ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR PROPOSED INSTALLATIONS AND OPERATION OF PYROLYSIS PLANT ON LR NO. KWALE/MWAVUMBO/1, KALALANI (MWANDA A') VILLAGE, SAMBURU KWALE SUB-COUNTY, KWALE COUNTY.

This Environmental Impact Assessment (EIA) Project Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003

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The environmental experts who participated in the environmental impact assessment study for the Proposed Project for Pyrolysis Plant on L.R. No. Kwale/Mwavumbo/1 area Off Mombasa-Nairobi highways Kalalani Location in Kwale County, within the republic of Kenya, are listed below.

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I submit this Environmental Impact Assessment Report for the Proposed Pyrolysis Plant project on Plot L.R. No. Kwale/Mwavumbo/1, (Mwanda A") Village Samburu area Kwale sub county off Mombasa-Nairobi highway Kwale County, within the republic of Kenya. To my knowledge all information contained in this report is accurate and a truthful representation of all findings as relating to the project.

PROPONENT/CONTACT PERSON

Name: ABUBAKAR SWAIBU

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Signature: .....

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ACRONYMS, ABBREVIATIONS AND SYMBOLS

^0C	Degrees Celsius
WSSD	World Summit for the Social Development
UNCED	United Nations for the Environmental Development
EIA	Environmental Impact Assessment
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
EA	Initial Environmental Audit
KM^2	Square Kilometres
M^2	Metre Squared
EIK	Environmental Institute of Kenya
GHG	Greenhouse Gases
KWS	Kenya Wildlife Services
NEC	National Environment Council
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
PPE	Personal Protective Equipment
TOR	Terms of Reference
VAT	Value Added Tax
SWM	Solid Waste Management
Ha	Hectares
%	Percentage
WRA	Water Resources Authority

EXECUTIVE SUMMARY

Introduction

Industrialization in Kenya and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006, has necessitated the need to develop a Used tyre treatment plant based on thermal destruction of raw materials (used tyres and plastic) under the high temperatures and lack of oxygen into the products with the smaller molecular mass: liquid pyrolysis oil, carbon black and metal thus promoting recycling of waste products in order to cope with the increased waste tyres produced from ever increasing motor vehicle imports in the country. Most of the old tyres are thrown into landfills or burned to extract wires. In the natural environment, the tyres take approximately 150 years to decompose and this is accompanied by a number of leaching of toxic organic compounds into the soil.

This report was carried out so that proponent can meet the ever demanding regulatory framework. Visun Indutries Ltd was registered to undertake pyrolysis activities within a six acres piece of land bought by the directors of the firm within Mwavumbo ranch. The proposed site is secured with a perimeter wall

Visun Industries Ltd is planning to install and Operate a waste tyre pyrolysis plant in Mwavumbo Kwale County near to the Abisinia Steel mill plant, to convert waste tyre to diesel oil. The process will involve molecular breakdown of larger molecules into smaller molecules in presence of heat and in the absence of oxygen, a process also known as thermal cracking, thermolysis, depolymerization. During the process, object's molecules are subjected to very high temperatures leading to very high molecular vibrations. At these high molecular vibrations, every molecule in the object is stretched and shaken to such an extent that molecules starts breaking down into smaller molecules.

The site is expected to be designed such as to ensure optimal utilization of space, ensure minimal waste movement, easy and safe movement for the forklifts and other machines. At full operations the plant is expected to help recycle a lot of waste from within the country. Wastes will be segregated and contained safely at specific locations around the premises. Spills, emissions and friable materials will be contained in the premises.

The purpose of this EIA report to be submitted to the National Environment Management Authority (NEMA) is the proponent to install and operate as highlighted above. The site has good geological structure in a remote location bordering a dump site which is a positive step in waste management process.

The availability of such waste recycling facility is not only a critical environmental issue, but also an essential economic factor for a country that aspires to grow its industrial base. Most international companies expect a hazardous waste management program to be in place that is both economical and meets international standards, especially ISO 14001 considerations. Besides, without the means to such wastes as tyres, it is not possible to enforce the current

environmental legislation.

The proposed project entails the installation/construction of a Pyrolysis Plant at an existing yard for pyrolysis of waste tires, including, buildings and associated infrastructures.

The **pyrolysis** method for recycling used **tires** is a technique which heats whole or shredded **tires** in a reactor vessel containing an oxygen-free atmosphere. In the reactor the rubber is softened after which the rubber polymers break down into smaller molecules.

Generally, there are three types of tyre pyrolysis plants, batch operating plants, semi-automatic operating plant and fully continuous operating plant.

Background information

Process and Design alternatives

The Waste Tyre Pyrolysis process is a relatively new process and is to a certain extent still being perfected. A number of process alternatives are being considered by the applicant and plant designer and the process that will be followed at the proposed plant. Process alternatives include, for example, the way in which the feedstock (waste tyres) will be cleaned, by either using water or compressed air. Other alternatives include the way in which the feedstock will be introduced into the reactor, such as through a gravity feed system or a bottom feeding system, and the type of reactor that will be used, a horizontal reactor. Vertical reactors can be fluidized bed, entrained bed or fixed bed reactors.

It is with this framework that the proponent will be working closely with the, the National Environment Management Authority. They will offer investigations, surveys, design and supervision of engineering and civil works as well as oil products' management and training. This will prove invaluable to the project management team both in the initial period and for years to come.

Since the inception of the Environmental Management and Coordination Act (EMCA) 1999, it has now become a legal requirement for all projects leading to the activities listed in the second schedule to undertake Environmental Impact Assessment (EIA). EIA is a tool for environmental conservation and has been identified as a key component in new project implementation. The report of the EIA must be submitted to National Environment Authority (NEMA) for approval and issuance of license.

The proposed pyrolysis plant consists of furnace systems. The main reactor operates at the temperature range of 350^{o}C to 450^{o}C. Waste gases of the main reactor are mainly made up of (CH_4 + C_2H_4 + C_2H_6 + C_3H_6 + C_3H_8 + C_4H_8 + $C4H_{10}$), depending on the composition of waste plastics and tyres input fed into the main reactor. After pyrolysis in the main reactor, a catalyst and a second combustion chamber is used to handle and treat the waste gases under designated temperature and pressure. The waste gases are fully burned in the

second chamber, whereby the temperature is controlled at 850-1000°C. This is to thermally decompose the potentially aromatic substances as well as odour and gaseous dioxins. The heat generated then re-enters the main reactor, contributing to the heating of the main reactor which is required to maintain designated temperature. This heat reclamation is environmentally beneficial and reduces the cost of fuel used by the system.

The by-products from the system are mainly waste gases and ash. A waste gas cleaning system will be installed for each pyrolysis plant system to reduce the emission of waste gases. This waste gas cleaning system consists of a cyclone, a dosing device for the additive to bind the pollutants, a reactor with a ball rotor to improve the efficiency of the additive, and a bag filter to separate dust from the waste gases. The waste gases are finally exhausted from the 20-metre high chimney installed for each of the pyrolysis furnace system. A Continuous Emission Monitoring System (CEMS) will also be installed to continuously monitor the emission concentrations of waste gases.

Ash generated from the main reactor is mainly dry black carbon. The ash settles at the bottom of the reactor, where it is discharged out of the reactor via an automated screw pump, and brought to the ash bin. The ash collected in the ash bin will be disposed of every morning

In terms of the usage of water, a cooling water system will be developed for the pyrolysis plant system. The cooling water for the waste gas-oil separator is a closed circuit system. The cooling water would not contact with the waste gases. Hence, the cooling water will be re-used continuously and only discharged to a sedimentation tank every 3 months.

Each of the pyrolysis furnace system has a temporary storage tank of capacity of 1,000 Litres for storing the useful fuel oil extracted from the pyrolysis process. The useful fuel oil products will be collected at frequent times.

Scope, objective and criteria of the Environmental Impact Assessment (EIA)

The NEMA Registered Expert was appointed to conduct the Environmental and Social Impact Assessment of the proposed pyrolysis plant project. The scope of the assessment covered all the construction phase activities, operational phase activities and decommissioning phase activities. The output of this work was a comprehensive Environmental Impact Assessment study report for the purposes of guiding the project proponent through all the project phases, and applying for an EIA licence.

The consultant on behalf of the proponent conducted the EIA by incorporating (but not limited to) the following terms of reference:

- The proposed location of the pyrolysis project.

- A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- The technology, procedures and processes to be used, in the implementation of the project.
- The materials to be used in the development and construction and implementation of the project.
- The products, by-products and waste to be generated by the project.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- To recommend a specific environmentally sound and affordable waste tyres management system.
- Provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.
- Analysis of alternatives including project site, design and technologies.
- An environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.
- Provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development and processing activities.
- Propose measures to prevent health hazards and to ensure security in the working environment for the employees and the management in case of emergencies.
- An identification of gaps in knowledge and uncertainties which were encountered in compiling the information.
- Assist the proponent to follow up and seek license approval of the proposed project.

Project description

The Proposed Project for Pyrolysis Plant on Plot L.R. No. Kwale/Mwavumbo/1, Kalalani (Mwanda A' village samburu area, Kwale sub county Off Mombasa-Nairobi highway at Mariakani SGR in Kwale County, within the republic of Kenya. The site for the proposed project is neighboured by undeveloped pieces of land as it is within ranch land and other lands which are undeveloped. The project will cover an approximate area of six acres.

For maximum production, the following steps techniques will be adopted:

1. Pretreatment

For the continuous type, its feeding hole is very small, so it needs a shredder machine to cut tyre into small pieces (about 30-50mm). While for the batch system, the tyre can be directly put into the reactor without being pretreated.

2. Feed raw materials
For the continuous type, the waste tires can be loaded into reactor by an auto-feeder. While for the batch type, this process is manual.

3. Tyre Pyrolysis
Heat the reactor by using fuel materials, such as coal, charcoal, fuel gas, wood etc. The reactor will be slowly heated, when the temperature reaches around 250℃, the oil gas will be produced.

4. Condensing
A part of oil gas will be processed by this technology and then goes to cooling system to form liquid oil. We adopt new-type condenser which can improve the oil yield efficiency and make the oil yield to the maximum.

5. Extra gas recycling
The gas which cannot be liquefied under normal pressure will go back to combustion system. It can be used as fuel material to heat the reactor, which will save energy for the whole working process.

6. Discharge
In the process, there are also carbon black and steel wire produced. For the continuous type, the discharging of these two products are both automatic. When the temperature falls down to 40℃, workers will open the door and take the steel wire out.

When the whole working process has been finished, the reactor of the batch type must be cooled and then you can start another batch.

Methodology outline
Given the scale of the proposed project, proposed project complexity and the environmental conditions of the project area, Environmental Impact Assessment study was opted for to ensure comprehensiveness and completeness of the assessment. The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental and social impact assessment under schedule 2 of EMCA, 1999.
- Environmental scoping that provided the key environmental issues.
- Desktop studies and interviews.
- Physical inspection of the site and surrounding areas.
- Photography and data collection on the key elements constitution the environmental resources (land, soil, water, flora and fauna) within the study area.
- Public participation via the use of questionnaires, interviews, door to door discussion, and public meetings.
- Reporting.

Physical Environmental Baseline surveys

Results regarding the environmental characteristics of the study area are as briefly discussed below, within the EIA report and exhaustively discussed in the respective specialist study reports commissioned by the proponent.

Proposed mitigation measures for the negative impacts

The EIA study found out that all the negative impacts resulting from the proposed project can be adequately mitigated. Given the scale of the project, its complexity and the existing environmental characteristics of the project area, the proponent commissioned specialist studies to fully address the impacts on human being, vegetation cover and biodiversity, alteration and destruction of wildlife and wildlife habitats, soil, hydrology and water resources, livestock and fisheries.

To address the negative social and economic impacts resulting from the project, EIA project study was done to guide the proponent all along. This study recommends that the proponent adheres to the recommendations in the reports (EIA) which should be in agreement with the laws of the land.

This report emphasizes legal compliance for any negative aspect which might be a threat to any segment of the environment and mankind. The following legislations were found handy in providing mitigations measures to most of the likely negative impacts. For full disclosure of the various mitigation measures, see the chapter on mitigation measures of this EIA report.

- Occupational Safety and Health issues shall be addressed as per the provisions of OSHA, 2007 among the other measures given.
- Noise and Vibrations impacts shall be addressed as per the requirements of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.
- Waste management shall be addressed as per the provision of the Environmental Management and Coordination (Waste management) Regulations, 2006.
- Waste water shall be addressed as per the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006.
- Hazardous substance will be addressed as per the requirements of the Environmental Management and Coordination (Controlled Substances) Regulations, 2007.
- Public health concerns will be addressed through the provisions of the Public Health Act (Cap. 242).
- The Energy Bill, 2014.

Conclusion and way forward

The proposed pyrolysis plant project is in line with the government's objective to ensure good and proper transportation of goods and human beings in an adequate and safe manner by making sure

the means of transport such as vehicles and other machines are efficiently lubricated and maintained to operate properly, and the by-products used for energy production. The project design seeks to ensure sustainable development through sustainable use of environmental resources. Good processing techniques shall be employed to maximize production without injuring any segment of the environment. The positive and negative impacts which will come along with the establishment of the proposed project have been exhaustively discussed within the report with revelation that the positive impacts outweigh the negative impacts. The proposed project will not only enhance economic growth at local level but also contribute to the national, regional and international economy.

The study recommends that the proponent ensure environmental care within all the project phases as required by the laws of the land. The negative environmental impacts which will come along with the proposed project as per this study can be adequately mitigated. The proponent of the proposed project shall be committed to putting in place all the necessary measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project. It is recommended that in addition to this commitment, the proponent shall focus on implementing the measures outlined in the EMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects.

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. The 'No project scenario' from a socioeconomic perspective would mean that the use of the site continues in a marginal manner with substantial underutilization of resources. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. Without the proposed used Pyrolysis plant project, the site would continue to be in the status quo with the prevailing economic marginalization of the area, high poverty and unemployment levels, insecurity, low development and land use, high illiteracy, poor health facilities, poor access roads and improper infrastructure leading to more loss of financial exchange. Additionally, potential for over 50 employment opportunities during and after construction of the proposed development would also be lost. The illegal use of the site for other commercial purposes like truck parking and football playing field would continue and the resources will finally be degraded to an irreversible state.. The current Kenyan and regional economy cannot afford these loses while the rest of the country is on a tremendous economic growth. This alternative was the least favorable.

On the basis of the above and taking cognizance of the fact that the project is basically essential to local needs it is our recommendation that the project be allowed to go ahead provided the mitigation measures outlined in this report are adhered to and the Environmental Management Plan is implemented.

1 INTRODUCTION

1.1 Background and Rational for an Environmental Impact Assessment

Visun Industries Limited contacted the NEMA Lead Environmental consultant to carry out an Environmental Impact Assessment study for the proposed Pyrolysis Plant on Plot L.R. No. Kwale/Mwavumbo/1 area, Kalalani location (Mwanda A' village) Samburu, kwale sub county Off Mombasa-Nairobi highway at Mariakani SGR in Kwale County, within the republic of Kenya. This was to comply with the Legal requirement stipulated in the Environmental Management and Coordination Act 1999 and the subsequent Legal supplement of 2003.

The availability of a commercial hazardous waste management facility is not only a critical environmental issue, but also an essential economic factor for a country that aspires to grow its industrial base. Most international companies expect a hazardous waste management program to be in place that is both economical and meets international standards, especially ISO 14000 considerations. Besides, without the means to treat and dispose hazardous wastes, it is not possible to enforce the current environmental legislation.

Industrialization in Kenya and the implementation of Environmental Management and Coordination (Waste Management) Regulations, 2006, has necessitated the need to develop a waste recycling facility that can cope with the increased demand from industry and more so the increased motor vehicles that ply within the country and at the same time meet the ever demanding regulatory framework. For this reason Ja-Recycling Ltd is a registered company under a single business permit to carry out waste tyre and plastic recycling to dieses that will also add to supply of fuel necessary to power industrial needs within the country.

The project design and technology shown eco-friendly and cost-effective waste pyrolysis plant with the world class design and technology. The waste pyrolysis equipment has been designed to have a lower cost and higher fuel oil output. The waste tyre pyrolysis machine combines continuous and batch type pyrolysis plant. The continuous pyrolysis machine is to feed the raw materials, such as tyre and plastic, on one side and discharge the carbon black continuously from the other side. However, the batch type is to feed the machine with a batch of raw material and take the process and start the next process after cooling down the machine and discharging the carbon black. The proposed plant is based on the green technology (pyrolysis) to achieving the environmentally friendly process, which is the excellent waste tyre management solution for tyre recycling.

The plant process environmentally friendly designed to solve tyre and other environment pollution which are becoming the serious issues in the current industrial dispensation. Due to multiplicity of end products from the process including heat, electricity, steam and so on, the

plant will therefore be of benefit to the economy of the country in its operation. Further distillation of the oil by professional pyrolysis oil distillation plant, the end product can be used for vehicle powering.

Two main reasons of the great demand of scrap tyre pyrolysis equipment. With the development of social modernization, on the one hand, the rubber industry has been vigorously developing, and the rubber products have been widely used in all works of life, especially in the tyre manufacture; on the other hand, more scrap articles, such as tyres, are generated and accumulated to such huge amount. Because of the erode-resistant characteristic of tyres, the big pollution hazard was posed to the environment and hygiene. This has widely been described as black pollution. The plant was therefore designed to curb and conquer the pollution posed by the aforesaid.

Tyre refining device decomposes waste tyres through high temperature process into kinds of useful resources, such as fuel oil, carbon black, steel wires and fuel gas. Meanwhile, tyre pyrolysis equipment will make renewable resources out of black pollution. During this process, scrap tyres are put into production as raw material, which not only controls environment pollution but also achieves resource regenerating and recycling. What is more, batch tyre pyrolysis plants are suitable for raw materials within 120mm.

The management of hazardous wastes in Kenya is regulated under the Environmental Management and Co-ordination Act (EMCA, 1999)), EMCA (Waste Management) Regulations (2006) and other related regulations controlling the all wastes which poses hazardous attributes to the environment and the environmental occupants as a whole. These regulations establish an order of preference for the management of hazardous wastes to be: minimization, recycling, treatment, and land filling. The facility will therefore offer recycling aspect in fulfillment of the regulation"s aim.

The main parts of the system includes reactor, transmission device, catalytic chamber, cooling tube, manifold, heavy oil tank, light oil tank, oil condenser, oil-water separator, safety device, vacuum system, dedusting system.

Pyrolysis basically involves the thermal decomposition of the tire at high temperatures (300–900°C) in an oxygen-free atmosphere. Through the tire pyrolysis oil plant, waste tires can be effectively recycled into tire oil, carbon black and steel wire. These pyrolysis products can be applied in many fields. For example, tire oil can be widely used as fuel oil in industries such as steel and iron and boiler factories, ceramics, power or chemical industries etc. And it can be used for generators to get electricity. Carbon black will be used for making construction bricks with clay. Steel wire will be recycled to the smelting plant, which are within the Mazeras area such as Kenya Steel Makers and Tarmal wire products which fully depends on scrape for their production.

The facility will comprise of the following:

- Office block ground floor only,
- Shed to house the pyrolysis reactors
- Parking area
- Soak pit for disposal of sewage and
- Concrete perimeter wall which is already existing and entry gate;

Countless tyres are dumped each year from the landfills. This not just produces a nuisance but it is also harmful for that environment. A lot of chemicals can be used for making tyres in addition to the rubber. When these waste tyres lie from the landfills, there exists a chance of these harmful chemicals leeching in the groundwater below and pollute the water supply. Because of this, that the use of waste tyre to fuel oil pyrolysis method is gaining plenty of popularity for recycling the waste tires/plastic.

One of the primary advantages of this method is by using pyrolysis technology; it is easy to get fuel oil from waste tyres and also plastics. The raw materials necessary for operating this pyrolysis plant is incredibly cheap as these raw materials are useless to people. Quite simply, it is actually a highly profitable business especially if you have an abundance of raw material.

Other benefits that will be accrued from this project will include;

- Convert waste into energy thus clearing the existing dumping site;
- It will provide renewable source of energy
- Provide raw material for other industries such as carbo black used in mixtures for various purposes: metallurgy, production of paints and building materials, the manufacture of fuel briquettes while Metal cord can be used in the metallurgical industry
- It will offer employment opportunities,
- The gas generated during the process can be used for the system operation, as well as to electricity generation

It is with this framework that the proponent will be working closely with the National Oil Corporation, and the National Environment Management Authority. They will offer investigations, surveys, design and supervision of engineering and civil works as well as oil products' management and training. This will prove invaluable to the project management team both in the initial period and for years to come.

1.2 Scope, objective and criteria of the Environmental Impact Assessment (EIA)

1.2.1 Scope

The Kenya Government policy on all new projects, programmes or activities requires that an environmental impact assessment be carried out at the planning stages of the proposed

undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the facility. The scope of this Environmental Impact Assessment, therefore, covered:

- Description of the proposed project.
- The baseline environmental conditions of the area.
- Provisions of the relevant environmental laws.
- Seeking views through Public participation and consultation.
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project.
- Appropriate mitigation measures.
- Provision of an environmental management plan outline.
- Occupational and Environmental health and safety management.
- Analysis of alternatives.

1.2.2 Objectives of the Project

The objective of the proposed project is to construct and operate a waste tires horizontal condensor pyrolysis plant. This will reduce the amount of tyres directly burned unsustainably and reduce green- house emissions as while at the same time generating energy sources in the process, generating steel for recycling and carbon black (a material used as a main ingredient in industry to improve colouring features). The proponent targets the Mombasa area and its environs, where burning of tyres has been reported in the former Kibarani dumping site and the current Mwakirunge dumping site, among other individual transporters. This will do ensure that tyre materials are not released into the environment but recycled for re-use.

1.2.3 Objectives of the EIA

The overall objective of the study is to assess the potential significant adverse impacts of the proposed development and articulate appropriate mitigation measures.

The specific objectives of this study include the following:

i. To identify and evaluate the significant environmental impacts of the proposed project.
ii. To assess the environmental costs and benefits of the proposed project to the local and national economy.
iii. To determine the compatibility of the proposed facility with the local environmental setting.
iv. To evaluate and select the best project alternative from the various options.
v. To propose mitigation measures for the negative environmental impacts
vi. To incorporate Environmental Management Plans and monitoring mechanisms during implementation, operation and decommissioning phases of the project.

