area security, increase housing units, improve infrastructure and services, may have an effect of bringing rents down and development of the area not to mention the better utilization of the land.

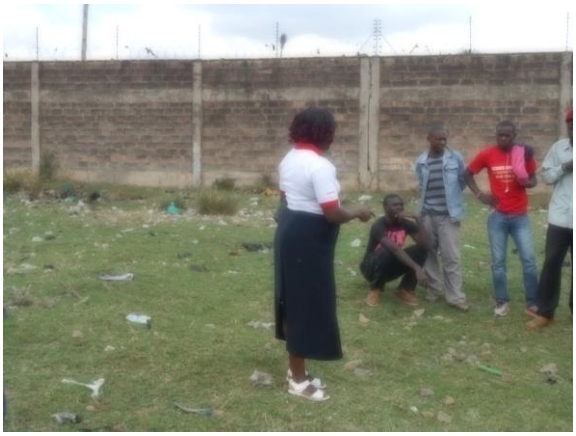
Photos showing some of the attendants of the public participation meeting

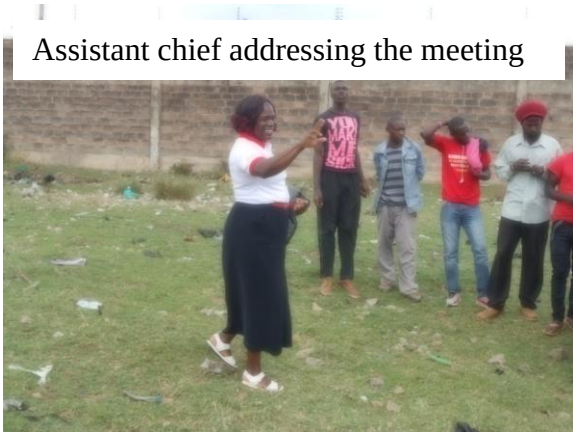




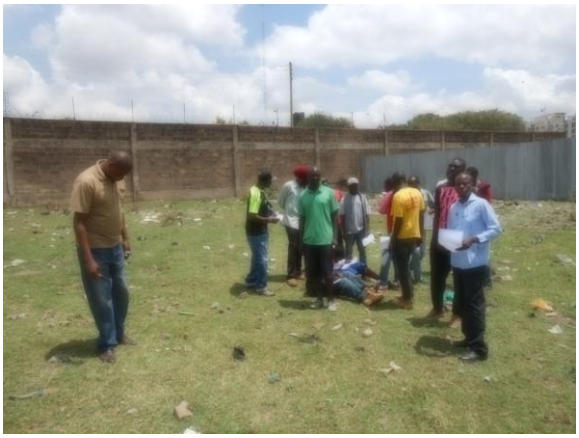







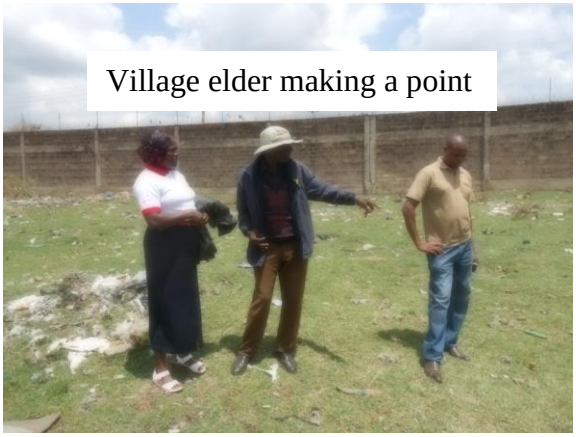




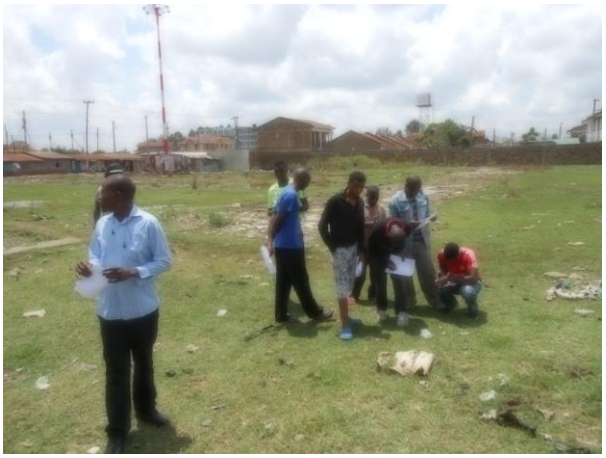


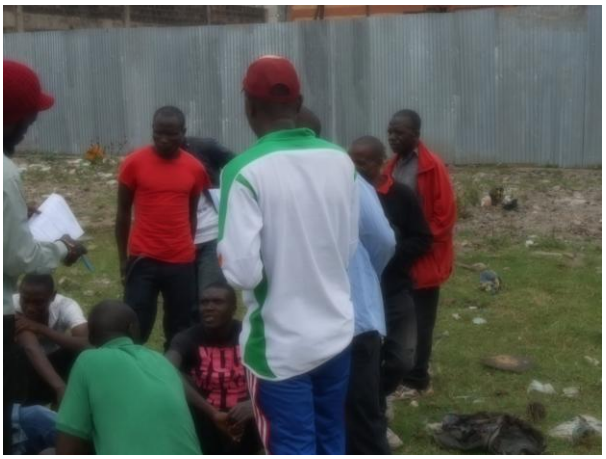
Assistant chief addressing the meeting

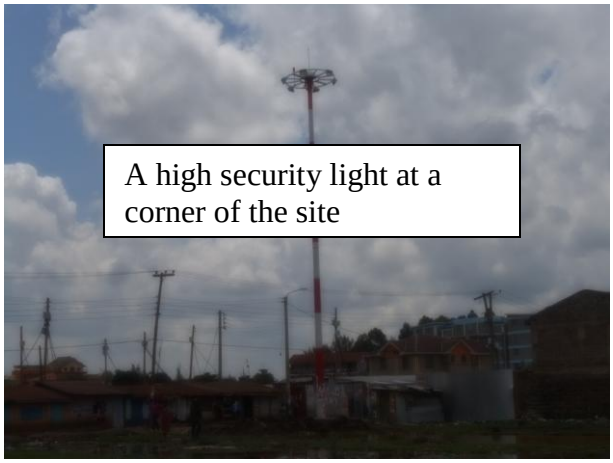




Village elder making a point







Source: Field survey

Project Completion

On approval, the first phase of the project (implementation) which will pave way for the second phase (occupation) which will in turn pave way for the last phase, decommissioning. At the end of the 1st phase, the contractor will leave the site after officially handing over the completed project to the proponent. Before leaving the site, the proponent should ensure that the contractor does or causes to be done the following:

- ※ Comprehensive landscaping of open areas should be done.
- ※ All waste materials must be cleared and removed from the site. However, these should be disposed appropriately and to the approved dump sites in accordance to the laid down regulations.
- ※ The structures should be cleared, cleaned and rubbed of any dust particles before occupation.