1.2.4 Purpose and terms of reference

The purpose and terms of reference developed for this project study is to assess the impacts that may arise during the construction/installation, operational and decommissioning phases of the proposed development. These are the impacts anticipated from the project to the vegetation and biodiversity, wildlife and their habitats, existing hydro-geological settings, livestock, and fisheries life, mankind and the physical environment at large.

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

- The objectives of the project.
- Describe to details the baseline condition of the project area.
- Give a detailed outline of regulatory and legislative framework related to the project.
- To describe the potential impacts that may occur during the construction, operational and decommissioning phases.
- To describe the technology, materials, procedures, and process to be used in the implementation of the project.
- To describe the potential effects of the development on both the natural and human environment, and the likely products and by-products and waste generated by use of the project and how they would be treated or disposed taking into account health and safety matters.
- The impact imposed on existing infrastructure.
- Propose suitable mitigation measures for the identified impacts.
- Describe if any, alternative technologies and processes available and reasons for the preferred chosen location, technology and process.
- Develop a comprehensive environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse negative impacts on the environment including the cost, timeframe and responsibility to implement the measures.
- To develop the monitoring plan.
- Offer conclusion and recommendation, and
- Such other matters as the Authority may require.

1.2.5 Data collection procedures

First, the Consultant undertook environmental screening and scoping to avoid unnecessary data. The data collection was carried out through questionnaires/standard interview/public meetings schedules, use of checklists, observations and photography, site visits and desktop environmental studies, where necessary in the manner specified in Part V (section 31-41) of the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.2.6 EIA organization and structure

The EIA was carried out to full completion in line with NEMA Regulations as specified in section 58 of EMCA, 1999. The Consultants (Lead Expert) coordinated the day-to-day functions and any related institutional support matters. Otherwise, all formal communications were directed to NEMA through the proponent.

1.2.7 Reporting and documentation

The Environmental and Social Impact Assessment study report from the findings was compiled in accordance with the guidelines issued by NEMA for such works and was prepared and submitted by the proponent for consideration and approval. The Consultant ensured constant briefing of the client during the exercise. Description plans and sketches showing various activities are part of the Appendices.

1.2.8 Responsibilities and undertaking

The Consultant (Lead Expert) undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material as agreed with the proponent to ensure respect of timelines as outlined in the NEMA approved TOR. The consultant arranged for own transport and travels during the exercise. On the site of the proposed re-processing of lubricating oil project, the proponent provided contact persons to provide information required by the consultant. The proponent also provided site plans showing roads, service lines, buildings layout and the actual sizes of the sites, details of raw materials, proposed process outline and anticipated by-products, future development plans, operation permits and conditions, land-ownership documents and site history. The output from the consultants includes the following:-

- An Environmental Impact Assessment study report comprising of an executive summary, study approach, baseline conditions, anticipated impacts and proposed mitigation measures.
- An Environmental Management Plan outlines which also forms part of the report recommendations.

1.2.9 Methodology outline

Given the scale of the proposed project and the environmental conditions of the project area, Environmental Impact Assessment study was opted for to ensure comprehensiveness and completeness of the assessment. The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental and social impact assessment under schedule 2 of EMCA, 1999.
- Environmental scoping that provided the key environmental issues.
- Desktop studies and interviews.
- Physical inspection of the site and surrounding areas.

- Photography and data collection on the key elements constitution of the environmental resources (land, soil, water, flora and fauna) within the study area.
- EIA Public Participation via the use of questionnaires, door to door interview and public meetings.
- Reporting.

1.2.9.1 Environmental screening

This step was applied to determine whether an environmental impact assessment was required and what level of assessment was necessary. This was done in reference to requirements of the EMCA, 1999, and specifically the second schedule. Issues considered included the physical location, sensitive issues and nature of anticipated impacts.

1.2.9.2 Environmental scoping

The scoping process helped narrow down onto the most critical issues requiring attention during the assessment. Environmental issues were categorized into physical, natural/ecological and social, economic and cultural aspects.

1.2.9.3 Desktop study

This included documentary review on the nature of the proposed activities, project documents, designs policy and legislative framework as well as the environmental setting of the area among others. It also included discussions with key stakeholders, managers and design engineers, as well as interviews with site neighbours.

1.2.9.4 Site assessment and public participation

Field visits were meant for physical inspections of the site characteristics and the environmental status of the surrounding areas to determine the anticipated impacts. To ensure adequate public participation in the EIA process, structured questionnaires were administered, door to door interviews made and public meetings held to the project site neighbours and the information gathered was subsequently synthesized and incorporated into the EIA study report.

1.2.9.5 Reporting

In addition to constant briefing of the client, this Environmental Impact Assessment study report was prepared. The contents were presented for submission to NEMA as required by law.

2 PROJECT DESCRIPTION

2.1 Project Background

The proposed site where the project is to be located has good geological structure in a developing area which has been zone as industrial area by the County Government of Kwale, On plot No. Kwale/Mwavumbo/1, Kalalani (Mwanda A') village samburu area kwale subcounty off Mombasa-Nairobi highway near Mariakani SGR in Kwale County the site is easily accessible for trucks that will be delivering raw materials to the plant for various collection points and collection of finished products to various to various consumers within the republic. The two acre piece of land that will hold an office block and pyrolysis shed will seek approval from county government once the drawings have been done; the plot has an already existing concrete perimeter wall with entry lockable gate.

Electricity need will be met from the KPLC grid, also a power generator will be in place in case of power shortages.

The site will be designed to ensure optimum utilization of space, minimal waste movement, safe movement of machineries, during full operation the plant will help to recycle a lot of waste generated from various activities within Mombasa and Kwale counties. A location will be identified for segregating and holding waste within the yard.

Appropriate mitigation measures will assist in minimizing the potential impacts on the surrounding environment during the construction and operational phases of the proposed plant.

The main mitigation measures that should be applied to the proposed project include the following:

- ✓ Environmental Awareness Training for all contractors and workers;
- ✓ An Atmospheric Emission Analysis to be done for the pyrolysis plant on quarterly basis;
- ✓ Oil storage tanks must be designed and operated in accordance with SANS 10089- 1:2008 and 10087-3:2008, respectively;
- ✓ Adequate firefighting equipment must be available on site and all employees must receive training on the correct use of the equipment. The equipment must be maintained as stipulated by the manufacturer and the local fire department must be satisfied with the fire prevention measures on the site
- ✓ All waste tyres must be stored in a manner that prevents the establishment of fires;
- ✓ No products from the pyrolysis process may be stored in the open and all storage containers and/or bags must be sealed during storage and transportation. Storage must occur on impermeable surfaces; and
- ✓ Soil, storm water and groundwater pollution must be prevented through the correct handling, storage and disposal of cement, concrete, waste and chemicals.

Based on the outcomes of the Environmental Impact Assessment, conducted as part of this full Scoping and Environmental Impact Assessment process, as well as the alternatives assessment,

the following recommendations are made:

- The proposed project/activity (the construction and operation of the Waste Tyre Pyrolysis Plant) should be authorized and allowed to proceed on the preferred site on condition that the proposed plant should be carrying out ambient and stack emission's analysis on quarterly basis;
- The mitigation measures proposed in this report and the draft Environmental Management Programme must be implemented during all phases of the proposed project;
- It is assumed that the mitigation measures proposed in this report and the draft Environmental Management Programme will be correctly implemented by the applicant and that they will be effective;
- Proposed mitigation measures should be incorporated as far as possible into the operational plan for the plant; and
- Strict monitoring and enforcement of requirements of the EMP must be undertaken to ensure that contractors and operators adhere to these requirements.

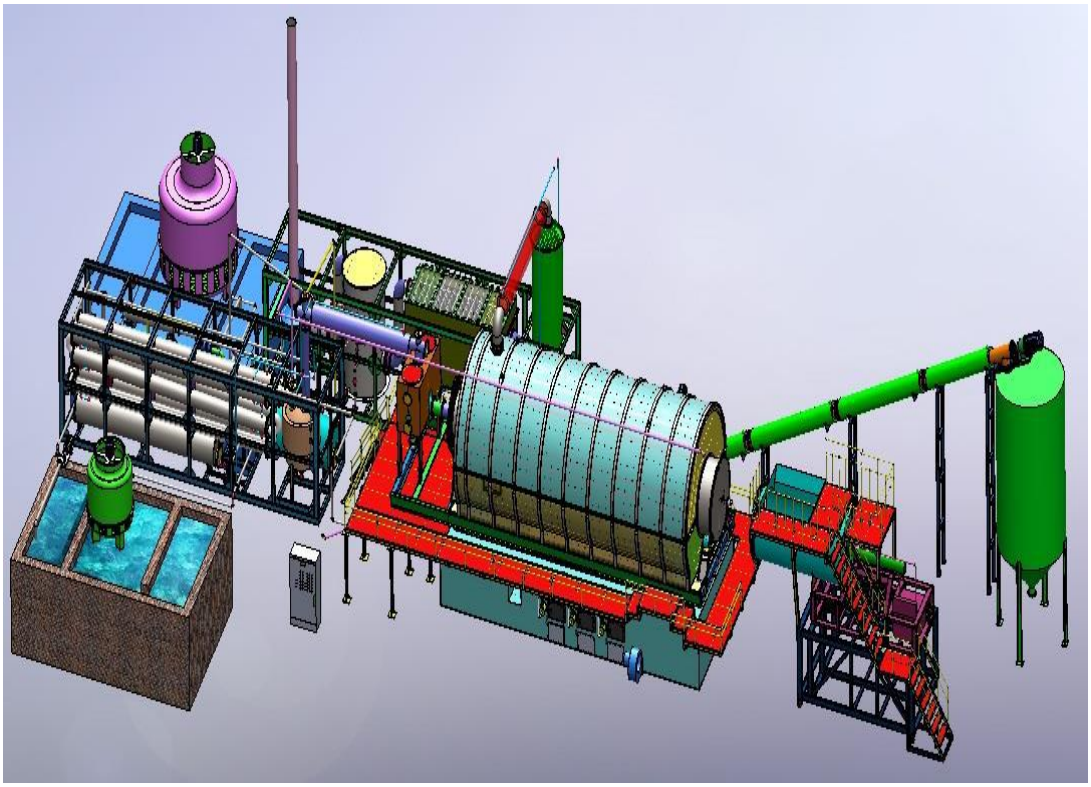
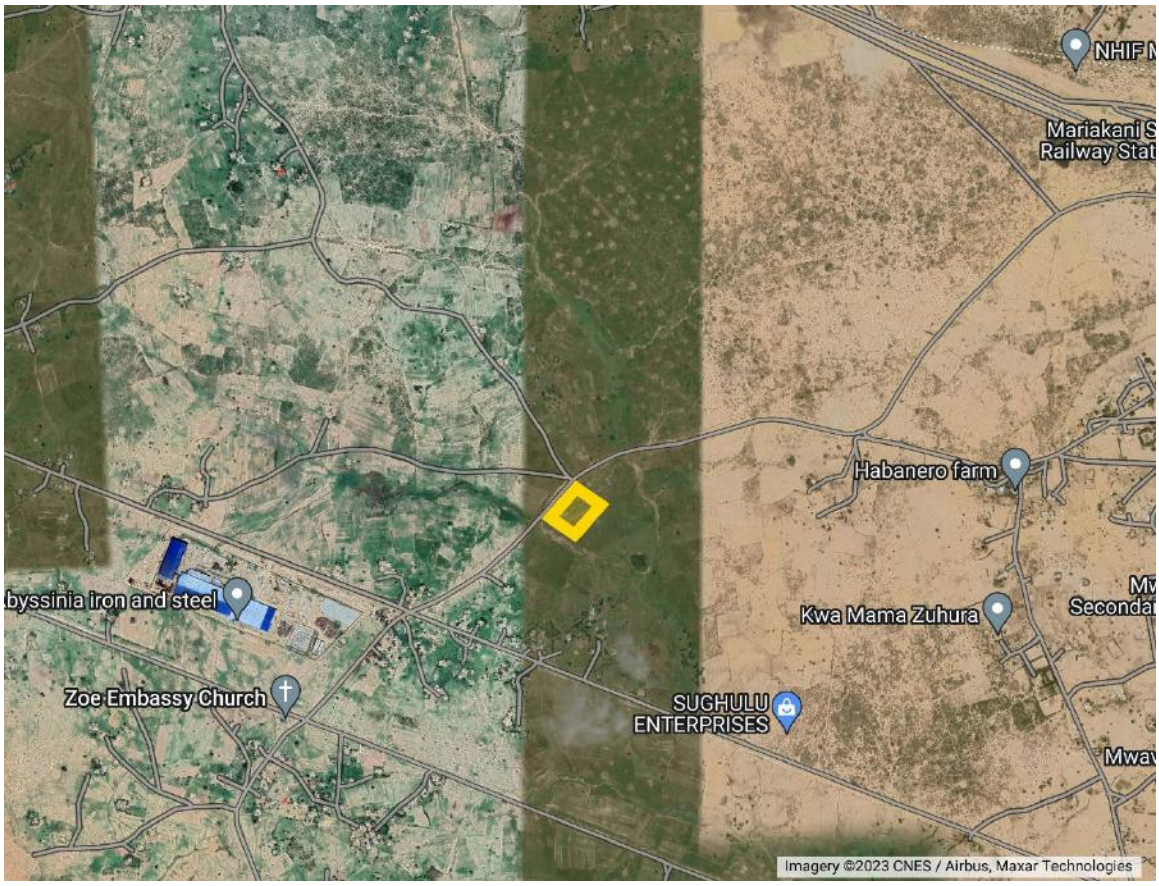


Photo showing model of proposed pyrolysis plant

2.2 The Project location

The proposed project will be located on plot no Kwale/Mwavumbo/1, kalalani (Mwanda A village georeferened as **-3.869718, 39.442777** off Mombasa-Nairobi highway at Mariakani SGR in Kwale County. Administratively the site is located in Mwavumbo Sub-location in Mariakani. The

neighbourhod of the site features commercial and industrial developments. Mariakani lies about 35 km from Mombasa town.



2.3 Project Description and Design

The following figure shows a conceptual process flow for the proposed Waste Tyre horizontal condenser Pyrolysis Plant. These designs are also subject to confidentiality agreements. The facility will involve installations of two reactors chambers, secondary gas tank, horizontal condensors, secondary tank with coil, 100 feet chimney flaring system, scrubbers, ID fan, Oil and water separation tank, cooling tower and oil receiving tanks.

Recycling of waste tyres could save energy resource, change waste in to valuables, reduce its pollution to environment, has great economic and social benefits.

The proposed pyrolysis plant consists of furnace systems. The main reactor operates at the temperature range of 350^{o}C to 450^{o}C. Waste gases of the main reactor are mainly made up of (CH_4 + C_2H_4 + C_2H_6 + C_3H_6 + C_3H_8 + C_4H_8 + $C4H_{10}$), depending on the composition of waste plastics and tyres input fed into the main reactor. After pyrolysis in the main reactor, a catalyst and a second combustion chamber is used to handle and treat the waste gases under designated temperature and pressure. The waste gases are fully burned in the

second chamber, whereby the temperature is controlled at 850-1000°C. This is to thermally decompose the potentially aromatic substances as well as odour and gaseous dioxins. The heat generated then re-enters the main reactor, contributing to the heating of the main reactor which is required to maintain designated temperature. This heat reclamation is environmentally beneficial and reduces the cost of fuel used by the system.

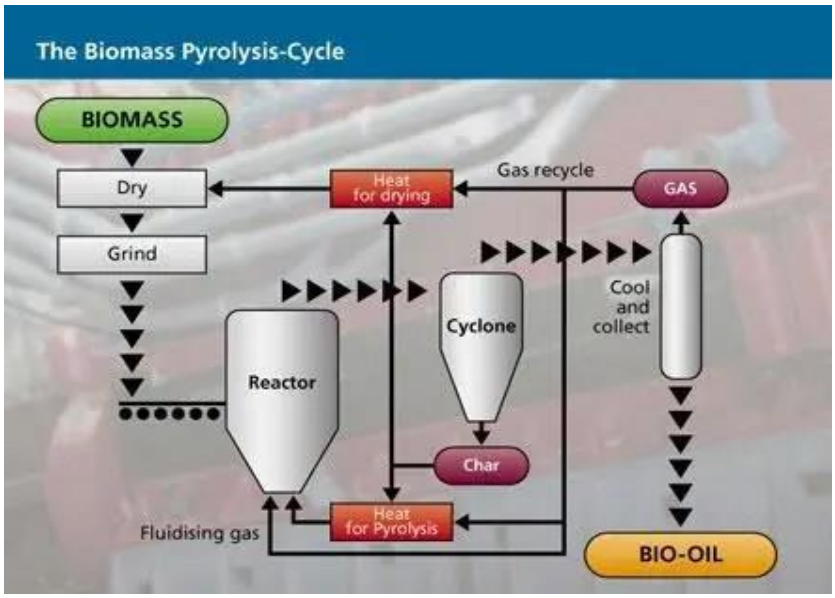
The by-products from the system are mainly waste gases and ash. A waste gas cleaning system will be installed for each pyrolysis plant system to reduce the emission of waste gases. This waste gas cleaning system consists of a cyclone, a dosing device for the additive to bind the pollutants, a reactor with a ball rotor to improve the efficiency of the additive, and a bag filter to separate dust from the waste gases. The waste gases are finally exhausted from the 20-metre high chimney installed for each of the pyrolysis furnace system. A Continuous Emission Monitoring System (CEMS) will also be installed to continuously monitor the emission concentrations of waste gases.

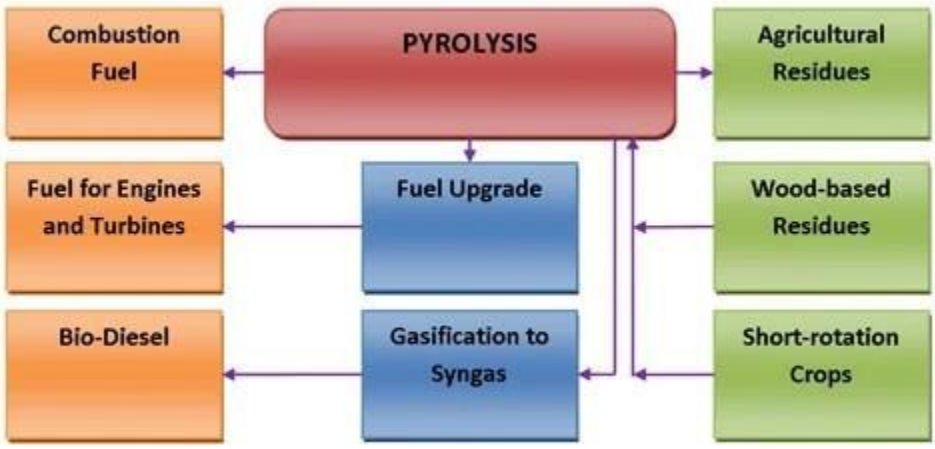
Ash generated from the main reactor is mainly dry black carbon. The ash settles at the bottom of the reactor, where it is discharged out of the reactor via an automated screw pump, and brought to the ash bin. The ash collected in the ash bin will be disposed of every morning

In terms of the usage of water, a cooling water system will be developed for the pyrolysis plant system. The cooling water for the waste gas-oil separator is a closed circuit system. The cooling water would not contact with the waste gases. Hence, the cooling water will be re-used continuously and only discharged to a sedimentation tank every 3 months.

Each of the pyrolysis furnace system has a temporary storage tank of capacity of 1,000 Litres for storing the useful fuel oil extracted from the pyrolysis process. The useful fuel oil products will be collected at frequent times.

Figure 1: Waste Tyre Reclying Flow Process Chart





2.3.1 Expected project activities

For maximum production, the following steps techniques will be adopted. The scope of works includes but is not limited to the following:

1. Pretreatment

For the continuous type, its feeding hole is very small, so it needs a shredder machine to cut tyre into small pieces (about 30-50mm). While for the batch system, the tyre can be directly put into the reactor without being pretreated.

2. Feed raw materials

For the continuous type, the waste tires can be put into reactor by an auto-feeder. While for the batch type, this process is manual.

3. Tyre Pyrolysis

Heat the reactor by using fuel materials, such as coal, charcoal, fuel gas, wood etc. The reactor will be slowly heated, when the temperature reaches around 250°C, the oil gas will be produced.

4. Condensing
A part of oil gas will be processed by our technology and then goes to cooling system to form liquid oil. We adopt new-type condenser which can improve the oil yield efficiency and make the oil yield to the maximum.

5. Extra gas recycling
The gas which cannot be liquefied under normal pressure will go back to combustion system. It can be used as fuel material to heat the reactor, which will save energy for the whole working process.

6. Discharge
In the process, there are also carbon black and steel wire produced. For the continuous type, the discharging of these two products are both automatic. When the temperature falls down to 40°C, workers will open the door and take the steel wire out.

- **Product**

The base oil produced is to be sold mainly for blending or direct use in industries.

Waste disposal

The waste from the recycling of waste tyres will be used as fuel for industrial boilers, hotel boilers, furnaces, in steel processing plants/smelters. The products can also be used in foundries, traditional brick and lime kilns and in bakeries. The remnant wastes will be burnt at temperatures of approximately 1,400 degrees Celsius ensuring complete combustion. At this temperature dioxins are not formed due to high temperatures.

2.4 Construction Inputs/ Raw Materials

The construction and operation phases of this project will utilize a lot of inputs and raw materials. The proponent and contractor are expected to procure building materials from licensed dealers. Besides, they have must meet both local and international safety and quality standards.

Main inputs during construction include metal and steel tanks and containers, building blocks, sand, gravel, glasses, hand cut construction stones, timber for making structural formwork and interior design.

2.4.1 Technology and Activities

The contractor shall employ modern and best building and construction technologies. They should not be inferior to locally and internationally established building standards. Construction of the project will involve ground excavations; making foundations; building courses; and roofing, .

2.5 Description of the Project's Construction Activities

2.5.1 Excavation / Earthworks

In order to prepare the site for construction of the building, a lot of excavations will be carried out. In this regard, machinery and human labor will be relied upon. Debris and excavate materials from earthworks, especially soil and stones will be used in various construction activities.

2.5.2 Foundation and Masonry

Completion of excavations will be followed with setting a foundation for the re-processing machines/equipments, and other constructions. Other masonry activities include stone carvings, concrete mixing, and plastering, slab construction, reinforcing walls/lintels and curing of walls.

2.6 Staff Amenities

2.6.1 Site Office

The proponent is to construct a modest site office with iron concrete walls and concrete floor. The roof will be made using iron sheets whereas the ceiling board will be constructed using soft board on timber framing.

2.6.2 Sanitary Waste Management

Wastewater from sanitary facilities should be generated to exhaustible septic tanks and or soakage pits. This is because the project area is not sewered.

2.6.3 Non-Hazardous Materials

The store for non-hazardous materials will be accommodated within the site office. Materials to be stored in this store shall include samples for review by consultants and inspectors.

2.6.4 Hazardous Materials

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

2.6.5 Bulk Construction Materials

The bulk materials to be stored on site include: sand, ballast, stones, cement, quarry chips and timber. However, to avoid material accumulation with potential for obstructing site activities, inducing safety hazards and creating a nuisance in the neighborhood, the main contractor intends to have materials delivered in small quantities.

2.7 Description of the Project's Operational Activities

Completion of construction activities will be followed by operation of the Pyrolysis plant and associated amenities. The activities to be carried out during the operation phase of the proposed project include: Reactor still container, separation system, condensation unit, air compression unit, gear pumping, turbo pumping, oil filtration device, and the control cabinet unit.

2.8 Project's Decommissioning Activities

During decommissioning, of this Pyrolysis plant project it's advisable to return the excavated land to its original state. Analysis of the soil should be done to check on the salinity levels and the land should be rehabilitated.

2.9 Responsibilities

2.9.1 Proponents' Responsibilities

The proponent will have to ensure that all legal provisions and standardization benchmarks are observed .In this regard, the proponent shall ensure that:

- Building and mechanical materials are of high quality and from accredited dealers,
- Sanitary facilities are provided and hygiene observed,
- Avail a first aid tool kit,
- Ensure that any accident is well attended to and medical bills paid,
- All workers are duly compensated for their services,
- The proponent shall provide a room at the site for logistic purposes, and
- He will provide a dressing and changing room to all workers.

2.9.2 Contractors' Responsibilities

The contractor will have the following duties:

- Have an updated timetable of the progress documenting periods of each construction and mechanical fitting stage,
- During the night, public holidays and any other time when no work is being carried out onsite, the contractor shall accommodate only security personnel and never should a labor camp be allowed onsite,
- The contractor shall make good at his own expense any damage he may cause to public and private roads and pavements in the course of carrying out his work.
- The architect shall define the area of the site, which may be occupied by the contractor for use as storage, on the site, by providing a proper site layout plan.

- The contractor and proponent shall provide at his own cost all water required for use in connection with the works including the work of subcontractors, and shall provide temporary storage tanks,
- The contractor shall make his own arrangement for sanitary conveniences for his workmen,
- The contractor shall take all possible precaution to prevent nuisance, inconvenience or injury to the neighboring properties and to the public generally,
- The contractor shall take all effort to muffle the noises from his tools, equipment and workmen to not more than 70 Decibels,

2.10 Estimated Project Investment Cost and NEMA Fee

The proposed project is to be completed at an approximate total project cost of **Forty million shillings only (**Kshs. 40,000,000.00**)**.

BASELINE INFORMATION OF THE PROPOSED PROJECT STUDY AREA

2.11 Site Location

The proposed project will be located on plot No. Kwale/Mwavumbo/1, Kalalani (Mwanda A,) village Samburu area off Nairobi-Mombasa highway at Mwavumbo sub location in Kwale County. The geographic coordinates of the site are as -3.8873800, degrees South and 39.4995900 degrees East. The neighbourhod of the site features similar oil handling yards that have already been licensed by NEMA, transport yard and Clinker handling yards and parcels of undeveloped lands.

2.12 Land Use

Agriculture, mostly of subsistence nature, is the main land use and si mainly owned byabsentee landlords leadig to the squatter settlement . In the drier areas of the Nyika plateau in Kinango, kasemeni, samburu and some parts of lunga lunga divisions is held under group ranches and land is viewed as communal asset where every member of the community has the right to use it Development and land use activities have largely been uncontrolled leading to the proliferation of informal settlements.

The site for the proposed project was previously was unused site with existing boundary wall and a lockable gate. The proposed project will therefore not lead to changes in land use as its already zoned as industrial zone by the County Government of Kwale.

2.13 Climate

Generally, the Kenyan coastal region is charecterized with a tropical and monsoon climate. The temperatures are usually high throughout the year. Maximum and minimum temperatures range between 26.5-34^{o}C and 22.5-24.5^{o}C respectively. The region experiences more than 6 hours of sunshine on a daily basis with the period between October and March exceeding 8 hours. Winds follow a typical monsoon pattern; during December to February they blow from the east and east-north east. By March they start to shift towards the south and by April, the start of the monsoon season, they're predominantly from south-southwest. The predominant wind direction continues to be from the south from May until October with gradual eastwards shift beginning which becomes more pronounced by November and by December the cycle begins again.

The rainfall pattern is bimodal with rainfall averaging between 900-1200mm annually. The long rains come between March and July while the short one is experienced between November and December.

2.14 Topography, Geology and Soils

The project site is characterized by a slightly undulating terrain that slopes towards the Ocean. The land rises gradually from sea level to 900m on the south-western side of the district. It can be divided into six physiographic regions namely:

2.14.1 The coastal Plain

This region is generally below 30m in altitude except from Malindi northwards where the land rises to 60m in some places. The coastline consists of beaches, mangrove forests, sand dunes north of the Ramisi River, arid creeks of which the main ones are Msambweni, Chale and Diani beahes. The creeks include marine swamps covered by mangrove forests.

2.14.2 The Foot Plateau

The southern extension of the coastal plain lies between 60m and 135m in altitude above sea level It is charecterised by basement rocks that also contain random reddish sand and soil patches

2.14.3 The Coastal Range

Several sand stone hills mark the coastal range. DakaWacha and Gaabo in the northwestern part of the District, Simba (347m), Kiwara (323m) and Jabana in the Kilifi and Mazaras areas and Mangea (705m) west of Watamu. The central part is incised by the Sabaki, Koromi and Goshi Rivers, lowering the altitude to below 150m level.

2.14.4 River Basins and Lowlands

Seven major rivers and numerous minor streams form the county's drainage system. The main rivers are Ramisi, Marere,Pemba, Mkurumunji, Umba, mwachena and the mwache river. All these rivers flow into the Indian Ocean The river basin is made up of alluvium and old sediments including sand gravel, silt, clay, and marsh and composed of narrow elongated plateaus and lowlands.

2.14.5 The plateau

At an altitude between 300m and 900m, the plateau is formed of ancient rocks, mainly metamorphic of the basement complex. Flood plains are along the Sabakiriver, and in certain areas along the Ndzovuni and Rare (Goshi) rivers. Bottom land (depressions without visible drainage outlets) occur in the north, drained by the Mukale and Wildeinia Rivers.

The soils were observed to be mainly composed of rock outcrop with patches of brown loamy soil. The soils are poor in fertility except where indigenous vegetation remains and a layer of fertile loam soil has developed. The soils can be grouped into three major units namely coastal plain, coastal uplands and erosional plain. In general terms, the lithology of Kwale Sub County is composed of sedimentary rocks of the Mesozoic and cainozoic eras. The sedimentary rocks consist of a variety of sandstones, siltstones, shales and limestone.

2.15 Demographic characteristics

2.15.1 Population

The population of Kwale especially in its urban centers has been on the rise mainly due to rural urban migration, tourism and the influx of foreigners. In the Kenyan Coast as a whole, population distribution in the hinterlands is mainly affected by rainfall distribution, altitude, agro-ecological zones and administrative policy through which a number of settlement schemes have been created. The 1999 population census figures show that the District had 544,303 persons and a density of 144 persons per km² with a population growth rate of 3.05% against the national population growth rate of 2.49% (CBS 2005 estimate).

The Coastal population in Kenya is culturally heterogeneous. The largest indigenous ethnic group being the Mijikenda which is comprised of nine sub-tribes namely: Giriama, Digo, Rabai, Duruma, Kauma, Chonyi, Kambe, Ribe, and Jibana. Other indigenous Coastal ethnic groups are: Taita, Pokomo, Bajuni, Orma, Sagala, and Swahili. Due to its socio-economic dynamics which offer great opportunities for livelihoods and leisure, the Kenyan Coast and Mtwapa in particular has over the years attracted a multiplicity of ethnic and racial groups.

2.15.2 Settlement patterns

Settlement patterns in Kwale District are influenced by infrastructure network (roads, water, and electricity) and high agricultural potential zones. High population densities are found in Kinango, Matuga and samburu divisions along the tarmac road of Mombasa-Nairobi up to Mariakani urban town. These areas are also well supplied with piped water and electricity. High population clusters are also found in Shimba hills division and some parts of Samburu division where there are high potentials for agricultural production.These areas are rangelands and are less productive agriculturally. The three larger towns in the district (Kinango,Mariakani & Samburu) have a total population of 72,451 (1999), which represents 13% of the total district population.

2.15.3 Poverty Status

The immediate cause of poverty in the Kwale District has been attributed to landlessness, high and increasing cost of living, inaccessibility to credit facilities, lack of entrepreneurial skills, unemployment, low incomes and HIV/AIDS and discrimination at places of work. In general, poverty has led to over-use and destruction of natural resources where short-term development goals are pursued at the expense of long-term environmental sustainability. Therefore there is need to ensure that environmental concerns are integrated into development planning and that development plans lead to empowerment of local communities to engage in sustainable livelihood activities.

2.16 Environmental quality

2.16.1 Water availability

Kwale District is generally water scarce both in terms of surface and ground water and largely depend on piped water from the Mzima springs and Baricho water. The only permanent river is the Ramisi River which feeds the Pambe water works and crosses the northern part of Kwale district. The others are temporary due to few catchment areas, sandy soils which have high infiltration rates and high evapo-transpiration rates. Ground water resources are exploited along the coastline through shallow wells and bore holes but diminish as one move inland. This is because inland boreholes have to be deep and in most cases the water quality is poor; hard, mineralized and saline.

2.16.2 Solid waste and sewerage management issues

The main waste generation sources are domestic, commercial ventures, hotels, markets, industries and institutions including health facilities. The types of waste that are generated can be classified as follows.

- **Mixed heavy plastics** -Soft drink bottles, detergent bottles, cooking oil/fat bottles, household plastics etc
- **Mixed light plastics** - Shopping bags, wrapping films, waste collection bags
- **Rubber** - Old tires, shoe soles etc
- **Mixed paper** - Books, office paper, newspapers carton pieces etc
- **Metals** -Pieces and sheets of aluminum, steel and other metals
- **Mixed glass** - Coloured and non-coloured, broken or whole glass bottles, panes, household glass items etc
- **Organics** - Food remnants, wooden debris, yard waste etc
- **Biomedical waste-** waste from hospitals, dispensaries and medical clinics.

All types of waste are transported to the designated disposal site. These include hazardous types containing pesticides, heavy metals, oils, batteries, acids, domestic and hospital wastes. It is against this background that the private sector has initiated ways to address the problem of waste management through construction of compost pits in areas where collection is limited and providing waste disposal services to complement those provided by the County Council. The entire Kwale County Council has no sewerage infrastructure hence the common methods for disposal of human wastes is through pit latrines and septic tank and soak away pit systems. The proposed project will make use of septic tanks and soakage pit for disposal of sewage and waste water.

2.16.3 Protected areas

Gazetted forests, kayas and marine parks constitute the protected areas in Kwale District. The protected areas include Shimba hills, Mwaluganji elephant sanctuary, Kisite-Mpunguti marine national park. The kayas (sacred forests) include Chonyi, Kambe, Ribe, Jibana, Kauma and Kaya

fungo. The marine parks and reserves include, part of the Mombasa marine and National Reserve, Watamu-Malindi Marine National park and Reserve (coral gardens) and part of the Malindi Marine and National Reserve. The part of ArabukoSokoke forest which falls in Kilifi District constitutes 19,000 Ha out of the 37,000 Ha .The forest is situated between Kilifi creek and The Sabaki River. The forest has a very high biological diversity. It is one of the important sites for bird conservation in Kenya (Ksley and Langton). Six of the bird species listed as rare in the ICBP/IUCN Bird red data book occurs in this forest. Two of these bird species, the Sokoke Owl (*Otus arena*) and the clerk's weaver (*Ploceusgolandi*) are found nowhere else in the world except in this forest. In addition to the endemic bird species, ArabukoSokoke is also home to other terrestrial fauna. For instance it is the only known home for the endangered *Cephalophusadersi*, the frog *Leptopelisflavomacculatus*, and two butterfly species, the *Charaxesprotocles* and the *Charaxeslasti*.

The Marine Parks and Reserves in the coastal zone are made up of several different ecosystems each with a high degree of faunal and floral diversity. The ecosystems include coral reefs, mangroves, tidal and estuarine ecosystems. The coral reef runs parallel to the coast at distances ranging from 500m- 2 km from the shoreline. The coral reefs are one of the examples of biologically productive and taxonomically diverse ecosystems. About 140 species of soft and hard corals have been identified along the Kenyan coast. They are very important in that they form breeding grounds for various marine fauna, they serve as a barrier against the force of the sea and the lagoons they protect provides stable environment for breeding and feeding of marine biota.

2.16.4 Flora and Fauna

Human interference and particularly agriculture have greatly modified the original floral and faunal status of the District. Several vegetation types including coastal dunes, woodlands, bush lands and savannas are encountered from the shoreline inland. It is likely that prior to the maize and coconut cultivation, Kwale district was covered in bush land. Currently, 30% of the district is covered under maize, coconut trees and citrus plants. The remaining 70% of the site comprises of bush land.

2.17 Infrastructure

2.17.1 Roads

Most rural areas at the coast are served with a dilapidated and narrow road network contrary to most urban centers such as Mombasa, Kilifi and Kwale which are well served by both classified and non-classified roads. The road networks are greatly influenced by existence of important industrial, tourism and commercial centers. Except for the Mombasa-Nairobi highway most of the roads in Kokotoni are earth roads. The proposed site has a good road network and adequate transport linkages.

2.17.2 Telecommunications

All mobile networks are available and fixed landlines provided by Telkom Kenya.

2.17.3 Energy supply

The main source of energy supply in the area is electricity from the Kenya Power and Lighting Company. However, this is mostly supplemented with diesel powered generators in times of power blackouts. A number of facilities have also ventured into harnessing solar energy by use of solar panels and accumulators. Wind energy has also been sparsely used especially in pumping water from boreholes in the remote parts of the District. In the rural areas, main energy sources are fuel wood, charcoal and paraffin. The proposed development will be connected to the nearby 240kV KPLC line.

2.18 Health Profile

Kwale District has a total of 73 health facilities distributed across the district. Accessibility of health services is, however low and 57% of the population live over 5kms to the nearest health facility. The doctor patient ratio stands at 1:100,000 which in itself is a manifestation of staff shortages in the District. The most prevalent diseases include Malaria, Pneumonia and diseases of the digestive system. HIV/AIDs is a major health and development problem in the district. The prevalence in the district is estimated to be 10% and bed occupancy by people affected with HIV/AIDs related illnesses in the various health institutions is about 50%. The impact of HIV/AIDS is already evident in the District.

3 RELEVANT LEGISLATIVE, POLICIES, AND REGULATORY FRAMEWORK GOVERNING ENVIRONMENTAL MANAGEMENT IN KENYA

3.1 Introduction

There is a growing concern in Kenya and at global level that many forms of development activities cause damage to the environment. Development activities have the potential to damage the natural resources upon which the economies are based. A major national challenge today is how to maintain sustainable development without damaging the environment. The Environmental Impact Assessment is a useful tool for protection of the environment from the negative effects of developmental activities. It is now accepted that development projects must be economically viable, socially acceptable and environmentally sound. It is a condition of the Kenya Government to conduct Environmental Impact Assessment on the development Projects.

According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and Section 3 of the Environmental (Impact Assessment and Audit) Regulations 2003 (Legal No. 101), all industries require an Environmental Impact Assessment project/study report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual Licensing before the development commences. This was necessary as many forms of developmental activities cause damage to the environment and hence the greatest challenge today is to maintain sustainable development without interfering with the environment.

3.2 Environmental Problems in Kenya

There are many environmental problems and challenges in Kenya today. Among the cardinal environmental problems include: loss of biodiversity and habitat, land degradation, land use conflicts, human and animal conflicts, water management and environmental pollution. This has been aggravated by lack of awareness and inadequate information amongst the public on the consequences of their interaction with the environment. In addition there is limited local community involvement in participatory planning and management of environmental and natural resources. Recognizing the importance of natural resources and the environment in general, the Kenyan Government has put in place wide range of policy, institutional and legislative framework to address the major causes of environmental degradation and negative impacts on ecosystem emanating from industrial and economic development programmes.

3.3 Environmental Policy Framework

Environmental Impact Assessment (EIA) is a methodology used to identify the actual and probable impacts of the projects and programmes on the environment and to recommend alternatives and mitigating measures. The assessment is required at all stages of project development with a view

to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. The National EIA regulations were issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999. The EIA Regulations must be administered, taking into cognizance provisions of EMCA 1999 and other relevant national laws. The intention is to approve and license only those projects that take into consideration all aspects of concern to the public as they impact on health and the quality of the environment.

3.4 Institutional Framework

At present there are over twenty (20) institutions and departments which deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Council (NEC), National Environmental Management Authority (NEMA), the Forestry Department, Kenya Wildlife Services (KWS), Water Resources Management Authority (WRMA) and others. There are also local and international NGOs involved in environmental issues in the country.

3.4.1 National Environmental Management Authority (NEMA)

The object and purpose for which NEMA is established is to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. A Director General appointed by the president heads NEMA. The Authority shall:

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plan, programmes and projects with a view to ensuring the proper management and rational utilisation of the environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya.
- Take stock of the natural resources in Kenya and their utilisation's and consultation, with the relevant lead agencies, land use guidelines.
- Examine land use patterns to determine their impact on the quality and quantity of the natural resources.
- Carry out surveys, which will assist in the proper management and conservation of the environment.
- Advise the government on legislative and other measures for the management of the environment or the implementation of relevant international conservation treaties and agreements in the field of environment as the case may be.
- Advise the government on regional and international environmental convention treaties and agreements to which Kenya should be a party and follow up the implementation of such agreements where Kenya is a party.

- Undertake and co-ordinate research, investigation and surveys in the field of environment and collect and disseminate information about the findings of such research, investigation or survey.
- Mobilise and monitor the use of financial and human resources for environmental management.
- Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under EMCA.
- Initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradation and evolve remedial measures where accidents occur.
- Monitor and assess activities, including activities being carried out by relevant lead agencies in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impeding environmental emergencies is given.
- Undertake, in co-operation with relevant lead agencies programmes intended to enhance environmental education and public awareness about the need for sound environmental management as well as for enlisting public support and encouraging the effort made by other entities in that regard.
- Publish and disseminate manuals, codes or guidelines relating to environmental management and prevention or abatement of environmental degradation.
- Render advice and technical support, where possible to entities engaged in natural resources management and environmental protection so as to enable them to carry out their responsibilities satisfactorily.
- Prepare and issue an annual report on the state of the environment in Kenya and in this regard may direct any lead agency to prepare and submit to it a report on the state of the sector of the environment under the administration of that lead agency and,
- Perform such other functions as government may assign to the Authority or as are incidental or conducive to the exercise by the authority of any or all of the functions provided under EMCA.

However, NEMA mandate is designated to the following committees:

3.4.1.1 County and District Environment Committees

According to EMCA, 1999 No. 8, the Cabinet Secretary by notice in the gazette appoints County and District Environment Committees of the Authority in respect of every county and district respectively.

3.4.1.1.1 County Environment Committee

County Environment Committees are responsible for the proper management of the environment within the District in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Cabinet Secretary by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them.

3.4.1.1.2 County Environment Committee

Like in the case of District Environment Committees, the County Environment Committee is responsible for the proper management of the environment within the county, which they are appointed. They are also to perform such additional functions as prescribed by this Act or as may from time to time be assigned by the Cabinet Secretary by notice in the gazette.

3.4.2 Public Complaints Committee

The Committee performs the following functions:

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and excise such powers as may be assigned to it by the council.

3.4.2.1 National Environment Action Plan Committee

This Committee is responsible for the development of a 5-year Environment Action plan among other things. The National Environment Action Plan shall:

- Contain analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time.
- Contain analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity.
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes.
- Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development.

- Set out operational guidelines for the planning and management of the environment and natural resources.
- Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist.
- Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their negative impacts.
- Propose guidelines for the integration of standards of environmental protection into development planning and management.
- Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general diverse impacts on the environment.
- Prioritise areas of environmental research and outline methods of using such research findings.
- Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities and;
- Be binding on all persons and all government departments, agencies, States Corporation or other organ of government upon adoption by the national assembly.

3.4.2.2 Standards and Enforcement Review Committee

This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures.

Standards and Enforcement Review Committee consists of the members set out in the third schedule to the Environmental Management and Co-ordination Act. The Principle Secretary under the Cabinet Secretary is the Chairman of the Standard and Enforcement Review Committee. The Director General appoints a Director of the Authority to be a member of the Standards and Enforcement Review Committee who is the Secretary to the committee and who provides secretarial services to the Committee. The Committee also regulates its own procedure. The Standard and Enforcement Review Committee may co-opt any person to attend its meetings and a person so co-opted shall participate at the liberations of the committee but shall have no vote. Finally, the Committee shall meet at least once every three months for the transactions of its business.

3.4.2.3 National Environmental Tribunal

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

3.4.3 National Environmental Council (NEC)

EMCA 1999 No. 8 part iii section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organisations and such other organisations engaged in environmental protection programmes. It also performs such other functions as are assigned under EMCA.

3.4.4 National Environmental Action Plan (NEAP)

The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of societal decision-making.

3.5 Environmental Legal Framework

Environmental Management and Co-ordination Act No. 8 of 1999, provide a legal and institutional framework for the management of the environmental related matters. It is the framework law on environment, which was enacted on the 14th of January 1999 and commenced in January 2002. Topmost in the administration of EMCA is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is National Environment Management Authority (NEMA). EMCA comprises of the parts covering all aspects of the environment.

Part VIII, section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radio-active or any other pollutants into aquatic environment. Section 73 requires that operators of projects which discharge effluent or other pollutants submit to NEMA accurate information about the quantities and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewages system upon issuance of prescribed permit from the local Authorities.