POTENTIAL ENVIRONMENTAL IMPACTS

POSITIVE IMPACTS (ECONOMIC AND SOCIAL BENEFITS)

Provision of standard housing and income generation

Housing is a basic good and a major contributor to productivity. Supply of standard and affordable housing has always lagged behind demand for the same and the proposed project has a contribution towards reduction of the deficit. The proposed project shall also increase cash flows to the proponent by renting of the units. This is in line with the government policy of providing standard and affordable housing infrastructure to the society to the tune of 150,000 houses per year. The proposed development will give an opportunity for people to acquire shelter easing housing problems. The project will form a well-planned project and shall include key services, infrastructure and amenities. The project will also include provision of infrastructure including driveway and parking, storm water drainage, outdoor lighting, sewerage and water to local authority's adoptive standards. The proposed project shall inject 345No. residential units to the national stock.

Increase in commercial premises

The proposed project has proposed a commercial building housing a supermarket/minimart and/or shops. This is a boost to the area which does not have such services and will promote business in the area and save the residents valuable time spent moving elsewhere for similar services.

Increase in social services and infrastructure and recreation facilities

The proposed project shall provide a club house. These are social and recreational facilities which are definitely required in the area particularly so by potential increase in area population.

Promotion of healthy competition, convenience and uniformity in land use

The area has been for a long time vacant and/or developed with single dwellings and temporary structures but this has now changed and the area has opened up for multi-dwelling. This has led to the majority of the plots being developed with flats/apartments and the process is ongoing in others. The proposed project shall blend well with the rest. It shall also promote healthy competition in housing market which has an effect on improved service and fair prices.

Optimal utilization of the land

The proposed site was at the time of study vacant but the proposed project shall accommodate at least 345 households and various shops thus raising the utility of the land. The proposed use also conforms to the area's planning policy and is not unique in the neighbourhood. The proposed project site has also proposed a commercial building, and a club house.

Land Values

The opening up of the area by the planning policy and the rush for the plots by commercial developers has led to a sharp increase in land values in the area and in the neighborhood due to the potential high returns after development. This has also led to attraction of middle income groups with improved economic status.

Employment

The proposed project will provide direct and indirect job opportunities to a significant number of the population during construction, occupational and decommissioning phases thus reducing the unemployment and in the process provide livelihood.

Promotion of development

The proposed project has the potential to influence the commercial trends in the area in various ways and in the long run the multiplier effect will lead to development and reduction of poverty. The proposed project shall contribute in overcoming the challenges of today's life including strategies for alleviating poverty and promoting sustainable development.

Increase government revenue

The proposed project shall generate tax revenue for the government directly and indirectly.

Creation of market for goods and services and secondary businesses

The proposed project shall consume various materials during construction such as stones, cement, sand, glass, steel products, wood products, PVC products, ceramic products e.t.c. Various professionals have and shall continue giving their services during both the construction and operational phases and thus making livelihoods. Those doing commercial activities in the neighbourhood shall also have their market widened by the occupants and workers.

Economic returns and promotion of secondary business

Economic-investment by the proponent shall increase wealth. The property owner will enjoy income generated through the sale/rental of the apartments and business premises. The project shall also create market for goods and services and especially construction inputs which include raw materials, construction machinery and labour. Many secondary businesses are also likely to spring up during the construction phase especially those providing foods and beverages to the construction workers. Other businesses will also come up in the in the neighbourhood when the project is complete that will be serving the estate residents

Promotion of social cohesion

The development will bring together people with diverse traditions and culture. It will lead to promotion of cultural interaction.

Promotion of good neighbourliness and saving on costs

The proposed project shall bring at least 345 households to live on the same plot. This may help the households in saving some of the overheads such as security, waste disposal etc since if they were to live on individual plot, some of these costs would have to be borne individually without any economies of scale which are otherwise shared.

Improvement in area security

The land as it is, is expansive to be manned well. There are overgrown bushes in some areas which provide some very conducive hiding grounds for criminals. The development will enhance security in the entire plot thus eliminating such potential threats.

PREDICTED NEGATIVE IMPACTS AND POTENTIAL MITIGATING MEASURES.

This part includes impacts during implementation/construction phase, operation phase and decommissioning phases of the project.

Soil Erosion

This is loss of the top-most soft material on the earth surface (soil) down - slope or transportation by the use of machinery or other equipment including animals. Soil movement is common in construction activities. This mostly happens during the laying of foundations for the projects and site clearing. The top loose material is excavated and transported elsewhere. This also exposes the underlying material to more dangers of degeneration by erosion agents.

In this case soil erosion will not be a major environmental impact especially when the project is over since there will hardly be open areas. However, during site clearing and construction phases, there will be massive movement of soil materials from the site. Most of the vegetation on site will be cleared (and in fact much of it has been extirpated) paving way for soil degradation.

Potential Mitigation Measures

- ※ Avoid unnecessary movement of soil materials from the site.
- ※ Provide soil conservation structures on the areas prone to soil erosion.
- ※ Control construction activities during rainy / wet conditions to mitigate erosion effects to the soil.
- ※ Resurface (pavement) open areas after the completion of the project
- ※ Introduce suitable and well-managed vegetation to generate surface covers on the open areas; to control soil movement by erosion agents i.e. water, animals and wind.
- ※ Provide storm water drainage channel to discharge water to safe areas. Such channels need to be regularly maintained and repaired to avoid point discharges in case of breakages or blockages. Point water discharges usually have pronounced effect to soil erosion.