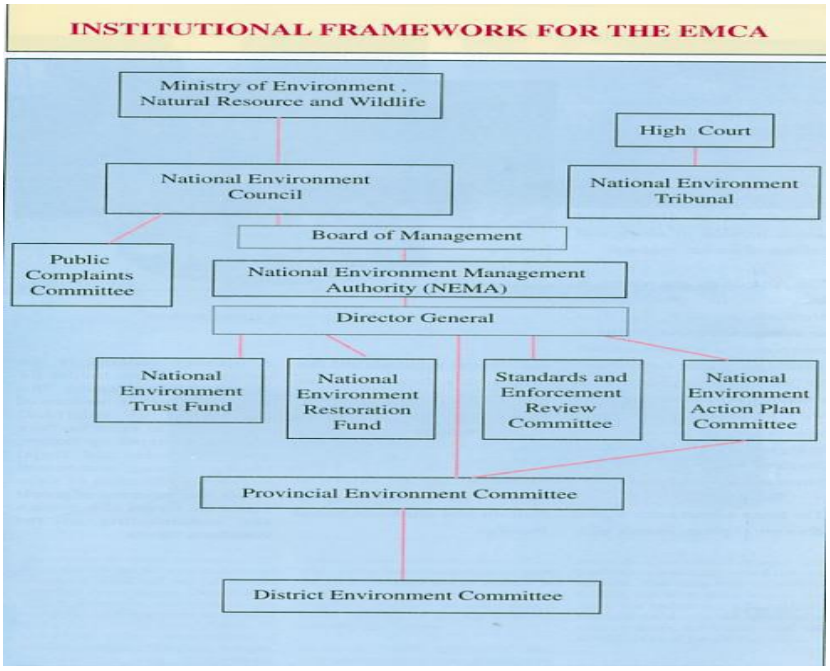
3.6 Waste Management Regulations, 2006

In exercise of the powers conferred by Sections 92 and 147 of the Environmental Management and Co-ordination Act No. 8, of 1999, the Cabinet Secretary for Environment and Natural Resources, on the recommendation of the National Environment Management Authority and upon consultation with the relevant lead agencies makes the Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle:

- Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.
- Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility.
- Any person, whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority.

Figure 2: EMCA, 1999 Institutional Framework



3.6.1 Land Tenure and Land Use Legislation

The Kenya constitution, which is the basic law of the land provides for protection of private property from deprivation without lawful compensation. The constitution also provides that such property may be "acquired if it is necessary in the interest of defence, public security, and public morality". Land is a crucial national resource that is basic to the livelihood and well being of Kenyans. The following are some of the main statutes that regulate land ownership and land use in Kenya:

3.6.1.1 The government Land Act, Cap 280

Under this act the president through the commissioner of lands may allocate any unalienated land to any person he so wishes. Once allocated, such land is held as a grant from the government on

payment of such rents as the government may announce. The government may call back the land at the time for its own use. The act covers agricultural land and town plots within local authorities which are allocated on application by interested persons. Such land is held for a maximum period of a hundred years, subject to renewal. Such allocations have often disregarded social and environmental imperatives, leading to degradation, inequity and other undesirable impacts.

3.6.1.2 Registration of Titles Act Cap 281

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

3.6.1.3 Land Titles Act Cap 282

The Land Titles Act Cap 282 section 10 (1) states that there shall be appointed and attached to the Land Registration Court a qualified surveyor who, with such assistants as may be necessary, shall survey land, make a plan or plans thereof and define and mark the boundaries of any areas therein as, when and where directed by the Recorder of Titles, either before, during or after the termination of any question concerning land or any interest connected therewith, and every area so defined and marked shall be further marked with a number of other distinctive symbol to be shown upon the plan or plans for the purposes of complete identification and registration thereof as is herein after prescribed.

3.6.1.4 The Trust land Act, cap 285

The constitution vests all land which is not registered under any act of parliament under the ownership of local authorities as trust land. Under the act, a person may acquire leasehold interest for a specific number of years subject to renewals. The local authorities retain the power to repossess such land for their own use should the need arise.

3.6.1.5 The Land Acquisition Act, cap 295

This act gives powers to the government to acquire any persons land for public utilities. The act however stipulates that once such land is acquired, prompt and full compensation be paid to the owner. The levels and modes of such compensation is determined by the government.

3.6.2 The Forest Act (Cap 385)

Section 8 of the Forest Act states that except as provided in the Act and subject to any rules made there under, no person shall, except under the license of the Director of Forestry fell, cut , take , burn, injure or remove any forest produce; erect any building or cattle enclosure; set fire to any grass or undergrowth or any forest produce; de-pasture or allow any cattle to be therein, clear, cultivate or break up land for cultivation or for any other purpose ; construct a road or path or damage, alter, shift, remove or interfere in any way whatsoever with any beacon, boundary, mark, fence, notice or notice board.

3.6.3 Public Health Act (Cap. 242)

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

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

On responsibility of the Local Authorities Part XI, section 129, of the Act states in part “It shall be the duty of every local authority to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purposes

Section 130 provides for making and imposing regulations by the local authorities and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth or noxious matter into water supply as mentioned in section 129. This provision is supplemented by section 126A that requires local authorities to develop by laws for controlling and regulating among others private sewers, communication between drains and sewers and between sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc. for reception or disposal of foul matter.

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

3.6.4 Local Authority Act (Cap. 265)

Section 160 helps local authorities ensure effective utilization of the sewages systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with kinds of refuse and effluent and where such service is established, compel its use by persons to whom the services is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on; excavate or opens-up; or injures or destroys a sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

Section 170, allows the right to access to private property at all times by local authorities its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers. To ensure sustainability in this regard, the local authority is empowered to make by laws in respect of all such matters as are necessary or desirable for maintenance of health, safety, and well being of the inhabitants of its area as provided for under Section 201 of the Act.

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

3.6.5 Physical Planning Act, 1999

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

Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective local authority.

Finally, section 36 states that if connection with a development application, local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the application shall be required to submit together with the application an environment impact assessment EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the NEMA and should be followed by annual environmental audits.

3.6.6 Land Planning Act (Cap. 303)

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to then Cabinet Secretary for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted. This is intended to reduce conflict with the interest such as settlement and other social and economic activities.

3.6.7 Water Act, 2016

Part II, section 18, of the Water Act 2002 provides for national monitoring and information system on water resources. Following on this, sub-section 3 allows the Water Resources Authority (WRA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

The Act Cap vests the rights of all water to the state, and the power for the control of all body of water with the Cabinet Secretary, the powers is exercised through the Cabinet Secretary and the Director of water resources in consultation with the water catchments boards, it aims at among others:

1. Provision of conservation of water and
2. Appointment and use of water resources.

Water apportionment board is a National Authority whose duty is to advise the Cabinet Secretary on issues with respect to water use. Permission to extract underground water for large-scale use lies with the board and the pollution of such water source is an offence. Failure to comply with such directives is an offence. The Cabinet Secretary is given the power to appoint undertakers of water supply and in most cases are Town, Municipal and City Councils.

Further in order to provide security and supply of water the Cabinet Secretary can declare a catchment's area of particular source of water as protected area and restrict activities in those areas. Such orders must be publicized in Kenya gazette.

Pollution of any water course is an offence and the Act also prohibits whoever throws, conveys, cause or permits throwing of rubbish, dirt, refuse, effluent, trade waste to any water. It enhances the Ministry's capacity to enforce the Act by reviewing the water user fees.

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

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

3.6.8 Way leaves Act Cap 292

According to the Way leaves Act cap 292 Section 2, Private land does not include any land sold or leased under any Act dealing with Government lands. Section 3 of the Act states that the Government may carry any sewer, drain or pipeline into, through, over or under any lands whatsoever, but may not in so doing interfere with any existing building. Section 8 further states that any person who, without the consent of the Principle Secretary to the Cabinet Secretary responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an offence and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Principle Secretary; and the Principle Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and may recover any expense incurred by the Government in so doing from the offender.

3.6.9 Petroleum Act Cap. 116

Section 5 states that the occupier of any facility which petroleum is kept in contravention of any rule made under this Act shall be guilty of an offence.

Section 6 states that if any person to whom any license is granted under any rule made under this Act contravenes any of the conditions of the license, he shall be guilty of an offence. Petroleum rules, Part III section 13(1) provides guidelines on storage of petroleum. According to the section, no person shall store petrol unless in accordance with a license issued by a licensing Authority. Petroleum rules, part III section 19 and 29 provides guidelines on storage sheds and associated installations.

3.6.10 Energy Act, 2019

The Energy Act, 2019 was enacted in response to calls to consolidate the laws relating to energy; promote renewable energy; promote exploration, recovery and commercial utilization of geothermal energy; regulate midstream and downstream petroleum and coal activities, among others. It is expected to create an enabling environment for the Government's Big Four Agenda.

The Act establishes;

the Energy and Petroleum Regulatory Authority (**"EPRA"**) in place of the Energy Regulatory Commission (**"ERC"**)

Rural Electrification and Renewable Energy Corporation (**"REREC"**) as successor to the Rural Electrification Authority (**"REA"**).

The Energy and Petroleum Tribunal (**"Tribunal"**) replaces the Energy Tribunal that existed under the repealed Energy Act. The scope of the Tribunal has been expanded to hear and determine disputes and appeals relating to the energy and petroleum sector arising from the Energy Act, 2019 and any other statute.

The Nuclear Power and Energy Agency (**"NPEA"**) takes over from the Kenya Nuclear Electricity Board that existed under the repealed Kenya Nuclear Electricity Board Order.

3.6.11 The Weights and Measures Act Cap 513

This is the principal Act dealing with weights and measures in Kenya, it defines as the standards and units to be used and the regulations to be adhered to. Section 20 makes it an offence for any person to use or possess or control for use for trade a weighing or measuring instrument not constructed to indicate in terms of weight or measure as authorized by the Act. The next section (section 21) prohibits use for trade any weight, measure, weighing or measuring instrument which is false or unjust. It further requires that the weights, measures, weighing or measuring instrument used for trade be examined, verified, stamped or re-stamped at least once in every year- section 27(1) and a certificate of verification be issued -section 27(7). It is under the provisions of this Act that the dispensing pumps at filling stations must be examined and verified for their accuracy at least once in a year. Failure to do so is an offence under the Act. Section 153 of the Act requires that every dispensing pump be marked with the identity or grade of the product that it is meant to

deliver, and if it be the price-computing type shall display the 'price per litre' on every display panel. Under section 173(1) the pump shall be provided with one or more plugs, seals or sealing material to protect all stops or other adjustable parts affecting the quantity delivered.

3.6.12 Electricity Power Act No. 11 of 1997

The Electric Power Act No. 11 enacted in 1997 deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. According to the Act, the Cabinet Secretary through the Electricity Regulatory Board is conferred with the legislative power to grant licences and authorise works for generation or transmission of electrical energy. However, the provisions of section 4 of the Act require such authorisation only for generating plants with a rating capacity exceeding 1000kw. Section 9 (3) of the Act address environmental integrity of the power generating systems which, must be considered by the board in recommending the grant of licences to the Cabinet Secretary

In this respect, the following environmental issues will be considered before approval is granted:

1. The need to protect and manage the environment, and conserve natural resources;
2. The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Under schedule 3 of the Electric Power (licensing) Regulations 2003, it is mandatory to comply with all safety, health and environmental laws. Moreover, schedule 2 (regulation 9) of the Electric Power (licensing) Regulations 2003 stipulates that licensing and authorisation to generate and stipulates that licensing and authorisation to generate and transmit electrical power must be supported by the following documents which are approved by NEMA.

1 Environmental Impact Assessment Report (EIA) or
2 Initial Environmental Audit Report (IEA) and
3 Environmental Management Plan (EMP)

3.6.13 Building Code 1967

Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the local authority for a permit to connect to the sewer line and all the wastewater must be discharged into sewers. The code also prohibits construction of structures or buildings on sewer lines. And all the buildings to be constructed according to the building code standards.

3.6.14 Penal Code Act (Cap.63)

Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to

make it noxious to health of persons /institution is dwelling or business premises in the neighbourhood or those passing along public way, commit an offence.

3.6.15 Occupational Health & Safety Act 2007

Before any premises are occupied, or used a certificate of registration must be obtained from the chief inspector. The occupier must keep a general register. The Act covers provisions for health, safety and welfare.

3.6.15.1 Health

The premise must be kept clean, daily removal of accumulated dust from floors, free from effluvia arising from any drain, sanitary convenience or nuisance and without prejudice to the generality of foregoing provision. A premise must not be overcrowded, there must be in each room 350 cubic feet of space for each employee, not counting space 14 feet from the floor and a 9 feet floor-roof height.

The circulation of fresh air must secure adequate ventilation of workrooms. There must be sufficient and suitable lighting in every part of the premise in which persons are working or passing. There should also be sufficient and suitable sanitary conveniences separate for each sex, must be provided subject to conformity with any standards prescribed by rules. Food and drinks should not be partaken in dangerous places or workrooms.

Provision of suitable protective clothing and appliances including where necessary, suitable gloves, footwear, goggles, gas masks, and head covering, and maintained for the use of workers in any process involving expose to wet or to any injurious or offensive substances.

3.6.15.2 Safety

Fencing of premises and dangerous parts of other machinery is mandatory. Information, Instruction, Training and Supervision of inexperienced workers, protection of eyes with goggles or effective screens must be provided in certain specified processes. Floors, passages, gangways, stairs, and ladders must be soundly constructed and properly maintained and handrails must be provided for stairs.

Special precaution against gassing is laid down for work in confined spaces where persons are liable to overcome by dangerous fumes. Air receivers and fittings must be of sound construction and properly maintained. Adequate and suitable means for extinguishing fire must be provided in addition to adequate means of escape in case of fire must be provided.

3.6.15.3Welfare

An adequate supply of both quantity and quality of wholesome drinking water must be provided. Maintenance of suitable washing facilities, accommodation for clothing not worn during working hours must be provided. Sitting facilities for all workers whose work is done while standing should be provided to enable them take advantage of any opportunity for resting.

Section 42 stipulates that every premise shall be provided with maintenance, readily accessible means for extinguishing fire and person trained in the correct use of such means shall be present during all working periods.

Section 45 states that regular individual examination or surveys of health conditions of industrial medicine and hygiene must be performed and the cost will be met by the employer. This will ensure that the examination can take place without any loss of earning for the employees and if possible within normal working hours.

Section 55B provides for development and maintenance of an effective programme of collection, compilation and analysis of occupational safety. This will ensure that health statistics, which shall cover injuries and illness including disabling during working hours, are adhered.

3.6.16 Employment act, Cap 226 and the regulation of wages and condition of Employment Act Cap 229

These Acts deal with employee rights. Employment Act fixes minimum standards of employment, while regulation of wages and conditions of employment Act creates wages fixing institutions like the wages board and councils to continuously review the human standards of employment on a sector basis. These acts effectively deal with issues such as prohibition of forced labour, child labour, and discrimination in employment as provided for in the respective ILO conventions which Kenya has since ratified.

3.7 Relevant Government Sessional Papers

3.7.1 Sessional paper No1 of 2002

This Sessional paper for sustainable development which is an update of Sessional paper N0.4 of 1984 on population policy guidelines, addresses issues on environment, gender, poverty and problems faced by segments of the population including the youth, women, the elderly and persons with disabilities. Outlined in the paper are population and development goals and objectives including improvement on standards of living and quality of life of the people; full integration of population concerns into development process; motivating and encouraging Kenyans to adhere to responsible parenthood; and empowerment of women. The problem of HIV/AIDS is also addressed.

4.1.1 National Energy Policy

A key aspect of the Energy Act is that it requires the Cabinet Secretary (CS) responsible for energy, in consultation with relevant stakeholders, to develop and publish a national energy policy (Policy). This Policy is to be reviewed every 5 years and within 3 months of the end of each financial year, the CS is also required to publish a report on the implementation of the Policy.

Further, national energy service providers and county governments are required to submit to the CS plans for the provisions of energy services and county energy plans respectively.

These plans are required to be integrated into a national energy plan to be reviewed every 3 years and, among other aspects, serve as a guide for energy infrastructure investments and also guide in the selection of appropriate technology to meet energy demand.

In relation to petroleum, the CS is also required to publish a national policy on petroleum operations reviewed every 5 years and similarly within 3 months of the end of each financial year publish a report on the implementation of the national petroleum policy.

4.1.2 The National Poverty Eradication Plan (NPEP)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn income. It also aims to narrow gender and geographical disparities and create a healthy, better-educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for the Social Development (WSSD) of 1995. The plan focuses on the four WSSD themes of the poverty eradication; reduction of unemployment; social integration of the disadvantaged people and the creation of an enabling economic, political, and cultural environment. This plan is to be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government Ministries, community based organizations and private sector.

4.1.3 The Poverty Reduction Strategy Paper

This document outlines the priorities and measure necessary for poverty reduction and economic growth. The objectives of economic growth and poverty reduction are borne out of realization that economic growth is not a sufficient condition to ensure poverty reduction. In this regard, measures geared towards improved economic performance and priority actions that must be implemented to reduce the incidence of poverty among Kenyans have been identified.

4.2 International Conventions and Treaties

Conventions are legally binding contracts that bind all concerned member countries to respect and act according to its provisions. Kenya has ratified several international conventions and should live with regard to the proposed Chipboard Manufacturing Plant.

In June 1992 the United Nations Conference on the environment and development (UNCED) approved three documents; the Rio Declaration on environment and Development Agenda 21. This is a comprehensive plan to guide national and international action towards sustainable development and a statement of 15 principles for sustainable management of forests.

In addition two international treaties were signed; the convention on biological diversity which came into force on 29th December 1993 and the convention on climate change, which came into force in 1994. These key international conventions and regional agreements aim at protecting the environment.

In Africa, for example, realization of the dangers of uncontrolled toxic wastes led to a convention on hazardous waste movement and management, signed in 1991 in Bamako, Mali:

In an effort to control levels of air pollutants from industries sources, the Geneva Convention on long-range trans-boundary air pollution was signed. Other conventions include the convention on the law of the sea (1994). Conventions on nuclear accidents (Notification Assistance) 1986; the Montréal Protocol on substances that deplete the ozone layer, the Biological and toxin weapons etc

4.2.1 The World Commission on Environment and Development (The Brundtland Commission of 1987)

The commission focused on the environmental aspects of development, in particular the emphasis 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 resources. While social sustainable development is development that maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement.

4.2.2 The Ramsar Convention

Kenya ratified the Convention in June 1990. The Ramsar Convention on Wetlands is primarily concerned with the conservation and Management of Wetlands. Parties to the Convention are also required to promote wise use of wetlands in their territories and to take measures for the conservation by establishing nature reserves in wetlands, whether they are included in the Ramsar list or not. The proposed project is expected to observe strictly to the Ramsar Convention's

principles of wise use of wetlands in the project area. Wetlands are defined by the Convention on Wetlands or the Ramsar Convention (1971) as: “Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salty, including areas of marine water the depth of which at low tide does not exceed six meters”

In Kenya, as well as in Eastern Africa, wetlands are defined as: “Areas of land that are permanently, seasonally or occasionally water logged with fresh, saline, brackish or marine water, including both natural and man-made areas that support characteristic biota”. The latter definition has the approval of the national Wetland Standing Committee of Kenya’s Inter-ministerial Committee on Environment (IMCE). It is the refinement of the Ramsar Convention’s definition for the Eastern Africa and does not exclude anything defined by the Ramsar Convention. This definition included swamps, marshes, bogs, soaks, shallow lakes, ox-bow lakes, river meanders and flood plains, as well as riverbanks, lakeshores where wetland plants grow. It also includes marine and inter-tidal wetlands such as deltas, estuaries, mudflats, mangroves, salt marshes, sea grass beds and shallow coral reefs. For the purpose of the Environmental Management and Co-ordination Act 1999, wetland means “an area permanently or seasonally flooded by water plants and animals have become adopted.

5 CONSULTATION AND PUBLIC PARTICIPATION

5.1 Introduction

One of the key information sources used during the Environmental Impact Assessment exercise was public participation exercise. Positive and negative views of the project site proponents, lead agencies, and neighbours were sought on the 4th Feb 2023, 17th Feb and 24th Feb,2023. Public consultations for the proposed waste tyre pyrolysis to Heavy Industrial Oil project were conducted as required in EMCA, 1999 section 58. Door to door interview with neighbours within the proposed project neighbourhood and one on one interview with the lead agencies to ensure comprehensiveness in the EIA study. This chapter outlines the key issues/concerns raised during the public consultations exercise. The proposed mitigation measures suggested by the public and other stakeholders that the proponent should incorporate to minimize environmental degradation and promote good working relationship with the community has been integrated in this chapter.

The specific objectives of the neighbors or community public participation process are to:

- Inform the local community about the project and thereby minimize conflicts and delays on implementation.
- To gain the views, concerns and values of the local community.
- To initiate public involvement processes, in a bid to induce and cultivate a sense of peoples' belongingness to the project.
- To suggest and facilitate the peoples roles in the project's sustainability, in terms of management, maintenance and productivity.
- To take into account public inputs in decision making regarding the proposed project.
- To gain local knowledge.

5.1.1 Objectives of Public Participation

The main objectives of public participation were to:

- Provide clear and accurate information about the project to the beneficiaries.
- Obtain the main concerns and perceptions of the community and their representatives regarding the project.
- Obtain options and suggestions directly from the affected communities on their preferred mitigation measures.
- Identify local leaders and relevant stakeholders with whom further dialogue can be continued in subsequent stages of the project.

5.1.2 Scope of the Consultation

This section of the report focuses primarily on Consultation and Public Participation Process (CPP) for the Environmental Assessment Phase of the Project, and presents the issues gathered through this process. The purpose of this CPP is to gather and consolidate issues and Impacts raised by relevant institutions and affected persons.

The first phase of the Consultation and Public Participation was included in the Scoping section, the second phase of the CPP was meant to ensure that all affected persons were given accurate and timely project information, and that all were given adequate opportunity to raise comments and concerns. Specifically, the steps followed can be summarized into four phases of consultation, namely:

- Identification of institutions and affected persons;
- Project notification;
- Engagement with affected persons; and
- Feedback from consultation

5.1.3 Overview and approach

It is a mandatory requirement under EMCA 1999 and the EIA/EA Regulations, for all environmental impact assessments done in Kenya to incorporate a Public Consultation. The aim is to ensure that all stakeholder interests are identified and incorporated in the project development, implementation and operation. To give the public a chance to express its views, we have used questionnaires, and interviews.

5.2 Issues Raised

5.2.1 Employment Opportunities

The persons interviewed were positive that during the development and operation of the proposed project, numerous employment opportunities will be create for the local residents especially during the construction and installation works. A few of those interviewed suggested that the proponent should consider the youth and women in the area for the available casual jobs.

5.2.2 Improvement of the Surrounding

Those interviewed were happy with the project because it would improve the appearance of the area by making Kalalani area a small industrial area, with potential for job opportunities and improving the aesthetical value of the area. They also suggested planting of trees and flowers as part of landscaping.