Water resources; supply and use

Water will be sourced from the approved sources i.e. the NWSC mains. The development will cause strain to the existing water supply since construction activities are known to be heavy water consumers. The project occupation will also bring in very large population which will have direct impact to the water supply (hence high water demand). However, to take care of potential problems, the following is recommended:

Potential Mitigation Measures

- ※ Avoid excessive use of the water supplied by the NWSC. Water supply and use should follow approvals by the service provider and as per the extraction permits.
- ※ Roof catchments should be provided with gutters to facilitate collection of the run-off. This water should be stored for general use i.e. cleaning, fire fighting etc. In fact, the water can be consumed after suitable treatments and approvals by relevant department.
- ※ Sufficient Storage water tanks should be provided.

- ※ The NWSC should ensure long lasting and reliable water supply within its jurisdiction.
- ※ Provide notices and information signs to the involved stakeholders on means and needs to conserve water resource i.e. 'KEEP/LEAVE THE TAP CLOSED', 'WATER IS LIFE. SAVE IT' etc. this will awaken the civic consciousness of the community with regard to usage and management of the water resources.
- ※ Install water conserving taps that turn-off automatically when water is not in use.
- ※ Encourage water reuse/recycling mostly during construction and occupation phases.

Waste water

Sewage is the used water or liquid waste of a community, which includes human and household wastes together with street-washings, industrial wastes such as ground and storm-water as may be mixed with it.

Effluent/sewage resulting from sanitary facilities and wastewater from washrooms is of significant importance to the environment. It must never come into contact with the surrounding i.e. water, soil, air etc. It must always drain effectively into the existing sewer systems via well designed and laid pipe networks.

Sound sanitation should be ensured to influence prevention of the sporadic outbreak of diseases dangerous for the general health of the community (within the projected area), workers and the general public. Either controlling or eliminating such environmental factors that contribute in some form or the other to the transmission of the diseases can achieve this.

Potential Mitigation Measures

- ※ The system (sewer) should be made of hard, strong, durable, smooth, impervious, and non-corrodible materials. The sewerage lines require to be upgraded in order to adequately service the increased levels of sewage discharge due to rising levels of development.
- ※ Sanitary facilities must be kept clean always.
- ※ The proponent must connect the sewerage effluent to the NWSC sewer. The design of the sewer system should consider the estimate discharges from individual sources and the cumulative discharge of the entire project i.e. it must have the capacity to consistently handle the loads even during peak volumes. The gradient should be sufficient to ensure and maintain maximum depth of flow
- ※ The trunk sewer must be regularly monitored to avoid overfilling and overflowing. They must be checked regularly to monitor level of effluent.
- ※ Branches should be streamlined in the direction of flow and there should be no right-angled junctions that would affect the flow of the effluent
- ※ All drain pipes passing under building, driveway or parking should be of heavy duty PVC pipe tube encased in 150mm concrete surround
- ※ All waste pipes must have cleaning roding eyes accessible from outside. i.e. free to every part of the system for inspection, cleaning and repair
- ※ All manholes on drive ways and parking areas must have heavy-duty covers set and double sealed airtight; as approved by specialists.

Surface drainage

As rain falls on a certain area, part of the rainwater is lost through evaporation in the air or percolation into the ground while the remaining overflows the surface as storm water. The run-off from catchments is largely influenced by the size of the catchments, topography, the imperviousness of the surface (i.e. roof, road surface etc) and open surface.

In this particular project some of the surface water/run-off will mainly be absorbed within the property i.e. open areas. However, these (open) areas are limited since much land will be covered by building structures, driveway, parking and pavements. Therefore as rain falls much water is anticipated to overflow the surface as storm water. In connection to this, the amount of water reaching storm water drain channel will be large.

The surface drainage system has been considered to manage storm water such as may be derived from the paved areas (street-wash), courtyards and roof catchments of the buildings. Open (concrete drainage-inverted concrete drains) channels will be use to drain the site off the excess surface water/storm. The channels shall take the influence of the site's gradient and will effectively drain water in to existing drainage system.

The aim of a good surface drainage is to prevent land and human settlement from being saturated with water. Poor drainage causes dampness to building structures as well as water stagnation with a myriad of consequences to human health and safety and buildings. Damp (as influenced by poor drainage), in the presence of warmth and darkness, breeds germs and mosquitoes and may cause acute and Chronic Rheumatism. Poor drainage may also lead to property damage due to flooding.

The drainage of the storm water will be greatly compromised especially if it rains, since storm water drain channels will not be present during construction. In addition, it should be realized that a given area of land can only absorb a certain quantity of rain water/surface water. Therefore in and around the projected area where buildings are built close together, the space of land (left open) which is useful in absorbing the surface water is very small. The drainage of the general property comes in handy to enhance the flow of the much-anticipated surface run-off emanating from the roof catchments and other areas within the site, into the drains.

Potential Mitigation Measures

- During construction, the designs should ensure that surface flow is drained suitably into the public drains provided and water courses. There should be no flooding within the site at all.
- Drainage channels should be provided within the site and should be covered with gratings or other suitable and approved materials. They must be installed as provided for in the approved plans and designs.
- The channels should be designed with regards to the peak volumes i.e. periods or seasons when there is high intensity of rainfall. They should never at any time be full; say due to the resulting heavy downpours
- The drainage channels must ensure the safe final disposal of run-off surface water and must be self-cleaning i.e. should have suitable gradient.
- Storm water generated from roof catchments should be harvested, stored and made use in various household activities i.e. general cleaning. This will minimize resultant soil erosion and other associated impacts. It will reduce strain on the existing water supply systems. In this connection, it would be better if gutters are incorporated in the designs as well as down pipes to enhance water collection in to the storage tanks say of individual households.

Noise and vibration

Noise is unwanted sound that can affect job performance, safety, and health. Psychological effects of noise include annoyance and disruption of concentration. Physical effects include loss of hearing, pain, nausea, and interference with communications when the exposure is severe.

Construction activities will be generating noise and hence affecting the immediate environment; i.e. other operations in the nearby. Such noise will emanate from the construction machinery and equipment i.e. concrete mixers, excavators, workers, trucks and other vehicles accessing the site. It will also affect small animals and bird life.

During occupation noise will come from vehicles, and other operations within the site. Production machines generate/ produce a lot of noise. Hearing protection is thus essential when noise exposures cannot be controlled at their source.

Potential Mitigation Measures

- Use suppressors or silencers on equipment or noise shields for instance corrugated iron sheet structures.
- Construction works should be carried out only during the specified time i.e. from 0800 hrs to 1700 hrs; when most of the neighbours will be at work
- Machineries should be maintained regularly to reduce noise resulting from friction.
- There should be no unnecessary horning of the involved machinery and vehicles.
- Provision of bill boards at the construction site gates notifying of the construction activity and timings.
- Workers should be provided with relevant personal protective equipment/ materials such as earmuffs and earplugs when operating noisy machinery and when in noisy environment. These provide a physical barrier that reduces inner ear noise levels and prevent hearing loss from occurring.

Air quality

The construction activities on the site will result to increased dust and gas emissions. Construction machinery and trucks (including small vehicles) generate hazardous exhaust fumes such as Carbon Oxides (CO_x), Sulphur Oxides (SO_x) and Nitrogen Oxides (NO_x). Dust particles caused by vibrations of machines and vehicle movement suspends in the air mostly during dry spells. Diesel engines emit black carbon, which absorbs sunlight and warms the atmosphere and micro-particles. Unseen and odorless, microscopic particles of air pollution is very harmful. Exhaust from diesel engines and dust swirl into an insidious cocktail of tiny particles that can spend weeks airborne. The most harmful are the smallest, less than 2.5 microns in diameter; when inhaled, the lungs or pass directly into the bloodstream and damage arteries

Potential Mitigation Measures

- Provide Personal protective Equipment (PPE) such as nose masks to the workers on site.
- Regular and prompt maintenance of construction machinery and equipment. This will minimize generation of noxious gases and other suspended particulate matter.
- Control over areas generating dust particles. Such areas should be regularly cleaned or sprinkled with water to reduce dust. The areas can be enclosed to mitigate effects of wind on them.
- Workers should be trained to understand the hazards that may be generated in such work environments.

- ※ Workers should be encouraged to go for regular health check-ups to ascertain their health standards.
- ※ Enclose the site with dust-proof net during the construction

Oil Leaks and Spills

It is important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment. They contain such heavy metals as mercury, lead, and sulphur among others. Though this may not be common at the site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery.

Potential Mitigation Measures

- ※ All machinery must be keenly observed not to leak oils on the ground. This can be affected through regular maintenance of the machinery.
- ※ Maintenance must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground. Such areas should be covered to avoid storm from carrying away oils into the soil or water systems. Waste water/ wash water from these areas should be properly disposed.
- ※ All oil products and materials should be stored in site stores or in the contractor's yard. They should be handled appropriately to avoid spills and leaks.
- ※ Car wash areas and other places handling oil activities within the site must be well managed and the drains from these areas controlled. Oil interceptors must be installed along the drainage channels leading from such areas.

Solid Waste

Construction activities results to increased solid wastes within the sites. Such waste materials include excavated soil, stones, construction debris, wood, broken glasses, containers, rods of metal, pieces of iron sheets, extirpated vegetation on the site, kitchen materials and other general refuse especially during the occupation of the project etc.

On completion, the site will be generating waste products from various operations and activities. Removal and disposal of refuse comes under public cleaning and is very important and costly item on the CGN budget. If it is not removed promptly away from the generation points (within the apartments, business premises and elsewhere), it accumulates in large heaps harbouring rats, flies and vermin which disseminate germs of disease. A good deal depends upon the mutual cooperation between the local authorities and the public. Proper maintenance and use of dustbins is the key to the satisfactory solution of the problem of sanitary storage and collection of refuse without causing nuisance.

The problem of dealing with refuse resolves itself into four parts: *storage, collection, transportation and disposal*. Therefore bins come in handy during storage and collection; both in the units and on foot paths of the streets for the throwing of whatever rubbish such as paper wrappings, cigarette ends etc., into them instead of scattering them all over. Transportation of the collected waste need be simplified and finally, the use of sound method of

waste disposal. The proponent shall set provide dustbin cubicles in the project site to facilitate solid waste management.

Potential Mitigation Measures

- ※ The contractor or proponent should work hand in hand with private refuse handlers and the CGN to facilitate sound waste handling, and disposal from the site. All wastes must be taken to the approved dumpsites.
- ※ The wastes should be properly segregated and separated to encourage recycling of some useful waste materials; i.e. some excavated stone materials can be used as backfills. (Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composing and reuse, and sanitary land filling)
- ※ On completion, the project management should adapt effective waste management system to handle solid materials that will be generated from various operations. (Use of an integrated solid waste management system; through a hierarchy of options: source reduction, recycling, composing and reuse, and sanitary land filling)
- ※ There should be several bins - The bins should have a close fitting cover, lest stray dog's might scatter the refuse. The receptacle(s) must be kept in a good condition, and sanitarily clean by frequent washing and disinfecting. The first action should be reduction of waste at source and all residents must be encouraged and sensitised on reduction or waste. Biodegradable waste should be composted for use in the gardens. There should be several bins clearly labelled and possibly colour coded to handle various categories of waste. Food remains can be fed to dogs and/or sold out on daily basis to farmers for dogs or other animals while Plastics and polythene materials should be sold or given away to the approved plastic recyclers while paper waste should be sold to waste paper recyclers (e.g. Kamongo). Glass waste should be sold to glass manufacturers for recycle. Tins and scrap metal/waste metals should be sold to approved scrap metal dealers or steel rolling mills for recycle. Wastes from wood and related products should be reused out sold out for use elsewhere or as firewood. Any unrecyclable waste should be disposed to approved dump sites and as per the Waste Regulations
- ※ In addition to the bin to be provided by each unit, the proponent should provide a number of dustbins strategically on the footpaths of the driveways for the pedestrians to throw whatever rubbish instead of scattering them on the road surface or compound. These bins should better be fixed to posts one or two feet above the ground so as not to be within reach of dogs and other scavengers etc.
- ※ The collection should be made at least once in 24 hours, and it should be done in such a way as to minimize nuisance of smell and dust during filling into carts or vans or any employed (suitable) collection method. All the refuse collected must be carried away from the storage site to a safe place where it can be suitably disposed. Lastly, suitable and most effective method of disposal should be applied.
- ※ Train or educate the involved stakeholders on the importance and means of waste (garbage) management and handling especially during operation.
- ※ The contractor or proponent should work hand in hand with private refuse handlers, NEMA and the CGN to facilitate sound waste management as per the prevailing regulatory provisions.