5.2.3 Increased Customer Base

Those with businesses within and surrounding the proposed project site, including eateries and canteens, shall benefit from serving workers and visitors to the project. The number of customers benefiting from such businesses will be available throughout the project, and will require their services.

5.2.4 Dust and Fume Emissions

There were concerns raised by some respondents over the possibility of generation of large amount of dust and fumes within the project site and surrounding areas as a result of excavation works and transportation of raw oil materials. The proponent shall require of the contractor to put in place measures to reduce dust levels at the site to a minimum as much as possible.

5.2.5 Noise Pollution

There were concerns of possibility of noise pollution interfering with activities of adjacent neighbors which include the cooling tank, black oil tanks, laboratory, vacuum pump installation, hydration and distillation tanks, filters, and the final products tanks and cylinders. The noise is anticipated from the transportation of materials, excavation, and construction works. The proponent shall require of the contractor to put in place adequate measures to curb noise pollution to avoid interrupting activities in existing adjacent buildings.

5.2.6 Safety and Security

Those interviewed suggested that the proponent should ensure the contractor provides and maintains safety and security around the site during the construction works. Measures should also be put in place to reduce the possibilities of accidents and disruption of traffic caused by trucks to the building site. The workers involved in the project should also be provided with appropriate personal protective equipment when at work to ensure their safety.

5.2.7 Waste Management

Some of the consulted people were concerned about the unsightly scenarios associated with construction sites due to the presence of wastes including empty cement bags, rejected metals, wrappings (plastic bags), and broken glass. Also the final products from re-processing of lubricating oil will generate some oil waste and hazardous waste. These wastes cumulatively lead to unpleasant scenes not attractive to many people, and may pollute the environment and provide breeding grounds for disease vectors. Suggestions were made to the proponent to ensure the contractor manages all the wastes resulting from the project in an environmentally accepted manner.

5.2.8 Optimal Land Use

Some of the consulted people acknowledge the fact that this was an idle land being put to productive use and benefits to the company are expected to be in line with the increase in Mwavumbo ranch physical facilities. Majority of the respondents approved the proposed project.

Chief officiating the public baraza and locals being engaged in the entire public participation forum

Photo showing address by Area Chief and Project proponent

6 ENVIRONMENTAL IMPACTS FOR THE PROPOSED PROJECT

6.1 Introduction

This section identifies both positive and negative impacts associated with the proposed re-processing of used lubricating oil project. These impacts are hereby identified in two distinct phases of the project i.e. Construction Phase and Operation Phase. Another study is expected to be carried out during the projects decommissioning phase. Scoring or weighing of the magnitude of the impacts was undertaken and results are outlined in this draft report.

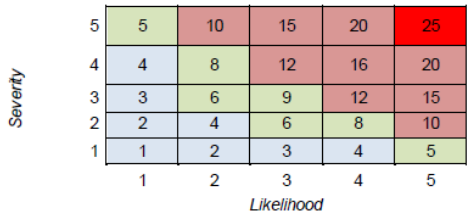
The impact categories analyzed were:

- Greenhouse gas emissions
- Energy consumption
- Freshwater resources
- Marine and terrestrial ecosystem
- Social and cultural issues
- Land use planning and management
- Storage and use of harmful substances
- Air quality, noise and odour
- Wastewater
- Solid waste
- Safety and health hazards

The outcome of this exercise is presented in Table below. Activities that could potentially cause significant environmental impacts have been singled out as those that need further investigation to ascertain the level of environmental stress that they may cause. The aspects that could possibly have a significant impact on the environment have been retained for further analysis.

Environmental, Socio Economic and Safety Aspects and Impacts

Stage	Aspect/Activity	Impact	Type (E, SE, H&S)	N/P	Severity	Likelihood	Significance	Level of Significance
1	**Construction Phase**: Construction of the scrap tyre/rubber and plastic pyrolysis plant	Greenhouse Gas Emissions	E	N	2	1	2	Relatively Harmless
		Energy Consumption	E	N	1	1	1	Relatively Harmless
		Freshwater Consumption	E	N	1	2	2	Relatively Harmless
		Marine and Terrestrial Ecosystem						
		Socio-Cultural and Economic Issues	SE	P	1	1	1	Relatively Harmless
		Land Use Planning and Management	E &SE	N	1	1	1	Relatively Harmless
		Storage and Use of Harmful Substances						
		Air Quality, Noise and Odour	E, SE & H&S	N	2	4	8	Mild Effect, Easily Correctable
		Wastewater Generation	E	N	2	2	4	Relatively Harmless
		Solid Waste Generation	E	N	3	3	6	Mild Effect, Easily Correctable
		Safety and Health Hazards	H&S	N	2	1	2	Relatively Harmless
2	**Operation Phase**: Operation of scrap tyre/rubber and plastic pyrolysis plant	Greenhouse Gas Emissions	E	N	2	2	4	Relatively Harmless
		Energy Consumption	E	N	1	5	5	Mild Effect, Easily Correctable
		Freshwater Consumption	E	N	1	5	5	Mild Effect, Easily Correctable
		Marine and Terrestrial Ecosystem						
		Socio-Cultural and Economic Issues	SE	P	1	1	1	Relatively Harmless
		Land Use Planning and Management	E &SE	N	1	1	1	Relatively Harmless
		Storage of Scrap Tyres and Waste Plastic	E & H&S	N	3	2	6	Mild Effect, Easily Correctable
		Air Quality, Noise and Odour	E, SE & H&S	N	4	3	12	Harmful but Correctable
		Wastewater Generation	E	N	4	3	12	Harmful but Correctable
		Solid Waste Generation	E	N	3	1	3	Relatively Harmless
		Safety and Health Hazards	H&S	N	3	2	6	Mild Effect, Easily Correctable



21 to 25	Requires Immediate Action
10 to 20	Harmful but Correctable
5 to 9	Mild Effect, Easily Correctable
1 to 4	Relatively Harmless

Severity

1	No Impact
2	Negligible Impact
3	Considerable Impact
4	Great Impact
5	Very Great Impact

Likelihood

1	Very Improbable
2	Not Probable
3	Rarely Occurring
4	From Time to Time
5	Fairly Regularly

E- Environmental Impact

S- Safety Impact

SE- Socio Economic Impact

N- Negative Impact

P- Positive Impact

6.2 Construction or machinery installation phase

This phase shall begin with the site preparations for construction works to take place. Construction Impacts have the potential to create nuisance for residents, however these could be managed in an acceptable limits. In addition the construction impacts are also temporary in nature.

6.2.1 Positive Impacts

6.2.1.1 Employment Opportunities

Both direct and indirect forms of employment shall arise from the project initiation. Direct employment will be mainly through skilled and unskilled laborers whose workforce shall be needed to build the proposed project. Employment opportunities will be a benefit both in economic and social sense. In the economic sense it means abundant unskilled labor will be used in economic production. In the social sense the young and energetic otherwise poor people from the surrounding areas will be engaged in productive employment other than remaining idle. Several workers including casual laborers, structural engineers, masons, carpenters, joiner's electricians, mechanics and plumbers are expected to work on the site for a period that the project will start to the end.

6.2.1.2 Local and National Economic Gains

Both the local and national economy shall gain much from the project in that materials for building shall be sourced locally within the country and that all the materials are charged VAT hence increasing revenue collection in the country.

6.2.1.3 Provision of Market for Supply of Building Materials

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

6.2.1.4 Informal Business Growth

During construction period, the informal sector will benefit from the operations. This will involve Jua kali operators selling their products to be used on site. Such a move shall promote Jua Kali entrepreneurs in the local areas. Food business will also emerge as most of the workers who will be working on the proposed project site will be buying food from the informal business owners who shall be operating in the vicinity.

6.2.2 Negative Impacts

6.2.2.1 Soil Erosion

There are high possibilities of soil erosion occurring during the construction phase are high specifically during rainy and windy seasons. This is even made worse by the type of soil and the gradient on site and some rain water runoff from other areas finding its way to the site. Such problems become serious when the top soil is left bare and agents of erosion become active. Removal of top soil after site clearance by agents such as wind, rain water, surface runs offs, movement is feasible action to occur. The top soil is made loose during site clearance and left vulnerable to soil erosion agents. Increased erosion as a result of unstable soil, nutrients imbalances in the soil, and/compaction of soil.

6.2.2.2 Storm Water Surface Run Off

There is a likelihood of interference of the construction activities from the storm water runoff either from the site, project accessing road or from the neighboring compounds. The gentle slope nature of the area facilitates surface run off to occur.

6.2.2.3 Noise pollution

The construction and mechanical installation works will most likely be a noisy operation due to the moving machines (mixers, tippers, hand held machines, communicating workers) and incoming vehicles to deliver materials and workers to site. However the site workers are likely to be affected since noise beyond some level is itself a nuisance and need to be avoided. Noise created shall be a nuisance to the neighboring community mainly immediate neighbors, though at a lesser scale.

6.2.2.4 Excavation Works

Excavation works is definite to take place during the leveling of the proposed project site in a bid to make a formidable ground for stable building structures. The result will be the removal of top soil to give way of laying foundation for buildings. The excavated soils have to be disposed off in an environmentally sound manner.

6.2.2.5 Oil Spills

The waste tyres product to be recycles or re-processed which might spill and to the machines on site may be containing moving parts which will require continuous oiling to minimize the usual corrosion or wear and tear. Possibilities of such oils spilling and contaminating the soil and water on site are real. Likewise, moving vehicles on site may require oil change.

6.2.2.6 Increased Water Demand

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

6.2.2.7 Dust Emissions

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

6.2.2.8 Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by the construction equipments and machines during the construction phase. Motor vehicles used to mobilize the work force and materials for construction would cause a potentially significant air quality impact by emitting pollutants through exhaust emissions.

6.2.2.9 Increased Runoff from New Impervious Areas

Construction of the proposed project and its associated constructions like roofing, the paved driving way could result in additional runoff through creation of impervious areas and compaction of soils. Impervious areas and compacted soils generally have higher runoff coefficients than natural area, and increased flood peaks are a common occurrence in developed areas.

6.2.2.10 Hydrology and Water Quality Degradation

Project related excavation could lead to water surface and ground water quality degradation. Contaminated soil or ground water in the path of the project could be disturbed by excavation resulting in a potential transfer of the contamination to surface waters. The excavated area, if linear

could act as a conduit to extend groundwater contamination to new areas. Spills of oil and other hazardous materials in excavated areas during construction could introduce contaminants to ground water.

6.2.2.11 Workers Accidents and Hazards during Construction

During construction of the proposed project, it is expected that construction workers are likely to have accidental injuries and hazards as a result of handling hazardous waste. Because of the intensive engineering and construction activities including erection and fastening of roofing materials, metal grinding and cutting, concrete work, steel erection and welding among others, construction workers will be exposed to risks of accidents and injuries. At times, such injuries may be from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets and collapse of building sections among others.

6.2.2.12 Exposure of Workers to Diseases

During construction phase, workers are likely to be exposed to diseases from building materials. It is therefore recommended that before the construction commences, there is need for the materials to be well inspected according to the occupational health and safety standards.

6.2.2.13 Solid Waste Generation

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

6.2.2.14 Extraction and Use of Building Materials

Most of the building materials such as hard core, ballast, cement, rough stone steel and sand required for construction of the proposed project will be obtained from quarries, hardware shops and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for construction of the slabs, and walls, the availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts.

6.2.2.15 Energy Consumption

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

6.3 Operation phase

6.3.1 Positive Impacts

6.3.1.1 Employment Generation

Employment opportunities are one of the long-term major impacts on the proposed project that will be realized after construction and during the operation and maintenance of the project. These will involve security personnel, workers, businesses that will be located within the vicinity of the building.

6.3.1.2 Increase in Revenue

There will be positive gain for the revenue system arising from the processing of the building plans to the proposed building to the local council; this is in addition to the annual rates to be paid to the council. The proposed project will also generate income to the owner through the sales from the re-processed final products of oil lubricants.

6.3.1.3 Individual Investments

Economically speaking, investing in products processing factory business is one area which never goes wrong. Investing in Pyrolysis plant project is a good investment to individual or even organizations like co-operatives. Through buying/construction of the project and then starting products manufacturing, the owner is able to earn some income or save on spent capital from lubricant oil sales.

6.3.1.4 Provision of infrastructure

Being a planned proposed project in Kwale County area, the residents of Mariakani Township and entire Coast region will get affordable services within their reach from the work place. This has a direct impact of greatly reducing regular travel to far looking for Lubricating oil. Land is a scarce resource in Kenya and through construction of the proposed project will ensure optimal use of land to the great benefit of the country and its people.

6.3.1.5 Improved Security

With the erection of a traffic barrier at the entrance to the targeted plot for the proposed project, the level of security will improve around the project area. The community will be given the necessary security by gate officers to be attached to the barrier.

6.3.1.6 Optimal Land use

To develop under-used land for this kind of project that complements economic activities hence making use of land space to improve the economy and provide more business premises.

6.3.2 Negative Impacts

The proposed project development will cause significant disturbances within the area which shall be kept at controllable levels.

6.3.2.1 Increased Pressure on Infrastructure

To some level, new projects usually have a potential of increasing pressure on existing infrastructure such as roads, sewer lines among other infrastructural facilities. This would be due to increased volumes on human and vehicle traffic along the access road.

6.3.2.2 Air Pollution

Poor solid waste management could lead to blocking of drainage works especially when the proposed project is in existence and this can lead to flooding and unsanitary conditions within the neighboring area. Blocked drains lead to bad odor hence environment unfriendly. The project management proposed to have good controlled and well management of solid and liquid waste to avoid this from occurring.

the pyrolysis reactor will not contribute to GHG emissions as it does not require oxygen, thus does not produce CO_2. The waste does not comprise halogens hence there will be no production of hazardous emissions like dioxins and furans. However, there will be generation of partivulate due to the composition of tyre consisting of rubber, carbon black, metal, textile, zinc oxide, Sulphur and additives.

The pyrolysis units are expected to have minimal air pollution impacts because most of the pyrolysis gas generated in the pyrolysis process will be re-used as it will be burned as fuel in the process. For complete combustion, the products will be water, CO_2, Oxygen and nitrogen from excess air and hydrogen from pyrolysis gas. The process undergoes below temperatures of below 800°C hence no NO_X will be generated

6.3.2.3 Electricity Consumption

The Proposed project development shall consume good amount of electricity. Since electric energy in Kenya is generated mainly through natural resources, namely water and geothermal resources,

increased use of electricity have adverse impacts on these natural resources base and their sustainability.

6.3.2.4 Solid Waste Generation

The Proposed project is expected to generate enormous amounts of solid waste during its operation phase. The bulk of the solid waste generated during the operation of the project will consist of paper, plastic, glass, metal, textile, organic wastes, and the produced oil spills. Such wastes can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on animal health. Some of these waste materials especially the plastic/polythene are not biodegradable hence may cause long-tem injuries effects to the environment. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas, a powerful greenhouse gas known to contribute to global warming.

6.3.2.5 Increased Storm Water Flow

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

6.3.2.6 Water Use

The domestic activities during the operation phase of the project will involve the use of large quantities of water as a result of activities that will take place and the large number of people who will be working and operating in the proposed project. These activities include: cooking, washing, general cleanliness, drinking among other activities.

6.3.2.7 Traffic Density Increase

The Proposed project will have a potential of increasing pressure on existing infrastructure such as road, with many truck and vehicles plying the access road to deliver materials and equipment.

6.4 Decommissioning Phase

6.4.1 Positive Impacts

6.4.1.1 Rehabilitation

Upon decommissioning of the proposed project development, rehabilitation of the project site will be carried out to restore the site to its original status. This will include replacement of topsoil and re-vegetation which will lead t improved visual quality of the project area. If the new project to be put up at the site is listed in the second schedule of EMCA, then an EIA will be carried out again.

6.4.1.2 Employment Opportunities

Since the demolition exercise will utilize human resource manpower, employment opportunities shall therefore be created.

6.4.2 Negative Impacts

6.4.2.1 Solid Waste

Demolition of the related infrastructure will result in the accumulation of huge amounts of solid waste. This consists of materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

6.4.2.2 Dust emission

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

6.4.2.3 Noise and Vibration

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

7 MITIGATION MEASURES FOR THE NEGATIVE ENVIRONMENTAL IMPACTS

7.1 Introduction

This section highlights the mitigation measures for the identified possible negative environmental and social impacts of the proposed project.

7.2 Mitigation of Construction and Mechanical Installation Phase Related Impacts

7.2.1 Air quality

Controlling dust during construction is useful in minimizing nuisance conditions. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants that would occur in the exhaust from heavy equipment are also included. The project proponent is committed to implementing measures that shall reduce air quality impacts associated with this project. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill fuel tanks in the afternoon, and minimize idle running of engines. In addition, dust emissions will be controlled by the following measures:

- Watering all active construction areas as and when necessary to lay dust
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access road, parking areas and staging areas at construction sites.
- Sweep regularly (with physical sweepers) the parking area and staging areas at the project sites.
- Plant fast growing trees around the project area to act as a wind breakers to reduce the uplift of particulate matter that lead to respiratory diseases.
- All construction machinery shall be marinated and serviced in accordance with the contractors' specifications.
- Dust generating activities like excavation, handling and transportation of soil will be avoided during strong winds.

7.2.2 Noise Pollution

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

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

In consideration of the above, the project proponent shall put in place several measures that will mitigate noise pollution during the construction phase. The following noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site.

- Install portable barriers to shield compressors and other stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Install sound barriers for pile driving activity.
- Limit pickup trucks and other equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.

7.2.3 Generation of Exhaust Emission

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

- Vehicle idling time shall be minimized
- Alternatively fuelled construction equipment shall be used where feasible
- Equipment shall be properly tuned and maintained

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

7.2.4 Risk Hazardous Waste Handling

Adequate collection and storage of waste on site and safe transportation to the disposal sites and disposal methods at designated area shall be provided. In addition the proponent is committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Health and Safety Act (Cap 514). In this regard, the project proponent is committed to provision of appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers as outline in the EMP.

7.2.5 Increased Runoff

Increased runoff from paved grounds and expansive roofs causing extreme flooding and overflows of drainage systems shall be mitigated. Surface runoff and roof water shall be harvested and stored in underground reservoir for reuse. A storm management plane that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structures will be designed.

7.2.6 Sustainable Utilization of Construction Materials

The project proponent will source building materials such as sand, ballast and hard core from a licensed quarry and sand mining firms, whose projects have undergone satisfactory environmental impact assessment/audit and received NEMA approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated. To reduce the negative impacts on availability and sustainability of the materials, the proponent will only order for what will be required through accurate budgeting and estimation of actual project requirements. This will ensure that materials are not extracted or purchased in excessive quantities. Moreover, the proponent will ensure that wastage, damage or loss (through run-off, wind, etc.) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials. In addition to the above measures, the project proponent shall consider reuse of building materials and use of recycled materials. This will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

7.2.7 Minimizing of Project Waste

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

7.2.8 Reduction of Energy Consumption

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

7.2.9 Minimization of Water Use

The project proponent shall ensure that water is used efficiently on site by sensitizing construction staff to avoid irresponsible water use.

7.3 Mitigation of Operation Phase Impacts

7.3.1 Ensuring Efficient Solid Waste Management

There shall be the provision of solid waste handling facilities such as waste bins and skips for temporarily holding domestic waste generated by the residents. There shall be arrangements to ensure proper disposal regularly and appropriately. Advice notices will be put up at strategic areas asking the occupants to manage their waste efficiently through recycling, reuse and proper disposal procedures. Overall, there shall be use of an integrated solid waste management system. In this regard, the project proponent will give priority to reduction at Source of the materials. This option will demand a solid waste management awareness programme in the management and the residents. Secondly, Recycling, Reuse and composting of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The recyclables will be sold to waste buyers within Kilifi County. The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy. Finally, sanitary land filing will be the last option for the proponent to consider.

7.3.2 Proper storage of scrap tyres within the yard

Risks associated to the storage of scrap tyres include tyre fires, tyre leachates contaminating groundwater, surface water and soil and risk with health consequences as improper storage of tyres may become potential breeding ground for mosquitoes, rodents and other animals.

The designated tyre storage area will be on level site away from surface watercourses, flood zones and groundwater recharge points. It is recommended that the area to have concrete flooring to eliminate the risk of contamination due to leachate.

7.3.3 Pollution control equipment/wet scrubber

The pyrolysis reactor will have emissions which if not mitigated may cause environmental nuisance. A wet scrubber will be used which will minimise the impacts of emissions to the environment.

7.3.4 Minimization of Sewage Release

The project proponent will ensure that there are adequate means of handling the large quantities of sewage generated at the proposed project. It will also be important to ensure that sewage pipes are not blocked or damaged since such problems will lead to leakages and careless disposal of effluent, resulting in land and water contamination. Any such blockages or damages will be fixed expeditiously.

7.3.5 Ensure Efficient Energy Consumption

The project proponent plans to install an energy saving lighting system at the proposed project. This will contribute immensely to energy saving during the operational phase of the project. In

addition, occupants of the shops will be sensitized to ensure energy efficiency in their domestic operations. To complement these measures, it will be important to monitor energy use during the operation of the proposed project and set targets for efficient energy use.

7.3.6 Ensure Efficient Water Use

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

7.4 Mitigation of Decommissioning Phase Impacts

Decommissioning is a controlled process used to safely retire a facility that is no longer needed. During decommissioning, facilities or structures are cleaned or secured so that the facility does not pose a risk to public health or the environment now or in the future.

Following completion of the construction of the Project, any areas of land used for the project should be re-instated for sustainable future use.

- Termination of power supply to the development.
- Termination of water connections.
- Submit a decommissioning plan to NEMA for approval at least three months prior to decommissioning phase.
- Treatment plant to be decommissioned in an environmentally friendly manner.
- All facilities within the project are will be decommissioned in an environmentally friendly manner.
- Provision of Personal Protective Equipments (PPEs) to the workers who will participate in the demolition exercise.
- Waste from the site to be disposed in an environmentally friendly manner.
- Rehabilitation of land by removing any unnecessary materials that shall be covering land and preventing the natural biodiversity.
- Landscaping and re-vegetation of all disturbed areas.
- Building materials that cannot recycled should be disposed off by a registered waste handler recognized by NEMA in relation to Environmental Management and Co-Ordination (Waste Management) Regulations, 2006 Legal Notice No. 121.