Ecological impacts: Flora and Fauna

Vegetation has a great effect on the general and localized environment and normally can modify microclimate. Usually, the flora creates a good environment for habitats thus the two may go together more often than not. In consequence, de-vegetation may result to negative effects on the fauna. Singly, the proposed project may appear of no significant impact but the cumulative effect in concert with other current and future projects are

capable of significant and serious effects including but not limited to soil erosion, decreases in air purifiers (carbon sinks) and thus contribution to global warming etc.

There will be some temporary and permanent disturbances to small animals / bird life especially those that inhabit the vegetation.

Mitigation

- Avoid unnecessary clearing of vegetation by conserving vegetation not in the sections being built up
- Landscape and plant vegetation in all open areas after the completion of the project and manage the introduced vegetation on completion of the development to restore or improve the site.

Construction materials

They include stones, sand, cement, ballast, reinforcing steel rods etc. They should be of the appropriate quality.

Potential Mitigation Measures

※ Should be sourced from licensed dealers and suppliers.

※ Quality should be thoroughly controlled through regular tests.

※ Procurement of the materials should follow specifications by the structural, mechanical and architectural engineers or other relevant professionals as appropriate

Visual Intrusion

Visual impacts occur during earthworks for the foundation of projects. However, the proposed project will not by far be out of scale with the existing projects or developments (within the area). The visual impact will not be significant and will have very little affects neighbouring activities and the general public. There are already completed similar projects in the immediate neighbourhood, which is thought to have psychologically prepared the general environment.

Potential Mitigation Measures

※ On completing the earthworks, the worked area should be restored through backfilling, levelling and planting of vegetation. All existing trees not in areas under construction should be spared.

※ All solid waste and debris from construction site must be cleared on completion.

※ The scheme should be blended in a way to merge with existing environment. It should in fact upgrade the quality of the surroundings. Landscaping and planting of vegetation especially trees shall go a long way in mitigating the visual intrusion.

Public safety, traffic, Occupational safety and health

During construction, there will be increased dust, air and noise pollution. These are considered as negative impacts as they significantly lower the quality of environment. The residents and workforce involved would be more subjected to these environmental hazards.

Food for the construction workers is provided by mobile individuals most of which operates without licenses. This can compromise health of the workers especially if such foodstuffs are prepared unhygienically. Road entry and exit may also be a risk if not properly designed and controlled and more so the heavy trucks during construction. Traffic congestion is also a problem during occupation because the proposed project may add more than 345 cars.

Mitigation measures

- Provide properly fitting personal protective equipment (PPE) depending on tasks being performed to avoid injuries and illness including working boots, overalls, helmets, goggles, earmuffs, masks, gloves etc
- OSHA abstract should be posted at a strategic point on site. The requirements of the **OSHA** should be strictly adhered to, the **Building Code** and other relevant regulations. Only specialised machine operators should operate machinery and specialised equipment and all moving parts should be provided with appropriate guards. A first aid kit should be provided within the site. This should be fully equipped at all times and should be managed by qualified persons.
- Properly design to allow for deceleration and acceleration to the site. Clearly indicate direction of traffic throughout the project cycle. Internal driveways should also be erected with bumps to control speed and thus reduce potential accidents. There should be careful design and layout of the site entrance, providing adequate visibility
- Adapt effective emergence response plans especially during construction phase.
- Safety awareness may be gained through regular safety meetings, safety training or personal interest in safety and health. This awareness will increase ability to respond if, some day in future, one is a bystander in an emergency.
- The contractor should have workmen's compensation cover. It should comply with workmen's compensation Act, as well as other ordinances, Regulations and union Agreements.
- Sanitary facilities should be provided (for each sex where conditions warrant). Standard cleanliness of the facilities should be maintained.
- Local individuals preparing food for the workers at the site should be controlled to ensure that food is hygienically prepared.
- Workers during construction phase should always be sensitized on social issues such as drugs, alcohol, diseases etc. There should be training programs to facilitate this.
- Proper waste management of domestic waste to prevent vectoral diseases.
- Public awareness campaigns on the prevention and management of prevalent diseases such as malaria, STDs and HIV AIDS.
- Ensure (consistently) good water quality through regular water analysis to ascertain compliance to public health standards.

Accident prevention and Emergency Response Plan (ERP)

Emergencies and disasters are a reality of everyday life Stakeholders must therefore be sensitized and prepared on how to react during all the phases (the construction, occupational and decommissioning). Absence of such plans may be risky since there would be no guidelines to handle or control emergencies if they occur. The proponent and the contractor shall take all necessary steps to prevent accidents in the entire project cycle. All construction safety procedures shall be followed as discussed elsewhere in this report while measures to prevent and manage fires shall be taken as discussed elsewhere in this report. For further management of any foreseeable accidents, the proponent shall develop an ERP which shall be documented and all the residents shall be provided with the requisite training and annual drills conducted.

The ERP shall typically contain all information on all likely types of emergencies likely to be encountered mainly accidents and fires. The ERP shall include actions to be taken in case of emergencies and shall display emergency contacts (ambulance, doctors, police and fire engines) telephone list; simple instructions on do and don'ts in various emergencies such as fires, LPG incidents etc. On traffic safety, the road shall be constructed to adoptive standards and all entry and exit points provided with clear views. Bumps shall erected to control speed along the driveway and the driveway. The ERP shall also provide for basic First aid training to some of the potential residents. The ERP shall also promote good neighbouriness which shall go a long way in emergency response. Such plans must be properly documented and made available to all. A fire assembly point must be identified and clearly marked for example.

Security

Security is a prerequisite for any development. During construction, security is very important in any site. This ensures that materials are in order. It also controls movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site.

The area is well covered with communication facilities, which facilitate security to large extents. After the project is over, security guards and facilities should be provided. The issue has been catered for in the drawings.

Potential Mitigation Measures

- ※ The project should be enclosed using suitable walls to beef-up security and to control movement within the site.
- ※ Security guards must always guard the gate to the estate to keep away the intruders and to control movement within the site.
- ※ Lighting as well as security alarms should be installed in strategic positions all over the site after the completion of the project.
- ※ Contractor should provide adequate security during the construction period when there are no works on the site.
- ※ The guards stationed at the gates should document movements in and out of the site/ property.

Fire preparedness

Fire outbreaks are common in Kenya and they usually subject detrimental effects to the environment. Fire causes both economic and social drawbacks. There are operations that are prone to such outbreaks at construction sites. It is therefore always important to consider the issue of fire.

Potential Mitigation Measures

Recommended Fire fighting equipment:

Potential causes of fire are many and varied electrical faults, smoking, gas leaks, carelessness etc. Fire incidences result to economic and social drawbacks. It is therefore always important to consider the issue of fire by bringing in the element of preparedness. In this regard, the design should provide and recommend implementation of fundamental fire fighting measures and control facilities.

- Install an automatic fire alarm system for the entire project mostly on occupation, provide 2No. 30m hose reels per floor and provide for adequate fire reserve water storage tanks with an automatic booster pump for hose reel and 2No. 9kgs water or powder fire extinguisher for every floor. Provide 3No. powder or carbon dioxide extinguishers for every floor where there is parking and install a sprinkler system for parking areas.
- Provide appropriate Fire Hydrant Ring main with suitable outlet points.
- Install heat and smoke detectors on each floor
- Install manual electric break-glass fire alarm system with secondary power
- All installation to follow CGN Fire Masters requirements approval.
- Conduct regular fire fighting drills/simulations to sensitize workers/residents and adapt an emergency response plan for the entire project during occupational phase.
- Ensure that all firefighting equipment are strategically positioned, regularly maintained and serviced.
- Provide fire hazard signs such as 'No Smoking' signs, Direction to exit incase of any fire incidence and emergence contact numbers should be provided as well as the assembly points.
- Conduct regular fire fighting drills within the site and adapt an emergency response plan for the project (during construction and implementation stages)
- Provide fire hazard signs such as 'No Smoking' sign, Direction to exit in case of any fire incidence and emergency numbers and display strategically contact/emergence numbers

Conflict with the community

Projects of such magnitude usually attract public uproar (especially from the neighbouring residents and community) if they are not made to own the project. Conflicts usually arise mostly from the foreseen negative impacts.

Potential Mitigation measures

※ Consultation with neighbours on the mitigation measures prescribed for the negative impacts as a way of conflict resolution and neighbourhood association.

Enhanced Social crime risks

Due to the influx of construction workers on site, there are chances of introduction of individuals with potentially anti-social behaviours such as thieves/thugs, drug users and traffickers and may pose a risk to the community both during the implementation and occupational phases.

Mitigation

Adopt strict hiring guidelines to lock out the bad elements and limit movement outside the site. The contractor has a responsibly of sensitising the workers on social issues such as HIV/AIDS, drugs and other social issues through regular training and social gatherings and strict monitoring. Workers should not be housed on site.

Construction safety

Construction work can be particularly hazardous. Personal protective equipment, fire safety, electrical safety, and other precautions are essential for safe construction work. Follow these guidelines when visiting or working at construction sites:

- Do not walk, stand, or work under suspended loads. If you raise a load, be sure to crib, block, or otherwise secure the load as soon as possible.
- Avoid placing unusual strain on equipment or materials.
- Be prepared for unexpected hazards. BE ALERT!
- Proper personal protective equipment, (i.e. safety shoes, hardhat, goggles, Respiratory Equipment and gloves) must be used at all times on the site or as conditions warrant. Jewelry should be avoided.
- Prior to the start of construction, all areas should be inspected for the presence of potentially hazardous energy in the area should be located and precautions taken.
- Workers should be trained on the proper use of tools and protective equipment.
- Great care must be given to excavations and the safety of the machinery, tools and other equipment such as scaffolding, ramp or ladder must be guaranteed. Accident prevention should be the overriding safety precaution. A qualified person should always be on site to oversee the working.
- Any area that poses a physical threat to workers and/or pedestrians requires barriers or guards.

Contractors and project managers should use barriers and guards as necessary to protect employees, and visitors from physical hazards. Areas that typically require permanent or temporary protection include the following:

Stairways, Open Manholes, Elevated platforms, Areas with moving machinery, Excavation sites, Construction sites, Temporary wall or floor openings, Doors opening into construction.

Community Facilities and Social Infrastructure Services

The increased population accommodated in the proposed housing developments has not been adequately provided with a commensurate increase in the community facilities and services. These include recreation facilities (such as public open spaces, playgrounds and sports facilities), education and health facilities, social and community halls, religious facilities, homes for special needs, police stations, post offices, administration facilities, and roads, water supply, sewer etc. The inadequacy of these facilities has led to unplanned and spontaneous change of use of other properties to accommodate these deserving community facilities and services.

Mitigation

The CGN and other government agencies together with all stakeholders (including developers) should discuss for a solution and come up with a comprehensive development plan.

Potential proliferation of business centres and kiosks

Due to the business opportunities presented by such developments, there is a likelihood of erection of kiosks along road reserves and other commercial centres beyond areas designated as commercial zones

Mitigation

The CGN and other government agencies together with all stakeholders (including developers) should discuss for a solution and come up with a comprehensive development plan to avoid flouting of Building development regulations and zoning guidelines with impunity. The CGN should strictly enforce the planning policy

ALTERNATIVES

The proposed Alternative

The EIA Study report has been prepared for submission to NEMA; facts, findings and recommendations/proposals of which are based on the proposed site, design, materials and proposed technologies. This helps in evaluating and examining the foreseeable effects of the project on the environment and therefore assisting in addressing how the proposed development has to ensure that all environmental measures are complied with during the premises preparation and during operational phase.

The alternative consists of the proponent's/applicant's final proposal with the inclusion of the legal guidelines, regulations and procedures as stipulated in the EMCA, 1999 which aims at reducing environmental impacts to the maximum extent practicable. Appropriate Environmental Management Plans have been prepared as per the proposed project.

Relocation alternative

Relocation option to a different site is an option for the project implementation. At the moment, the proponent has no alternative sites for relocation. Finding and acquiring land to accommodate the scale, type and size of the project and completing official transaction on it may take a long period. Besides, there is no guarantee that such land would be available and suitability is another very important factor, which cannot be ignored.