7.4.1 Efficient Solid Waste Management

Solid waste resulting from demolition waste be recycled or reused to ensure that materials that would otherwise be disposed off as waste are diverted for productive uses. In this regard, the project proponent is committed to ensuring that demolition materials at the end of decommissioning phase will be used in other projects rather than being disposed off. In addition, demolition materials including cabinets, doors, plumbing and lighting fixtures, marbles glass her and other steel machine parts will be recovered for refurbishing and use in other projects. Such measures will

involve the sale or donation of such recyclable/reusable materials to construction companies and sold to scrap metal dealers, local community groups, institutions and individuals residents or homeowners. It is further recommended that the project proponent should consider the use of recycled or refurbished demolition materials. Purchasing and using once-used or recovered demolition materials will lead to financial savings and reduction of the amount of demolition debris disposed of as waste.

7.4.2 Reduction of Dust Concentration

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

- Install portable barriers to shield compressors and other stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Install sound barriers for pile driving activity
- Limit pickup trucks and other equipment to an idling time of five minutes, observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.

7.4.3 Minimization of Noise and Vibration

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

- Install portable barriers to shield compressors and other stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements).
- Install sound barriers for pile driving activity.
- Observe a common-sense approach to vehicle use, and encourage workers to switch off vehicle engines whenever possible.

8 ANALYSIS OF ALTERNATIVES TO THE PROPOSED PROJECT

8.1 Introduction

The following definition of "alternatives" is given in the EIA Regulations: "alternatives", in relation to the proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to-

a) the property on which or location where it is proposed to undertake the activity;
b) the type of activity to be undertaken;
c) the design or layout of the activity;
d) the technology to be used in the activity;
e) the operational aspects of the activity; and
f) The option of not implementing the activity".

Typically, alternative assessments are conducted to assist in comparing various projects or attributes of projects that will occur. The most critical comparison is evaluating any proposed project against the No-Go option. The alternatives assessment then considers alternatives to project site selection for the proposed development; alternatives to layout of the development; and alternatives to construction methodologies and/or materials used for the development.

8.2 No Project Alternative

This alternatives assessment was conducted using a simple cost-benefit analysis, through assessing various environmental attributes. These attributes can include physical (geology and soils, surface water quality and quantity, groundwater quality and quantity); biophysical (flora and fauna, sensitive environments); and social attributes (site of archaeological or cultural importance, land use issues, social health and welfare).

The impact of the each alternative was then evaluated in terms of whether it has a positive, negative, or no impact. In this instance, the impact is not evaluated in terms of significance but rather whether or not it will arise. Positive impacts are assigned a value of 1; no impact a value of 0; and a negative impact a value of -1.

By adding all of the attribute scores for each alternative, a suitability score is derived that indicates the preferred alternative. A total positive score indicates that the project benefits outweigh the potential negative impacts, while a total negative score indicates the project environmental costs outweigh the potential benefits. Essentially, the highest scoring alternative is then carried forward for full impact evaluation. The potential impact of the preferred project option on environmental and socio-economic attributes identified during the assessment phase is evaluated against the potential impact of the No-Go option on the same attributes.

The no project alternative option in respect to the proposed project implies that the status quo is maintained; this option is the most suitable alternative from the extreme environmental perspective as it ensures non-interference with the existing conditions. Under no project alternative, the proponent's proposal would not receive the necessary approval from NEMA proposed project would not be constructed and there would be no demand for the development. This option will however, involve several losses both to the land owner and the community as a whole. The No project option is the least preferred from the socio-economic and partly environmental perspective due to the following factors.

- Discouragement for investors
- Land will remain less utilized.
- No employment opportunities will be created for Kenyans bearing in mind the proposed project is estimated to take at least one year before completion.
- Local skills would remain under-utilized.

8.3 Analysis of Site Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public, health safety, security and environmental aesthetic requirements. Equipments that save energy and water will be given first priority without compromising on cost or availability factors. Heavy use of timber during construction is discouraged because of massive destruction of forests.

8.4 Domestic Waste Water Management Alternatives

The proponent shall connect all his waste water to the waste water treatment plant system which will be designed to accommodate the capacity of the whole project.

8.5 Solid Waste Management

The proposed project will generate massive solid wastes both during construction and operational phases. An integrated solid waste management system is recommendable. The proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the management. Recycling, reuse and composting of waste will be an alternative in priority. This calls for a source separation programme to be in put in place. The recyclable will be sold to waste buyers within the surrounding areas.

Activity alternatives; The proposed activity is the recycling and recovery of waste tyres through the use of a pyrolysis processes. Currently, most tyres are disposed of to landfill or accumulate at various facilities or on vacant land where they are unmanaged. Alternative methods to dispose of, recycle or re-use the waste tyres include the following:

Alternative A1: Tyres can be retreaded, whereby the remaining tread is removed and a new tread (rubber strip) is fused to the old "skeleton" of the tyre using vulcanisation. The quality of the retreaded tyre is, however, not high;

Alternative A2: Tyres can be mechanically or cryomechanically milled/ground up and the rubber pieces used in other applications, such as for sport surfaces, carpets, playgrounds etc. If the rubber is ground up into a very fine powder, the powder can be used to reinforce new rubber products. These applications do not produce atmospheric emissions, but have a high energy usage and there is a limited market for the products;

Alternative A3: It has often been attempted to reclaim scrap rubber products, but the process is difficult and costly. The quality of the reclaimed rubber is also not high and the re-selling of the reclaimed rubber as a raw material is therefore problematic; and

Alternative A4: Pyrolysis presents an opportunity to produce valuable products from the waste tyres and can also result in less negative environmental impacts than for example, the burning of tyres or their disposal to landfill. The solid Char can be used as a smokeless fuel, to reinforce new rubber products or as activated Carbon. The oils can be used as fuels, a source of chemicals due to the oil's mixture of organic compounds, or as a feedstock for the petroleum industry. Gases from the pyrolysis process consist of non-condensable organics like CO, CO2, H2, H2S, CH4, C2H4 and C3H6, and can be used as a fuel for the pyrolysis process (Juma *et al.,* 2006).

Pyrolysis is seen as the most economically viable option at this stage and is also the type of recycling plant that the applicant would like to establish. The other alternatives are less viable as they are costly, have difficult processes and also do not always have proven markets for their products.

Site layout alternatives

On the proposed site, there are limited site layout alternatives that can be considered. The alternatives include which of the three existing buildings are used for the pyrolysis plant, the storage of raw materials, such as chemicals, and the storage of product, such as steel, Carbon black and oil. The ideal use of each of the three buildings is being considered as part of the planning phase for the project. It is anticipated that Buildings 1 and 3 will be used for storage purposes and Building 2 for the pyrolysis plant itself. As only one half of the site is still open space, this area will be used for the storage of waste tyres prior to their processing.

9 ENVIRONMENTAL MANAGEMENT/ MONITORING PLAN (EMP)

9.1 Introduction

This chapter presents the Environmental Management Plan (EMP) that will need to be implemented by the proponent to prevent or reduce significant negative impacts to acceptable levels. All the project components and support facilities like roads, electricity transmission lines, community CSR amenities, etc) were all considered when this comprehensive EMP was developed.

An environmental monitoring plan is vital for any Environmental Management Plan of a development project. The monitoring plan helps in assessing the effectiveness of proposed mitigation measures, in assessing changes in environmental conditions and to provide warning of significant deterioration in environmental quality for further preventive action.

The following EMP has been structured in such a manner to provide a basis for Environmental Management System (EMS) ISO 14001 Principles for the life of the proposed project. It should be further noted that the proposed EMP is not static, as allowance has been made for it to evolve through the life of the project. Such a characteristic is seen to be important to key factors and processes may change through the life of the project. It is therefore necessary to alter proposed mitigation and monitoring methodologies in order to determine best approach to deal with such changes.

This EMP include the necessary specialist input to determine, mitigate and manage any environmental impacts that the proposed development may have, relating to bio-physical and socio-economic aspects.

Specific attention has been made to ensure that the EMP conforms to the following criteria:
It is auditable in that it:

- Identifies specific quantifiable monitoring regimes;
- Delineates key lines of accountability;
- Associates mitigation and monitoring tasks to specific impacts;
- Gives guiding costs of implementation,
- Where practically possible identifies key indicator, which can be utilized for environmental performance monitoring
- Ensures flexibility to enable incorporation of additional monitoring and mitigation techniques as deemed necessary throughout the life of the project

- Conforms to all best practice principles by acknowledging the existence of both long time and immediate impacts and the resulting mitigation measures necessary to deal with such and;
- Identifies key corporate commitments made by project proponent and their local Partners in Kenya, with regard to its environmental performance.

9.2 Proposed Project – EMP for the Construction (Implementation) Phase

The following are the objectives, targets and measures that will be adhered to at all times.

Table 3: Proposed Project – EMP for the Construction (Implementation) Phase

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Increased exploitation of raw materials	▫ Source building materials from suppliers who use environmentally friendly processes in their operations. ▫ Ensure accurate budgeting and estimation of actual construction materials requirements to ensure that the least amount of material necessary is ordered ▫ Ensure that damage or loss of materials at the construction site is kept minimal through proper storage. ▫ Use at least 5% - 10% recycled refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills.	Developer	Once-off	0
Ecosystem disturbance	▫ Ensure proper demarcation and delineation of the project area to be affected by construction works ▫ Specify locations for trailers and equipment, and areas of the site which should be kept free or traffic equipment, and storage. ▫ Designate access routes and parking within the site. ▫ Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction.	Developer Contractor	Ongoing	0
Run off and soil erosion	▫ Create storm water management practices, such as piping systems or retention ponds or tanks, which can be carried over after the building is complete. ▫ Apply soil erosion control measures such as leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil. ▫ Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site.	Contactor,	When Necessary	0

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Solid waste generation	▫ Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials. ▫ Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed off. ▫ Ensure that damaged or wasted construction materials including cabinets, doors, plumbing and lighting fixtures, marbles and glass will be recovered for refurbishing and use in other projects. ▫ Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. ▫ Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements. ▫ Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste. ▫ Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site. ▫ Dispose waste more responsibly by dumping at designated dumping sites or landfills only; the use of a registered waste disposal company is encouraged.	Developer Contractor	As necessary	0
Air/Dust Pollution	▫ Ensure strict enforcement of on-site speed limit regulations ▫ Avoid excavation works in extremely dry weathers ▫ Sprinkle water on graded access routes each day to reduce dust generation by construction vehicles.	Contractor	Once-off	5,000
Air pollution	▫ Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, switch off or keep vehicle engines at these points. ▫ Ensure proper planning of transportation of materials to ensure that vehicle fills are increased in order to reduce the number of trips	Contractor	On-going	20,000

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
	done per vehicle or the number of vehicles on the road.			
Noise pollution	▫ Sensitize construction vehicle drives and machinery operators to switch off engines of vehicles or machinery not being used. ▫ Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as schools, residential areas and hospitals. ▫ Ensure that construction machinery are kept in good condition to reduce noise generation ▫ Ensure that all generators and heavy duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Contractor	Once-off	0
Depletion of energy resources	▫ Ensure electrical equipment, appliances and lights are switched off when not being used. ▫ Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy. ▫ Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. ▫ Monitor energy use during construction and set targets for reduction of energy use ▫ Promptly detect and repair of water pipe and tank leaks ▫ Ensure taps are not running when not in use ▫ Promote recycling and reuse of water as much as possible ▫ Install a discharge meter at water outlets to determine and monitor total water usage	Contractor	Continuous	0
Effluent emissions	▫ Provide means for handling sewage generated by construction workers ▫ Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies ▫ Monitor effluent quality regularly to ensure that the stipulated	Developer Contractor	As necessary	5,000

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
	discharge rules and standards are not violated			
Violation of rules and Regulations	▫ Ensure that all building plans are approved by the Local Authority and the local Occupational Health and Safety Office. ▫ Registration of the premises under the Factories and Other Places of Work Act Cap 514, Laws of Kenya is mandatory. ▫ A general register should be kept within the facility as stipulated in Sec 62 (1) of the Factories and Other Places of Work Act.	Developer Contractor	Ongoing	10,000
Ventilation obstructions	▫ Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers	Contractor	Ongoing	30,000
Physical fitness	▫ Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment.	Developer Contractor,	Ongoing	5,000
Injuries caused by machineries and equipments	▫ Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded. ▫ Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain. ▫ All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury. ▫ Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations ▫ Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued. ▫ Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register.	Developer Contractor	Ongoing	2,000
Poor storage of materials	▫ Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse.	Contractor	As necessary	2,000

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Unsafe means of access and safe place of employment	▫ All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained ▫ Securely fence or cover all openings in floors ▫ Provide all staircases within the premises with suitable handrails on both sides ▫ Ensure that construction workers are not locked up such that they would not escape in case of an emergency ▫ All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained.	Developer Contractor	Ongoing	10,000
Emergencies	▫ Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency ▫ Such procedures must be tested at regular intervals ▫ Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers ▫ Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site. ▫ Provide measures to deal with emergencies and accidents including adequate first aid arrangements.	Developer Contractor	Ongoing Continuous	0
Catastrophes	▫ Well stocked first aid box which is easily available and accessible should be provided with the premises. ▫ Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body. ▫ Firefighting equipment such as fire extinguishers and hydrant systems should be provided at strategic locations such as stores and construction areas. ▫ Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained.	Developer Contractor	Once-off	0

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Food and toxins	▫ Develop a suitable system for the safe collection, recycling and disposal of chemical wastes, obsolete chemical and empty chemical containers to avoid their reuse for other purposed and to eliminate or minimize the risks to safety, health and environment. ▫ Ensure that all chemicals used in construction are appropriately labeled or marked and that material safety data sheets containing essential information regarding their identity, suppliers classification of hazards, safety precautions and emergency procedures are provided and are made available to employees and their representatives/ ▫ Keep a record of all hazardous chemicals used at the premises, cross-referenced to the appropriate chemical safety data sheets ▫ There should be no eating or drinking in areas where chemicals are stored or used.	Developer Contractor	Once-off	0
Pollution	▫ Ensure that workers at the excavation sites and other dusty sites are adequately protected from inhalation of substantial quantities of dust through provision of suitable protective gear (e.g. nose masks) ▫ Provide workers in areas with elevated noise and vibration levels, with suitable ear protection equipment such as ear muffs ▫ Suitable overalls, safety footwear, dust masks, gas masks, respirators, gloves, ear protection equipment etc should be made available and construction personnel must be trained to use the equipment. ▫ Ensure that construction workers are provided with an adequate supply	Developer Contractor	Continuous	0
Sanitary	▫ Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained in within the site. ▫ Provide and maintain adequate and suitable accommodation for clothing not worn during working hours for construction employees ▫ Provide and maintain, for the use of all workers whose work is done	Developer Contractor	Continuous	0

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
	standing, suitable facilities for sitting sufficient to enable them to take advantage of any opportunity for resting which may occur in the course of their employment ▫ Accumulations of dirt and refuse should be cleaned daily from the floors, benches, staircases and passages. ▫ Provision for repairing and maintaining of hand tools must be in place			

9.3 Proposed Project - EMP for Operational Phase

Table 4: Proposed Project-EMP for Operational Phase

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Solid waste generation	▫ Provide solid waste handling facilities such as waste bins and skips ▫ Ensure that solid waste generated at the development is regularly disposed of appropriately at authorized dumping sites ▫ Donate redundant but serviceable equipment to charities ad institutions	Developer	Continuous	
Sewage release into environment	▫ Provide adequate and safe means handling sewage generated at the project	Developer	When necessary	
Energy consumption	▫ Switch off electrical equipment, appliances and lights when not being used ▫ Install occupation sensing lighting at various locations such as storage areas which are not in use all the time ▫ Install energy saving fluorescent tubes at all lighting points within the proposed development instead of bulbs which consume higher electric energy ▫ Monitor energy use during the operation of the project and set targets for efficient energy use ▫ Sensitize the occupants to use energy efficiently	Developer	As necessary	
Water Exploitation	▫ Promptly detect and repair of water pipe and tank leaks ▫ Residents to conserve water e.g. by avoiding unnecessary toilet flushing. ▫ Ensure taps are not running when not in use ▫ Install water conserving taps that turn-off automatically when water is not being used ▫ Install a discharge meter at water outlets to determine and	Developer	As necessary As necessary	

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
	monitor total water usage			
Higher and Safety Risks	▫ Implement all necessary measures to ensure health and safety of workers and the general public during operation of the Proposed project project as stipulated in Factories and Other Places of Work Act Cap 514	Developer	Continuous Continuous	0
Safety and security of the premises and surrounding areas	▫ Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the premises during night hours.	Developer	Continuous	0
Air Pollution	▫ All unnecessary movement must be limited ▫ Strict on-site speed controls are to be enforced	Developer	Ongoing	0
Registration of the project premises	▫ The developer must acquire application forms for the registration of the project site under the Occupational Safety and Health Act, Laws of Kenya. This registration application forms need to be completed and returned to the local occupational health and safety office.	Developer	Once-off	0
Approval of development plans	▫ Development plans should be presented to the local occupational health and safety office for subsequent scrutiny and approval	Developer	Once-off	0
Providing copies of the Occupational Safety and Health Act	▫ The abstract of the Occupational Safety and Health Act must be well posted in prominent places in the project site	Developer	Once-off	0
Dangerous occurrences	▫ Provision for reporting dangerous occurrences needs to be in place	Developer	Once-off	0
Environment, Health and Safety committee	▫ Provision must be put in place for the formation of an Environment, Health and Safety committee, of which the employer and workers are represented	Developer	Once-off	0

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Medical Examination for all employees	▫ Arrangements must be in place for the medical examination of all employees, before employment, during and after termination of employment	Developer	Continuous	0
Safety of all persons	▫ All machines and other moving parts of equipments must be enclosed to protect all workers from injury	Developer	Ongoing	5,000
Examination of plant and equipment	▫ All compressors, lifts (if any), and other lifting machines must be examined by a government or company authorized person. The equipment may only be used if a certificate of examination has been issued	Developer	Once-off	60,000
Sitting facilities	▫ Provisions need to be in place to provide adequate and suitable sitting facilities for workers who work standing	Developer	Once-off	10,000
Facilities for the physically disabled workers	▫ Provisions need to be in place to provide adequate and suitable facilities for physically disabled workers who work standing. Such people should be employed in areas without machinery movements.	Developer	Once-off	15,000
First aid and emergency preparedness	▫ Provision must be made for persons to be trained in first aid with a certificate issued by a recognized body. ▫ Three trained first aid personnel are needed for first hundred employees plus one additional person for each extra employees or thereof	Developer	Once-off	30,000
Ventilation	▫ Enough space needs to be left at all facilities to allow for adequate natural ventilation	Developer	Once-off	0
Fire emergency plan	▫ Emergency plan and evacuation routes should be marked and communicated to staff	Developer	Ongoing	0
Electrical safety (only when electricity is used)	▫ Circuits must not be overloaded ▫ All electrical equipments must be grounded	Developer	Once-off	0

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Emergency Exits	▫ ALL the emergency exits should be opened outwards and be marked in RED and should be clear of slip, trip and fall hazards	Developer	Once-off	0
PPE	▫ Provision for suitable overalls, safety footwear, dust masks, respirators, gloves, ear protection where possible.	Developer	Continuous	100,000
Handling of chemicals	▫ Chemical safety data sheet of the chemical used at the plant should be kept on record	Developer	Continuous	0
Ventilation at the administration block	▫ Air conditioners and overhead fans need to be installed (when electricity is available)	Developer	Continuous	0
Painting of administration block	▫ Ceilings must be painted white and walls light colour	Developer	Continuous	0
Ergonomics	▫ Must have a proper backrest to provide lower back support	Developer	Once-off	0
Noise Pollution	▫ Ambient noise impact mitigation needs to focus on the following: • The planning of construction activities must endeavour to minimize the noise impact on adjacent landowners • In this regard, vehicles should idle as little as possible, construction schedule times must be adhered to ,and all construction workers must be encouraged to keep noise to a minimum on site; • All generators and heavy duty equipment is to be insulated and/or placed within buildings to minimize the ambient noise levels	Developer	Continuous	0
Signage provision	▫ All signs must be within the guidelines of the Kenyan legislative framework and as directed by NEMA	Developer	Once-off	0

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Odour smell	▫ It is the responsibility of the developer to ensure that wastewater storage and load off areas are functioning correctly and that the source of odours is identified and dealt with immediately.	Developer	Continuous	0
Spirit of EMP	▫ In the spirit of this EMP document, the maintenance and the future improvement of the integrity and functioning of the project is fundamental. All the activities mentioned herein, must be carried out in this spirit, with this end-goal in mind.	Developer	Continuous	0

9.4 Proposed Project – Decommissioning and Closure Phase

In addition to the above Tables it is necessary to outline the basic rehabilitation measures that will be required to be undertaken once all operations activities have ceased. To this end Table 5 below outlines basic principles, which need to be adhered to during the rehabilitation process. It should however be noted that such principles should not be viewed in isolation but rather an extension of all actions identified in the above Tables.

Table 5: Proposed Project – EMP for Decommissioning Phase

Activity	Action Required	Responsible Party	Frequency	Approx Cost (Kshs)
Landscaping	▫ All cleared slopes shall be terraced and re-vegetated	Developer, Contractor	Continuous	30,000
Removal of construction materials	▫ Once construction is complete; all construction materials are to be removed in appropriate manner.	Developer, Contractor	Daily	50,000
Replacement of topsoil	▫ Topsoil is to be replaced strictly according to all principals outlined by environmentalist.	Developer, Contractor	Continuous	25,000
Restriction of vehicle access	▫ Vehicles must be kept on existing tracks and no new tracks should be created through rehabilitated areas.	Developer, Contractor	Once-off	0
Ripping of soil	▫ Soil that has been compacted by the passage of vehicles and pedestrians must be ripped to a depth of 15cm in lines not more than 50cm apart. ▫ Ripping should be done in two directions perpendicular to each other	Developer, Contractor	Once-off	8,000
Solid waste generation	▫ All building, machinery, equipment, structures and partitions that will not be used for other purposed must be removed and recycled/reused ▫ All foundations must be removed and recycled, reused or disposed off at a licensed disposal site, ▫ Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site ▫ Donate reusable demolition waste to charitable organizations, individuals and institutions	Developer, Contractor	Once-off	60,000

10 CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

The pyrolysis of waste tyres has been identified as the only viable Activity Alternative, even though such a plant will result in negative environmental impacts. The identified impacts/environmental risks to the environment as a result of the proposed Waste Tyre Pyrolysis Plant are mostly **Medium.** The impacts can, however, be mitigated to mostly **Low,** provided that the draft Environmental Management Programme, containing all proposed mitigation measures, is implemented. It is further important that the EMP must be viewed as a dynamic, working document that will be improved upon as and when required.