While we appreciate that monetary costs should not be used to justify a wrong project, this would also call extra costs in terms of money and time for example whatever has been done and paid to date would be a direct loss to the proponent. This may also lead to a No Action Alternative situation. The other consequence is that it would discourage both foreign and local investors especially in the housing sector that has been shunned by many public and private investors hence aggravating the housing short fall. In consideration of the above concerns and assessment of the current proposed site, relocation of the project is not a viable option. The problem is further aggravated by the fixed characteristics of land and the bottlenecks of the planning policy.

The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. The anticipated insignificant environmental impacts resulting from construction, and occupation activities would not occur.

This option will however, involve several losses to both the project proponent/land owner and other stakeholders; society and government. The landowner will continue to pay high taxes on the unutilized property. The No Project Option is the least preferred with reasons such that there will be no incremental housing stock and business premises, forfeiture of economic benefits that would accrue to the proponent, the public and the government, and it could also discourage investors wishing to invest in the housing sector.

From the analysis, it becomes apparent that the No Project Alternative is not the appropriate alternative.

Alternative design, layout and technology

Various alternative designs and technology has been evaluated by the proponent and various professionals involved. After extensive discussions and relevant considerations, the various options were assessed and the most optimal design and technology were agreed as per the proposed plans, materials and technology. There is the alternative design as to accommodation details and the size of the usable areas. These alternatives however shall call for little re-designing/orientation and positioning and could be worth further exploration.

Alternative landuse

The proponent has an option to use the land for other purposes other than the proposed residential apartments, business premises and related facilities development. The proponent may decide to use the land for commercial development such as a hotel, office block etc or even industrial, may opt to sell or use it for the myriad of the alternative other land uses. This option however calls for change of use and whatever the type of project, it will still have its potential impacts some even worse than the proposed project depending on their nature for example industrial activity. The land is too small and unsuitable for any agricultural activity.

The comparison of alternatives

Under the proposed Development Alternative, the project would create more and standard housing stock and business premises and would provide employment directly and indirectly to the public. It would provide jobs for the workers during construction. After completion more jobs would be generated during occupation. Under the No Action Alternative, there would be no development at all. There would be no benefits from the site and neither would there be the insignificant environmental Impacts. Layout redesign may perhaps give an optimal design and should be explored for optimization of the benefits and environmental enhancement.

Provided the Environmental Impact mitigation measures are implemented as well as adoption of sound construction management practices, negative impacts will be avoided/minimized. However, commitments related to development alternative would ensure that potential impacts are minimized to levels of insignificance as envisaged in the EMP.

Mitigation for the proposed Action

Mitigation measures for the proposed action are included in herein in this report and in the EMP.

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Environmental/ Social Impact	Project phase	Proposed Mitigation and Aspects for Monitoring	Responsibility for intervention and monitoring during design, construction and defects liability period	Responsibility for mitigation, monitoring and/or maintenance after defects liability period	Estimated Cost (Kshs)	Monitoring means	Recommended frequency of monitoring and indicators
Increased use of resources	Construction and occupation	• Conservation of resources ; use of renewable resources & rain water harvesting • Sourcing materials from environmentally compliant suppliers/sources • Use of recyclable materials	Contractor/Proponent	Contractor/Proponent	-	Inspection/ observation/records	Daily
Surface drainage	Construction and occupation	• proper Installation of surface drainage structures • rain water harvesting and storage	Contractor	Proponent/property manager	2,500,000	Inspection	During construction and on completion of the structure
Soil degradation	Construction and occupation	• Sound management of earthworks and heavy machinery/equipment • Sound soil erosion control measures • Sedimentation control/prevention	Contractor	Proponent/property manager	1,500,000	Inspection	Daily
Air pollution	Construction And occupation	• Enclose the site & buildings under construction with suitable dust nets /screens • Sprinkle water to dry soils in excavated areas & earth roads to suppress dust. • Covering friable material loads during transportation • Strict adherence to Air quality Regulations, 2014	Contractor	Contractor	3,000,000	Inspection/ observation	Daily
Noise pollution	Construction and occupation	• Maintain machinery , plant equipment • Construction activities to be restricted between 8 am – 5pm • Workers exposed to high-level noise to wear safety & protective gear. • Adherence to Noise and Excessive Vibration Pollution (Control)	Contractor	Contractor	1,000,000	Inspection/ observation	daily

		Regulations, 2009					
Water resources	Construction and occupation	• Construct water reservoirs and rainwater harvesting systems • Installation of water conserving taps ; waste water recycling and reuse	Contractor	Proponent/property manager	5,000,000	Inspection/ observation	Random
Public health; Occupational Health & safety	Construction and occupation	• Train staff/workers on occupational health and safety and Provide full protective gear • Design and disseminate appropriate emergency response plans • Installation and maintenance of fire prevention, control and management measures • Ensure machinery and equipment servicing and maintenance as per schedules & legal requirements • Ensure adherence OSHA , 2007.	Contractor, supervising Foreman	Proponent/property manager	500,000	Observation & records	Daily
Waste Management	Construction and Occupation	• Waste minimization by ordering right/accurate quantities and sizes rather than cutting to sizes leaving wastes or ordering excess quantities leaving residuals • Waste recycling and reuse e.g. excavated soil used in landscaping the site and rehabilitation of quarry pits off-site • Connection of sewerage effluent to the NWSC sewer system. • Incorporate suitable facilities for collection, segregation and safe disposal of solid wastes. • Adherence to Waste Management Regulations, 2006	Contractor and proponent	Proponent /Property Manager	50,000 monthly	Observation	Daily

ENVIRONMENTAL MANAGEMENT/MONITORING PLAN FOR THE DECOMMISSIONING PHASE

Expected Negative Impacts	Recommended Mitigation Measures	Responsibility Party	Time Frame	Cost (ksh)
1. Construction machinery/structures & wastes				
• Scraps and other debris on site	• Use of an integrated solid waste management system i.e. through a hierarchy of options: • Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. Disposal locations will be selected by the contractor based on the properties of the particular waste stream. • All buildings, machinery, equipment, structures and tools that will not be used for other purposes should be removed and recycled/ reused say in other projects • Where recycling/reuse of the machinery, equipment, implements, structures, tools and other waste is not possible, the materials should be disposed to approved dumpsites.	Contractor, Proponent/property manager	One-off	3,000,000
• Potential Pollution	• procedures for finding contaminated material during excavations will be established • covering and damping of excavated materials • appropriate storage of contaminated material if found. Ground contamination and storm water contamination will be limited on site by proper handling and storage of materials and equipment.	Contractor, Proponent/property manager	One-off	1,000,000
2. Rehabilitation of project site				
• Vegetation disturbance • Land deformation: soil erosion,	• Implement an appropriate re-vegetation programme to restore the site to its original status	Contractor, Proponent/property manager	One-off	2,000,000

drainage problems • Restoration of site	• During the re-vegetation period, appropriate surface water run off controls will be taken to prevent surface erosion; • Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; • Fencing and signs restricting access will be posted to minimize disturbance to newly-vegetated areas; • Carry out soil tests foe contaminants & if need be scoop out any contaminated soils and replace with uncontaminated soil from another source Comprehensive Landscaping	Contractor, Proponent/property manager	One-off	2,500,000
3. Safety of the project				
Occupational hazards	• Ensure that safety measures have been effectively integrated and positioned in respective areas of the project to control and manage fire outbreaks • Staircases and other hazardous areas shall be suitably protected say using strong rails to avoid occurrence of incidences	Contractor, Proponent/property manager	One- off	1,000,000
4. Safety and Social-Economic impacts				
• Loss of income • Reduced ability to support dependants • Loss of quality of life • Loss of benefits i.e. medical, insurance cover etc	• The safety of the workers should surpass as a priority of all other objectives in the decommissioning project • Adapt a project – completion policy: identifying key issues to be considered. • Assist with re-employment and job seeking of the involved workforce. • Compensate and suitably recommend the workers to help in seeking opportunities elsewhere. • Offer advice and counseling on issues such as financial matters. • Encourage workers to register with retirement benefits scheme of their choice	Contractor, Proponent/property manager	One- off	5,000,000

CONCLUSION AND RECOMMENDATIONS

The proposed project shall add 345No. residential apartments/studios in the existing housing stock implying that 345 individuals and/or households will be accommodated not to mention the much needed business premises, social and recreational facilities. This is a giant step towards regional and national development.

This study indicates that the construction and occupation/operation of the proposed project will have positive impacts, which include employment, increase in the national/local housing stock and quality, increase in business premises, increase in government revenue, improvement in security, increase in social and recreational facilities/services, improvement in infrastructure and services and improvement of standards of living. However, despite the outlined positive impacts, the proposed development will come up with some negative impacts such as increased pressure on existing infrastructure, potential pollution (to air, water, soil) mostly during construction phase, noise, enhanced security risks and social crimes, occupational and safety hazards and increased waste (solid and liquid) generation among others.

The proposed project design has integrated mitigation measures with a view to ensuring compliance with all the applicable laws and procedures as well as the legislation and regulatory framework that govern environmental management. The structures should be built to the required planning/architectural/structural standards of the CGN, ministries of land and housing, NEMA and MOH. During project implementation and occupation, sustainable environmental management should be ensured; avoiding inappropriate use of natural resources, conserving nature and guaranteeing health and safety of all people, working on the project, general public and inhabitants of the project. There is need for the expansion of infrastructure such as road, water, sewer & power.

From the foregoing and taking into consideration of all the foreseeable and relevant aspects, the proposed project is beneficial and important. It is our considerable opinion that the proposed development is a timely venture with a positive and significant contribution to the government housing policy. It is thus our recommendation that the project be allowed to go ahead with the implementation provided the outlined mitigation measures are adhered to. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment. This will however be overcome through close following and implementation of the recommended Environmental Management and Monitoring Plans (EMPs).

The project proponent should also work closely with service providers, NEMA, environmental Experts, CGN and other bodies to enhance the facilitation of any issues of concern. This will ensure that environmental concerns are integrated into the project at every stage of the implementation phase. It will enhance the co-existence of the proposed project with the environment, during the entire project cycle. The various service providers (power, sewer, water, garbage collection e.t.c.) must assess the respective requirements. The proposed design has met the basic requirements such as the minimum habitable room sizes and basic social services. It is recommended that that on approval, the proponent should implement the project on the proposed drawings and if alterations are necessary, approval should be sought. Conservation of resources such as energy and water within the project during construction and occupation phases should be encouraged. Sound construction practices aimed at environmental conservation should also be adopted and special attention should be paid to the extended sources of raw materials such as water, sand, stones, and energy. Some construction 'waste' materials can be re-used in other areas and forms

Wastes should be reduced to the minimum to save on costs and environmental pollution prevention. The operators during both the construction and operational phases should exercise diligence in all activities to ensure environmental sustainability. During project implementation and occupation, *sustainable environmental management (SEM)* shall be ensured. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment.

REFERENCES

1. Copies plans, documents and information availed by the proponent and other stakeholders

2. Kenya gazette supplement Acts 2000, Environmental Management and Coordination Act No. 8 of 1999. government printer, in Nairobi

3. Kenya gazette supplement Acts physical planning Act, 1999. Government printer, in Nairobi.

4. Kenya gazette supplement No. 56. Environmental Impact Assessment and Audit Regulations 2003. Government printer, Nairobi.

5. Kenya gazette supplement Acts local authority Act (cap 265). Government printer, Nairobi

6. Exploratory Soil Map and Agro-Climate Zone Map of Kenya, 1980, Scale 1:1 *by Sombroek W. G., Braun H. M. M. and Van der Pouw B. J. A., 1982*

7. Nairobi District Development Plan- 2004 -2008. Ministry of planning and National Development. Government printer, Nairobi.

8. The Making of a Framework Environmental Law in Kenya, *by ACTS press, UNEP-ACTS, 2001*

9. Environmental Assessment Sourcebook Volume I (Policies, procedures, and cross-sectoral issues), Volume II (sectoral guidelines) Volume III (guidelines for Environmental assessment of energy and industry projects) *by, World Bank, Washington, 1991*

10. *Dharani N. 2002.* Field guide to common Tree & Shrubs of East Africa. *Struck Publishers, Cape Town, South Africa*

11. *Environmental Management and Coordination Act, 1999.*

12. Relevant government Acts.

13. Sanitation Engineering, *volume I and II*, by R.S. Deshpande

14. Nairobi A to Z by R. Moss

ANNEX: Attachments

Sketch map showing location of the proposed site

Copies of the proposed plans

Copies of Title deeds

Copies of consultation and public participation filled questionnaires