The construction of the pyrolysis plant on a site with existing infrastructure and bulk services was found to be the most viable option for the client in terms of the financial costs associated with establishing a site for the proposed plant. Designing the Waste Tyre Pyrolysis Plant with a stack height in line with Good Engineering Practice is the preferred design alternatives as it resulted in fewer exceedances, however, still prove to be acceptable in practice, although it is more likely to require abatement technology.

The proposed project is in line with the government's objective to ensure environmental protection is put into control. The project design seeks to ensure sustainable development through sustainable use of waste tyre resources. The positive and negative impacts which will come along with the establishment of the proposed project have been exhaustively discussed within the report with revelation that the positive impacts outweigh the negative impacts. The proposed project will not only enhance economic growth at local level but also contribute to the national, regional and international economy.

10.2 Recommendations

Based on the outcomes of the Environmental Impact Assessment, conducted as part of this full Scoping and Environmental Impact Assessment process, as well as the alternatives assessment, the following recommendations are made:

1. The proposed project/activity (the construction and operation of the Waste Tyre Pyrolysis Plant) should be authorized and allowed to proceed on the preferred site on condition that the proposed plant also should be carrying out ambient and stack analysis on quarterly basis.
2. Strict monitoring and enforcement of requirements of the EMP must be undertaken to ensure that contractors and operators adhere to these requirements,
3. Proposed mitigation measures should be incorporated as far as possible into the operational plan for the plant.
4. A communications pathway must be established that would allow the designated ECO to accept and deal with stakeholder complaints.
5. Environmental management plan in addition to observing the mitigation measures

established for every impact identified. Among the specific recommendations include,

(i) Ensure waste and wastewater management regulations are complied with through provision of appropriate facilities including wastewater treatment facility, solid waste collection bins and transfer arrangements. Hazardous waste holding units should be isolated from the external environment at all times,

(ii) Aerial emissions be controlled through appropriate extraction fans in the operation areas into bag houses, electrostatic precipitators and installed scrubbers in the stacks to ensure no hazardous residuals finds their way back in to the natural environment,

(iii) Safety measures for the workers and the neighbouring community shall be integrated in the entire project cycle,

(iv) Compliance with the existing laws and regulations shall be upheld at all times,

(v) The above environmental management plan shall be adopted and applied as the basis for addressing environmental and social aspects throughout the project cycle with necessary amendments as may found appropriate. In this connection, it will be the guiding tool for future audits and monitoring exercises.

REFERENCES

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APPENDICES

1. Copy lease agreement for the Proposed project
2. Architectural/ Engineering Drawings/Layout Plans for the proposed plant
3. PIN copy
4. Certificate of in cooperation
5. Consultation and Public Participation field Questionnaires/minutes
6. NEMA Registration Certificate and Annual License for the Environmental Consultants
7. Plant manuals

No. **PVT-EYUBMPXA**

CERTIFICATE OF INCORPORATION

I hereby **CERTIFY** that,

VISUN INDUSTRIES LIMITED

is on this date 26 Jul 2022 Incorporated under the Companies Act, 2015 and that the Company is a **PRIVATE LIMITED COMPANY.**

Registrar Of Companies

This is a system generated certificate. To validate this document send the word **BRS** to **21546**

THE REPUBLIC OF KENYA

BUSINESS REGISTRATION SERVICE
P. O. BOX 30031
NAIROBI
26 JUL 2022

To
The Director(s)
VISUN INDUSTRIES LIMITED
P.O. Box 84417
80100 - MOMBASA G.P.O

THE COMPANIES ACT, 2015

Records relating to the below company held by the Companies Registry as at 26 Jul 2022

COMPANY	VISUN INDUSTRIES LIMITED
COMPANY NUMBER	PVT-EYUBMPXA
NOMINAL SHARE CAPITAL	100,000.00
NUMBER AND TYPE OF SHARES (VALUE PER SHARE)	ORDINARY: 1000 (KES 100.00 EACH)
DATE OF REGISTRATION	26 JUL 2022
REGISTERED OFFICE	P.O BOX 84417, MOMBASA G.P.O TELEPHONE: +254722414411, EMAIL: KWALE2022@YAHOO.COM COUNTY: MOMBASA, DISTRICT: MOMBASA DISTRICT , LOCALITY: ZIWANI STREET: ABDILNASSIR ROAD, BUILDING: ISLAND FOREX HOUSE
POSTAL ADDRESS	P.O BOX 84417 MOMBASA G.P.O
ENCUMBRANCES	

Name of Directors and Shareholders of the above company with their particular are as follows

NAME	DESCRIPTION	ADDRESS	NATIONALITY	SHARES
ABUBAKAR SWALEH SALIM	DIRECTOR/SHAREHOLDER	P.O BOX 84417 MOMBASA G.P.O	KENYA	ORDINARY: 2
VIMAL GORDHANBHAI VEKARIA	DIRECTOR/SHAREHOLDER	P.O BOX 84417 MOMBASA G.P.O	INDIA	ORDINARY: 499
SUNILKUMAR PARSHOTTAM VEKARIYA	DIRECTOR/SHAREHOLDER	P.O BOX 84417 MOMBASA G.P.O	INDIA	ORDINARY: 499
			TOTAL	1000

Yours Faithfully,
REGISTRAR OF COMPANIES

REF NO: PVT-EYUBMPXA

DISCLAIMER: THIS IS A SYSTEM GENERATED CERTIFICATE AND DOES NOT REQUIRE A SIGNATURE

MWAVUMBO GROUP RANCH
P.O BOX 516-80113
MARIAKANI

5TH JULY 2022

ABUBAKAR SWALEH SALIM
P.O.BOX 84300 – 80100
MOMBASA

RE.VOLUNTARY LAND SALE AT MWANDA 'A' VILLAGE IN MWAVUMBO GROUP RANCH.

I hereby write to confirm that **Abubakar Swaleh Salim (Purchaser)** bought 6 (six) acres of land at **Mwanda 'A'** village whose owners are Registered members of Mwavumbo Group Ranch as detailed hereunder**(Vendors)** -;

1.Muganga Chiberya Mbao IDNO.5017652
2.Hamisi Asumani Kaburu IDNO.0501988
3.Yusuf Yama Mbao IDNO.32949724
4.Jumaa Chitoja Mbao IDNO.22598556

Both the vendors and purchaser presented a certified land sale agreement dully signed by themselves and witnessed by **Barayan and Associates Advocate dated 4th July 2022** to Mwavumbo Group Ranch upon completion of the sale transaction where they had given their consent.

Thereafter the purchaser **Abubakar Swaleh Salim** was given the rules and regulations which stated the terms and conditions required for an outsider to own land inside **Mwavumbo Group Ranch title No. Kwale/Mwavumbo/1** which he agreed and fulfilled.

Upon fulfillment of the Mwavumbo Group Ranch procedures, the Group Ranch recognized the purchaser **Abubakar Swaleh Salim** as the owner of the **6 (six) acres of land located at Mwanda 'A' village inside Mwavumbo Group Ranch.**

The purchaser is therefore allowed to start any activities on the six acre piece of land as he awaits for the issuance of title deeds since the land was surveyed and subdivided by Kwale County Surveyors.

Yours faithfully,

William Yawa Chimega
Chairman

CHAIRMAN MWAVUMBO GROUP RANCH
DATE 6/7/2022
P.O. BOX 516 MARIAKANI

OFFICE OF THE PRESIDENT

MINISTRY OF INTERIOR AND COORDINATION OF THE NATIONAL GOVERNMENT

Telegram; "Districter" SAMBURU KWALE
Telephone 0715230300
E-mail address: soloolallu@yahoo.com.
When replying please quote;
Ref. No. KLN/ADMIN 11/Vol.: 3/796 and date;

THE ASS. CHIEF'S OFFICE
MWAVUMBO SUB LOCATION
P. O. BOX 104 - 80113
MARIAKANI
05 - 07 - 2022

TO WHOM IT MAY CONCERN.

RE: AN AGREEMENT BETWEEN THE FAMILLY MEMBERS.

This is to confirm that below is a list of names of the familly members who has agreed to sale their parcel of land measuring '6' Six acres.

The parcel of land is located at Muanda 'A' Village, Kalalani Sublocation, Mwavumbo Location, Kasemeo division, Samburu Kwale Subcounty, Kwale county.

Below are the names of the familly members:-

	NAMES	ID NO	SIGNATURE
1.	HAMISI ASUMANI KABURU	0501988	
2.	MUGANGA CHIBERIYA MBAO	5017652	
3.	JUMAA CHITOJA MBAO	22598556	for
4.	JUMAA HAMISI	28122347	
5.	HAMISI MBAO	33455544	
6.	ABDALLAH CHIBERIYA BURU	31220236	

They have all agreed and the parcel of land has no problem at all.

N/B:- The said parcel of land falls under Mwavumbo group ranch.

SOLOMON K. DALLU
CHIEF MWAVUMBO LOCATION
DATE: 5 - 7 - 2022

DATED THIS 14TH DAY OF JULY 2022

MUGANGA CHIBERYA MBAO

HAMISI ASUMANI KABURU

HAMISI MBAO

(as Vendors)

-AND-

ABUBAKAR SWALEH SALIM

(as Purchaser)

AGREEMENT FOR SALE
In respect of a portion of land allocated to the Vendors by Mwavumbo Group Ranch

---

DRAWN AND FILED BY:
BARAYAN & ASSOCIATES
ADVOCATES
JIWAJI BUILDING, 1ST FLOOR,
BEHIND KONZI MOSQUE
DIGO ROAD.
P.O BOX. 3028-80100.
MOMBASA.

I CERTIFY that the Vendors appeared before me on the ....12th....day of ....JULY.... 2022 and being known to me and being identified by ID No. 5017627,0501988 and 33455544 respectively Acknowledged the above signatures or mark to be theirs and that they have freely and voluntarily executed this Agreement and understood its contents.

BARAYAN & ASSOCIATES
P. O. Box 295-80100
MOMBASA

Signature and Designation
Of Person Certifying

SIGNED by the Purchaser]
ABUBAKAR SWALEH SALIM] .....
]
In the presence of:-]
Advocate

Witness]
BAKARI OMARI BARAYAN] .....
ID No 6725179

I CERTIFY that the Purchaser appeared before me on the ....12th....day of ....JULY.... 2022 and being known to me/being identified his ID No.8379315. Acknowledged the above signature or mark to be his and that he had freely and voluntarily executed this Agreement and understood its contents.

BARAYAN & ASSOCIATES
P. O. Box 295-80100
MOMBASA

Signature and Designation
Of Person Certifying

REPUBLIC OF KENYA

AGREEMENT FOR SALE

THIS AGREEMENT FOR SALE is made on this 4th day of July, 2022 **BETWEEN MUGANGA CHIBERYA MBAO ,HAMISI ASUMANI KABURU AND HAMISI MBAO** of National Identity Card Number 5017627,0501988 and 33455544 respectively and of Post Office Box Number 104 Mariakani (hereinafter referred to as **"the Vendors"**) which expression shall where the context so admits include her successors and assignees of the one part **AND ABUBAKAR SWALEH SALIM** of Post Office Box Number 84300-80100 Mombasa (hereinafter referred to as **"the Purchaser"**) which expression shall where the context so admits include its successors and assignees of the other part.

NOW THIS AGREEMENT WITNESSES as follows: -

1. **THE PROPERTY AND OWNERSHIP**

The Vendors are the owners of portion of land allocated to the Vendors by the Mwavumbo Group Ranch in Mwanda. Approximately 6 acres situated in Mariakani within Kwale County.

2. **THE PURCHASE PRICE**

2.1. The purchase price (hereinafter called **"the Purchase Price"**) of the said Properties is Kshs 4,200,000 (Kenya Shillings Four Million Two Hundred Thousand only) where a deposit of 10% of the purchase price being Kshs. 420,000/= (Four Hundred and Twenty Thousand Only) will be held by both the Vendor/Purchaser Advocate as a stakeholder.

2.2. That all parties have consented that the Vendor/Purchaser advocate will hold the money as a stakeholder pending the registration of the title.

2.3. That the vendors have agreed to sell the property at the agreed price hereinabove mention even after the matter is determined.

3. ADVOCATES

3.1 The Advocates acting for the Vendor and the Purchaser is **Barayan & Associates Advocates, Jiwaji Building, 1st Floor, Digo Road, and P.O. Box 3028-80100, Mombasa.**

4. LAW SOCIETY CONDITIONS

4.1 The Sale is subject to the Law Society Conditions of Sale (2015 Edition) (**"the Law Society Conditions"**) in so far as they are capable of having effect and application in this Agreement for Sale and are not inconsistent with or varied by any of the conditions contained in this Agreement for Sale or are not specifically hereby excluded.

5. COMPLETION

5.1. The completion date shall be thirty (90) days from the date of signing this agreement or upon completion of the suit which this property is the subject matter therein or upon such period as the parties may agree in writing.

5.2. On the date of execution of this agreement and before the completion date the Vendor through her Advocates shall deliver or procure the delivery to the Purchaser's advocates, the following documents, namely:

A. Original Certificate of Title for the properties.

B. Transfer, in triplicate, duly executed by the Vendor in favor of the purchaser.

C. Rates Clearance Certificate valid for at least 21 days from the Mombasa County Government.

D. Duly completed Stamp Duty Valuation Form.

E. Three (3) colored passport size photographs of the Vendor's.

F. Any other document, consent and/or authorization necessary and relevant for completion of this sale transaction.

6. CONDITION OF PROPERTY

The Purchaser has scrutinized the ownership documents, ascertained the beacons and has inspected the properties and is well versed with its boundaries and purchases the same as it is.

7. POSSESSION

7.1 The Vendors shall surrender immediate possession of the said property upon signing this agreement and the Advocate for the Vendor and Purchaser shall hold the Original Title in trust of both the Vendor and Purchaser until full payment of the purchase price.

8. CONSENTS AND CLEARANCES

The Vendors shall in accordance with Clause 5.2 hereinabove obtain all the consents and clearances requisite for the completion of this Agreement for Sale at his own costs.

9. SURVIVAL

Save with regard to matters that require to be fulfilled and are in fact fulfilled prior to or at the Completion Date, this Agreement for Sale shall continue to be in full force and effect.

10. WAIVER

No failure or delay by the Vendors or the Purchaser in exercising any claim, remedy, right, power or privilege under this Agreement shall operate as a waiver nor shall any single or partial exercise of any claim, remedy, right, power or privilege preclude any further exercise thereof or the exercise of any other claim, right or power.

11. REMEDIES CUMULATIVE

Any remedy or right conferred upon the Vendors or the Purchaser for breach of any term in this Agreement including the right of rescission shall be in addition to and without prejudice to all other rights and remedies available to them.

12. VARIATION

12.1. No variation of this Agreement for Sale shall be valid or effective unless such variation shall have been made in writing and signed by both the Vendor and the Purchaser or their respective Advocate provided always that the expression "variation" shall include any variation, supplement, deletion, amendment or replacement, howsoever effected.

12.2. Any reference to an obligation imposed upon a Party by this Agreement for Sale and the Law Society Conditions includes reference to any obligation undertaken or Intended to be undertaken by the Party's Advocates on the party's behalf.

13. NOTICES.

Any notice, request or demand required or permitted to be given or made under this Agreement for Sale shall be in writing and shall be deemed to have been duly given or made when sent by pre-paid postage or delivered to the physical address of the firm of Advocate acting for and on behalf of the party intended to be served and duly acknowledged by stamping.

14. LEGAL CHARGES AND OTHER ATTENDANT CHARGES

The Advocates Legal charges and expenses shall be shared by the Vendor and Purchaser in connection with this sale transaction but the Purchaser shall bear the charges relating to Stamp Duty and the requisite registration charges at the Lands Office.

15. ENTIRE AGREEMENT

This Agreement contains the whole agreement and understanding between the Vendor and the Purchaser relating to the transaction provided for in this Agreement for Sale and supersedes all previous agreements (if any) whether written or oral between the parties in respect of such matters.

16. ENDURING NATURE OF AGREEMENT

This Agreement shall continue to be in force and effect, notwithstanding completion having taken place, for as long as may be necessary for the mutual reliance on the provisions of the Agreement by the parties to it.

17. HEADINGS

The headings of this agreement and of any clauses in it are inserted only for the purposes of convenience and shall not affect the construction of this agreement.

18. BINDING EFFECT

Each of the parties hereby agrees and confirms for the purposes of the Law of Contract Act (Chapter 23, Laws of Kenya) and the Land Act she or he (as the case may be) has executed this Agreement with the intention to bind herself or himself (as the case may be) to the contents hereof.

IN WITNESS WHEREOF the parties have set their respect hands first hereinabove written.

SIGNED by the Vendors]

MUGANGA CHIBERYA MBAO } Muganga

HAMISI ASUMANI KABURU] .....

HAMISI MBAO } .....

In the presence of:-]

Advocate

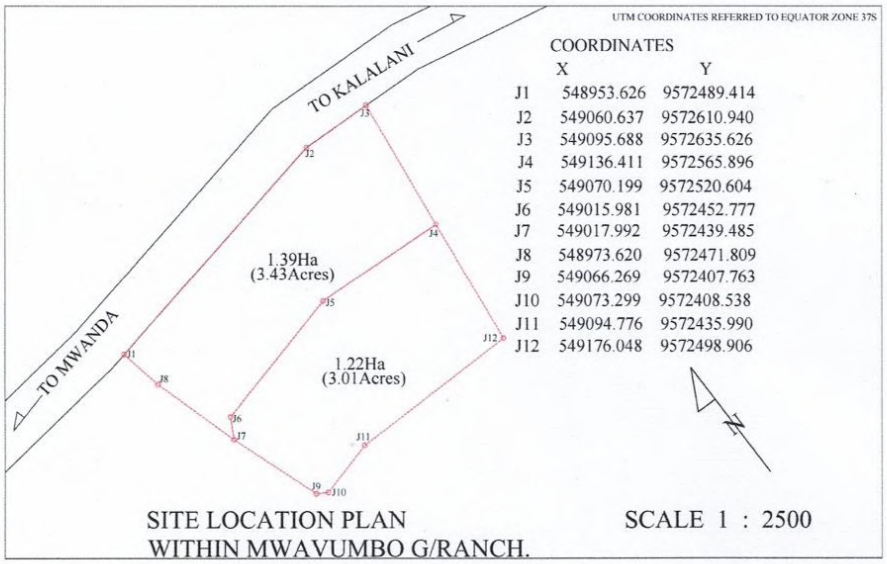
Witnesses

IDI HAMISI HINZANO } .....

ID No. 2177900

FRANCIS TSUMA NGOA } .....

ID No. 24683989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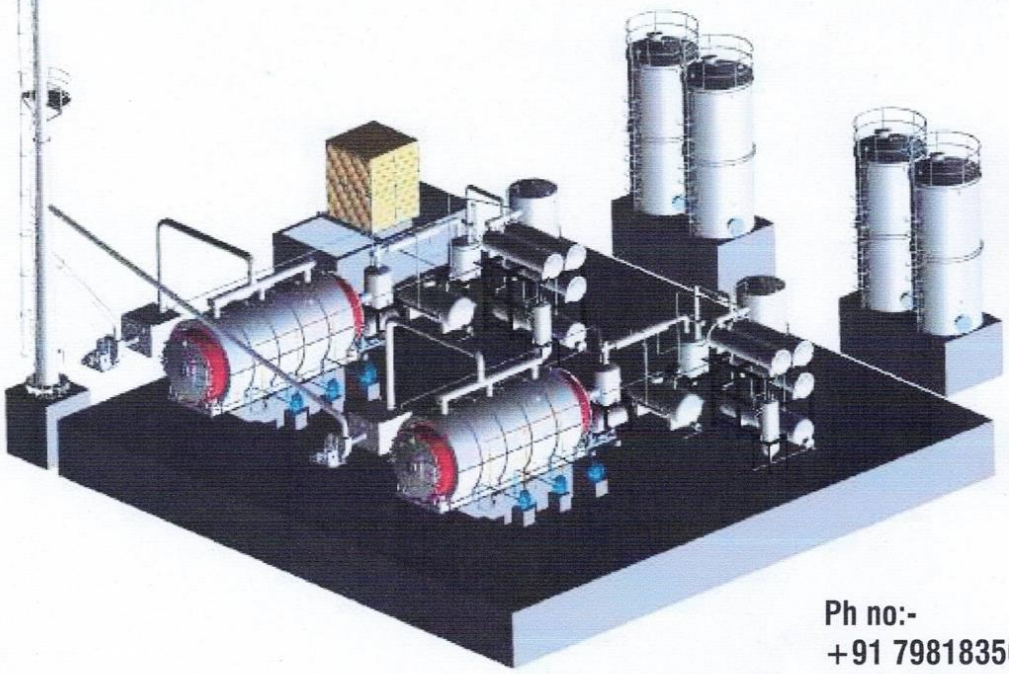
J9 549066.269 9572407.763
J10 549073.299 9572408.538
J11 549094.776 9572435.990
J12 549176.048 9572498.906
TO KALALANI
TO MWANDA
1.39Ha
(3.43Acres)
1.22Ha
(3.01Acres)
N
SITE LOCATION PLAN
WITHIN MWAVUMBO G/RANCH.
SCALE 1 : 2500

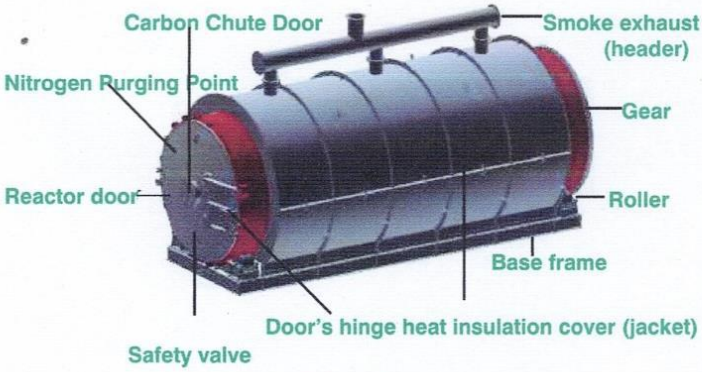
KGN INDUSTRIES

OPERATIONAL GUIDE
TYRE PYROLYSIS PLANT
HORIZONTAL CONDENSOR TYPE SYSTEM

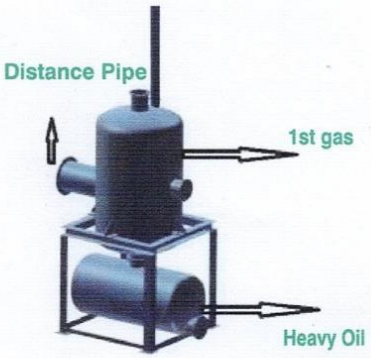


Address:
Plot No 39&40, Ram Reddy Nagar IDA jeedimetla,
Hyderabad-500055, Telangana,India.
Email ID:info@kgnindustries.in

Ph no:-
+91 7981835084
+91 6304520825
+91 9989999278
+91 9949117860
+91 8121431474
+91 9347271821



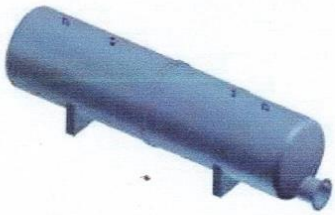
Reactor



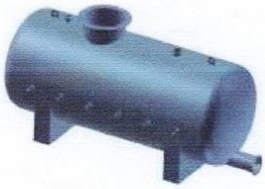
Secondary Gas tank

Horizontal Condensors Assembly

last Gas Tank



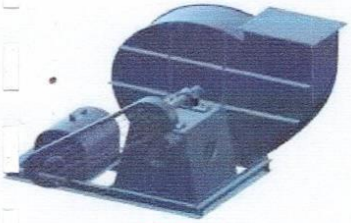
3 kL Tank for Horizontal Condensors



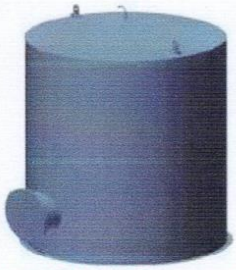
3KL Tank With Coil for Secondary Tank

100 Feet Chimney With Flaring System

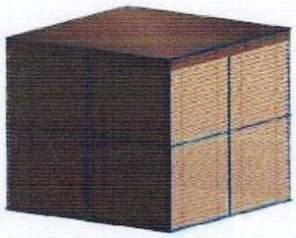
Scrubber



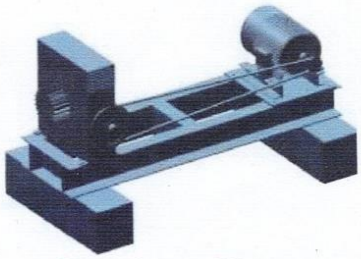
ID Fan



Oil & Water Separation Tank 7 KL Tank

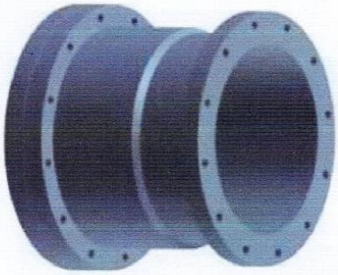


Cooling Tower



Gear box+Motor Assembly

8"Jacked Pipe (Horizontal Condensor)



Hub

Expansion Bellow

Four Way Pipe

0.5 HP Blower

Pyrolisis process

Pyrolisis is thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen (or any halogen) it involves the simultaneous change of chemical composition and physical phase ,and is irreversible.The word is coined from the Greek -derived elements pyro "fire" and lysis "separating".The following are the process operations involved in the waste tyres pyrolysis(batch process).The output in the process is fuel oil,carbon black and steel wire apart from combustible gases.

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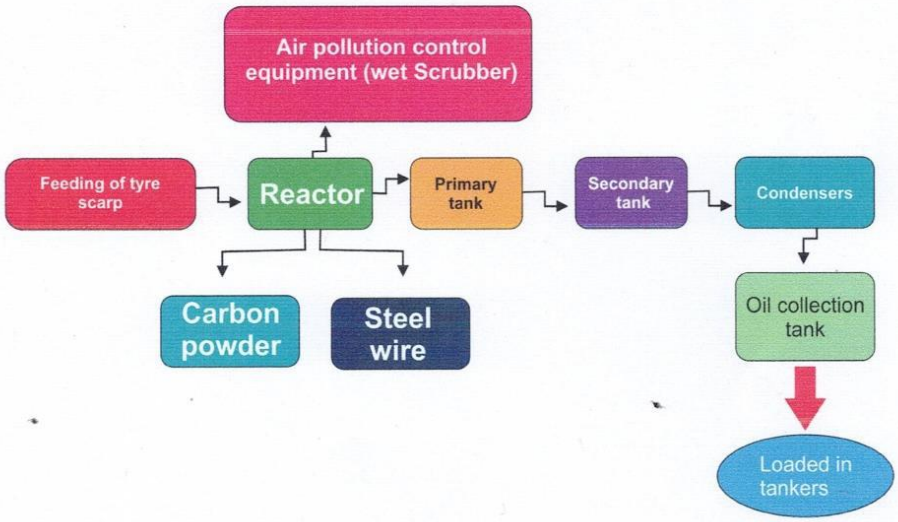
I The used/waste rubber tyres is loaded in the reactor by hydra crane .
ii The waste rubber tyres are loaded into the reactor made of high quality steel. The reactor is heated under control conditions of temperature and pressure.
iii Initially the heating takes place using coal/briquettes as fuel .
vi The process brings molecular restructuring of the rubber and generates furnace oil in gaseous from dddalong with other gases.
v These vaporized gases are passed Initially through a separator to remove any solid/dust particles in the gases.subsequently,the gas passes through heat exchangers/condensers where in the furnace oil is considered into liquid from after separating oil and water.
vi During the process,carbon black and steel are also generated.
vii The heat exchangers use water as coolant.
viii The combustible gases which are not condensed at the end of the process are circulated to the heating chamber and further heating takes place using these gases instead of coal.
ix The process is continued till the furnace oil condensation is exhausted.
x After completion of the process , the reactor is allowed to cool to room temperature.
xi The carbon black thus produced in the process is removed from the reactor by opening a man hole provided in the reactor at room temperature.
xii The steel wire is taken out from the reactor and sold as scrap.
xiii The fuel oil thus obtained is transferred into storage tank.The oil is then loaded in tankers sold to customers.
xiv The carbon black is packed in jumbo bags oven sacks and made ready for dispatch The process is continuously monitored during the heating of the material for temperature and pressure in the reactor and also the condensation of gases and usage of combustible gases for heating purpose.

Process flow chart



15

Process Cycle:	24 hours/ 10 Tons
Loading of raw material	45min to 2 hours.
process heating	8 to 9 hours.
cooling time	10 to 12 hours.
carbon unloading	2 to 3 hours.
nitrogen purging.Door opening, steel removal 4Cleaning	1hour

STANDARD OPERATINGPROCEDURE PROCESS

1.Objective: To describe a procedure for providing guidance to carrying out Pyrolysis Operations of Waste Tyres.

2.Scope: This procedure is adopted for Pyrolysis Operations.

3.Responsibility: Operator is responsible to perform the procedure. Supervisor is responsible to verify the operations. Manager/Director is responsible to implement the procedures.

1.PROCESS PROCEDURE

- Restriction of loading raw material (tyres) to the quantity between 9 MT to 9.5 MT in the Reactor.
- Start Reactor and Ignite the Bio Mass Briquette with about 150 kgs (initially).
- After Briquette catches fire completely, start firing with Pyro Water.
- Once temperature reaches 50°C, close all vents on the Gas Tanks.
- Start cooling tower circulation pump and ensure that water is being circulated.
- Continue Reactor firing with Pyro Water till 1st Gas Tank's pressure comes to 0.1 kg/cm^2 and until temperature reaches about 180° C to 200°C, then shift the fuel from Pyro Water to un-condensed Gas.
- Continue the process and maintain the gas pressure between 0.1 kg/cm^2 to 0.2 kg/cm^2 (maximum).
- If gas pressure seems to cross 0.2 kg/cm2, start firing the uncondensed gas slowly in the flaming room or flaring stack (chimney). Ensure that you start the air blower first followed by releasing the gas and then ignite the flame.
- Continue the same process by maintaining the gas pressure between 0.1 kg/cm2 to 0.2 kg/cm2 by monitoring both Reactor Gas Burners and Flaring Stack Burners.
- The temperature of the gas has to be increased gradually by 50°C in every 30 minutes by monitoring the gas burners.
- Once the gas temperature reaches 360°C to 380°C the gas pressure starts reducing automatically, and flame under the Reactor stops.
- Let the cooling tower pump running till the Gas Temperature on the 1st Gas Tank comes down to 100°C.
- Allow the Reactor to cool down naturally till it reaches 50°C by turning the ID Fan and Reactor's Blowers ON throughout the cooling process. Total cooling period will take about 10 to 12 hours.
- Once Reactor temperature comes below 50°C (it should be felt by hand). Open the Carbon Door (lid), fix

the slip on Carbon Chute on the Carbon Door and start the discharge of Carbon into Jumbo Bags. Ensure that the mouth of jumbo bag is tied up tightly with plastic rope on the carbon chute's outlet so that there is no spillage. Further shift the Carbon Bags into the Carbon Storage Shed with the help of Hydra Crane.

- Once the Carbon Discharge is completed, remove the Carbon Chute and Fix the Carbon Door (lid) back on the flange. Then, pass Nitrogen Gas for about 15 minutes into the Reactor.
- Open the Reactor's Main Door, pour water on steel and then remove the steel with the help of Hydra Crane and shift it to the godown.
- **Precautions:**
- Before starting the carbon removal process, oil from 3 KL Oil Collection Tanks (2 nos) needs to be transferred with the help of Oil Pump to Main Oil Storage Tanks (or into the Oil & Water Separation Tank).
- Safety Valve (Rupture Disk) has to be checked daily before starting the next process.
- At the time of Cooling, when the temperature reaches below 80° C all air vents on the 1st Gas thank, Secondary Gas Tank and Last Gas Tank and 3 KL Oil Collection Tanks (2 nos) should be left open to release heat & gases present inside the Reactor.
- While Reactor is under cooling, the Ash residue under the Reactor should be sprayed with water and removed with the help of a big spatula.

STANDARD MAINTENANCE PROCEDURE:

1.Objective: To describe a procedure for providing guidance to carrying out maintenance.

2.scope: This procedure is applicable to Pyrolysis Plant maintenance.

3.Responsibility: Operator is responsible to perform the procedure. Supervisor is responsible to verify the operations, Manager/Director is responsible to implement the procedure.

Daily Maintenance:

Before loading the Raw Material into the Reactor, Clean the mesh which is fixed at Gas outlet of the Reactor.

- Ensure that expansion bellow and collar duct (Hub) are free of carbon mist of previous batch.
- Ensure that all burner nozzles are clean.
- Ensure that Heavy Oil Tank (under the 1st Gas Tank) is empty.
- Ensure that cooling tower water sump is full with water.
- Ensure all the Rollers are greased.
- Shop Floor, Carbon Go Down, premises should be swiped and poured water on roads.
- Check Rupture Disk condition and replace if found disk is damaged.

- Check the pressure relief valve for cleanliness.
- Dust all Panel Boards with Air Blowers.

Daily Maintenance:

- Watering has to be done for Earth Pits.
- Clean all the condenser tubes by opening the Dummy Flange of the condensers.
- Reactor's Walls (internal Shell) Chipping to be done with the help of a hammering machine.
- Check Reactor's Door's, Carbon Door's and Hub's Gaskets (Gland Rope) and replace if required.

General Maintanence:

1. THE REACTOR DOOR SHOULD BE OPENED AND THE CARBON SHOULD BE CLEANED USING PNEUMATIC HAMMER MACHINE ONCE EVERY MONTH ON REGULAR BASIS.
2. THE FRONT PIPE SHOULD BE CLEANED EVERYDAY.
3. BEFORE OPENING THE DOOR EVERYDAY NITROGEN PURGING SHOULD BE DONE AFTER THE BATCH IS OVER.

REACTOR

FIRST GAS TANK &HEAVY OIL TANK

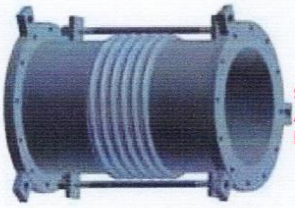
SECONDARY TANK

JACKETED PIPE
(HORIZONTAL CONDENSOR)

16

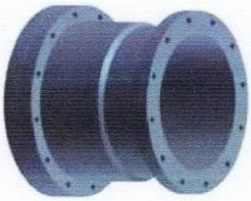
OPEN ALL DUMMY FLANGES ONCE A MONTH AND CLEAN IT PROPERLY.

FOUR WAY PIPE



SHOULD BE OPENED AND CLEANED ONCE EVERY MONTH.

EXPANSION BELLOW

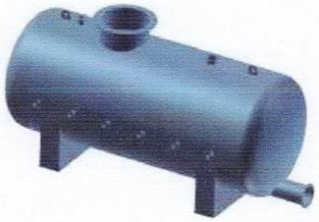


CHECK THE GASKETS (GLAND ROPE) INSIDE THE HUB AND REPLACE IF REQUIRED.

HUB

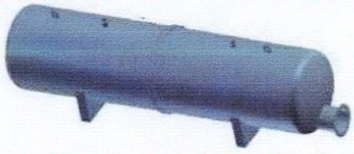
DISH AND DUMMY PLATES FROM BOTH THE ENDS NEEDS TO BE REMOVED AND TUBES INSIDE THE CONDENSERS SHOULD BE CLEANED COMPULSORILY ONCE EVERY MONTH.

HORIZONTAL CONDENSORS



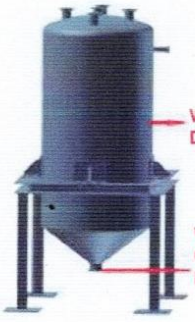
THE DUMMY PLATE NEEDS TO BE REMOVED AND SEDIMENTS INSIDE SHOULD BE CLEANED WITH THE HELP OF A SPATULA.

3 KL OIL RECEIVING TANK FOR SECONDARY GAS TANK (WATER SEAL)



THE DUMMY PLATE NEEDS TO BE REMOVED AND SEDIMENTS INSIDE SHOULD BE CLEANED WITH THE HELP OF A SPATULA.

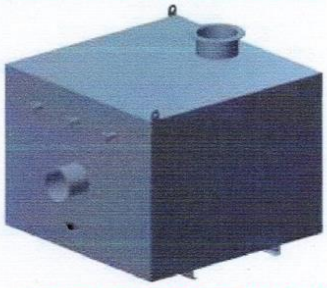
3 KL OIL COLLECTION TANK FOR HORIZONTAL CONDENSORS



WATER TOP UP SHOULD BE DONE DAILY BASIS.

WATER SHOULD BE DRAINED COMPLETELY AND FILLED WITH NEW WATER ONCE IN A WEEK.

LAST GAS TANK



W ATER IN THE SRCUBBER TANK NEEDS TO BE CLEANED AND REPLACED WITH FRESH WATER ONCE EVERY MONTH.

WET SCRUBBER

19

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Mobile Lines: 0724-253 398, 0723-363 010, 0735-013 046
Telkom Wireless: 020-2101370, 020-2183718
Incident Lines: 0786-101100, 0741-101100

P.O. Box 67839, 00200
Popo Road, Nairobi, Kenya
E-mail: dgnema@nema.go.ke
Website: www.nema.go.ke

NEMA/TOR/5/2/545 **15th February 2023**

The Director,
Visun Industries Limited
P.O Box 84417-80100
MOMBASA.

RE: ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE (TOR) FOR ENVIROMENTAL IMPACT ASSESSMENT FOR THE PROPOSED INTALLATION AND OPERATION OF A PYROLYSIS PLANT KWALE/MWAVUMBO/1, KALALANI, (MWANDA A') SAMBURU KWALE SUB-COUNTY, KWALE COUNTY

We acknowledge the receipt of TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act, 1999 the second schedule and the Environmental (Impact Assessment and Audit) Regulations 31 and 35, your terms of reference for the Environmental Impact Assessment (EIA) for the proposed **INTALLATION AND OPERATION OF A PYROLYSIS PLANT KWALE/MWAVUMBO/1, KALALANI, (MWANDA A') SAMBURU KWALE SUB-COUNTY, KWALE COUNTY** has been approved subject to inclusion of EMP for the proposed project and undertaking stakeholders' mapping, identification and engagement plan during the ESIA study.

You shall submit ten (10) copies, a soft copy summarised version of the **ESMP** in **WORD** form and one electronic copy of your report prepared by a registered expert to the Authority.

JOSEPH MAKAU
FOR: DIRECTOR GENERAL

Our Environment, Our Life, Our Responsibility

ISO 9001:2015 Certified

FORM 7 (r.15(2))

nema
mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/18681

Application Reference No: NEMA/EIA/EL/24634

M/S **LOVANS ROBERT ODHIAMBO SPOO**
(individual or firm) of address
P.O. Box 34153 - 80118 MOMBASA

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Associate Expert** registration number **7165**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: 1/23/2023 Expiry Date: **12/31/2023**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2015 Certified

nema

Payment Receipt

Invoice Number:EPL_24108
Invoice Status:PAID
Payment Date:29/12/2022

Applicant Details:
PIN:A005295084B
Name:EZEKIEL OLUKOHE
Phone:0724253398
Email:olukohe2000@yahoo.com

Service	Description	Amount (KES)
Expert License	Payment for Expert License	5,000
Convenience Fee	Ecitizen Convenience Fee	50.00
	Total Amount Paid	5,050
	Balance	0

eCitizen
Fast . Secure . Convenient

Payment Mode
Note :This document is computer generated and therefore not signed. Present it during licence or permit collection

FORM 7 (r.15(2))

nema
mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/16807

Application Reference No: NEMA/EIA/EL/21500

M/S **EZEKIEL OLUKOHE**
(individual or firm) of address

P.O. Box 42588-80100 MOMBASA

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **8379**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **3/11/2022** Expiry Date: **12/31/2022**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2015 Certified

Public consultation

THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT ON LR. KWALE/MWAVUMBO/1, WITHIN MWAVUMBO RANCH , KALALANI, KWALE COUNTY

VISUN INDUSTRIES Limited proposes to construct, install and operate a pyrolysis plant waste tires and plastic waste smelting to realize industrial oil for commercial purposes on a six acre piece of land. The proponent has engaged an Environmental Impact Assessment/Audit consultant as stipulated under Environmental (Impact Assessment and Audit) Regulations, 2003 to carry out an environmental impact assessment report and it in this case that it is mandatory to seek the views of neighbours who may be affected or concerned by the proposed project.
Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   ☑ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   No any conflicts.

3. Are you aware of the proposed project? Am aware of the Proposed Project.

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

☑	Noise	☑	Dust
☑	Increased waste generation	☐	Flooding
☑	Increased traffic	☐	Other

Pollution of mist emmision into the environment.
Waste products will be emitted into Water resources thus pollution.

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

Erection of along chimney
Building of drainage and Septic tanks.
Building of a wide road so that
to easy traffic Jam.

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

Advantage	Disadvantage
Employement.	Noise Pollution
Infrastructure development	Dust Pollution.
It will turn rural	Insecurity.
area into Urban.	Traffic Jam.
Advanced-technology	

7. Do you object the project? (*If Yes, give reasons*)

YES ☐ NO ☑

Name: RAMADHAN MBAO.
Contacts: 0731949713 I.D. No. : 8397195.
Date: 10TH MARCH, 023 Signature:

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION

Public consultation

THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT ON LR. KWALE/MWAVUMBO/1, WITHIN MWAVUMBO RANCH , KALALANI, KWALE COUNTY

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1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... NO .....

3. Are you aware of the proposed project? ..... YES .....

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

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Name: SUSAN DICKSON YAMA

Contacts: 0742808630 **I.D. No. :** 11600949

Date: 10-3-2023 **Signature:** Susan

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION

Public consultation

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   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... NO .....

3. Are you aware of the proposed project? ..... YES .....

4. What are the environmental issues that you may experience when this project is implemented? *(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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YES beneficial

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

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Name: KAMENE JOSEPH CHEMA

Contacts: 0798850635 **I.D. No. :** 4904184

Date: 10/3/2023 **Signature:** Kamene

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
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Public consultation

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1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... NO

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3. Are you aware of the proposed project?.....

   .....

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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Create employment
Air Pollution
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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☐

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Name: MYURIA KAZUNGU JAKA

Contacts: 0115797104 **I.D. No. :** 4990203

Date: 10/3/2023 **Signature:** [signature]

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION

Public consultation

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1. Do you reside in this area?

   ☑ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... N/A .....

3. Are you aware of the proposed project? ..... Yes .....

4. What are the environmental issues that you may experience when this project is implemented? *(tick in box that you think will affect you)*

☑	Noise	☑	Dust
☑	Increased waste generation	☐	Flooding
☑	Increased traffic	☐	Other

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

They Should plant many trees

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

put Cabros everywhere in the Site
put good drainage System
put long chemney

7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

Name: JUMAA CHIOJA MBAO

Contacts: 0728463632 I.D. No. : 22598556

Date: 16/3/2023 Signature:

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION

Public consultation

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   ☐ YES ☑ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... No .....

3. Are you aware of the proposed project?..... Yes .....

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

☑	Noise	☑	Dust
☑	Increased waste generation	☐	Flooding
☐	Increased traffic	☐	Other

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES [✓] NO [ ]

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Name: JIRA MCALA DALU

Contacts: 0114686432 **I.D. No. :** 25003925

Date: 16/8/2023 **Signature:** [signature]

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION

Public consultation

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NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   NO

3. Are you aware of the proposed project? YES

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

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Name: BANJU MVURYA FELIX

Contacts: 0745799115 **I.D. No. :** 33843882

Date: 10/8/2023 **Signature:** B

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION

Public consultation

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NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   ☑ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

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3. Are you aware of the proposed project?.....Yes.....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

   ☐ Noise ☐ Dust

   ☐ Increased waste generation ☐ Flooding

   ☐ Increased traffic ☐ Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES [✓] NO [ ]

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Name: JOHN MGALA MBOVU

Contacts: 0799573401 **I.D. No. :** 33227194

Date: 10/03/023 **Signature:**

Company stamp here

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zebahltd@gmail.com
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Public consultation

THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT ON LR. KWALE/MWAVUMBO/1, WITHIN MWAVUMBO RANCH , KALALANI, KWALE COUNTY

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

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3. Are you aware of the proposed project?.....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☐

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Name: MBOGA MUGUNYA KADZINGO

Contacts: 0796730301 **I.D. No. :** 21833895

Date: 10-3-2023 **Signature:** .....

Company stamp here

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1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

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   NO

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3. Are you aware of the proposed project?.....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☐

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Name: KWEKWE SAIDI MUMBA

Contacts: 0718260119 **I.D. No. :** 35365667

Date: 10/3/2023 **Signature:** Qa

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   ☐ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

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3. Are you aware of the proposed project?.....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

   ☐ Noise ☐ Dust

   ☐ Increased waste generation ☐ Flooding

   ☐ Increased traffic ☐ Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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1. Job opportunity.

2. Business

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

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They will be more smoke.

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Name: MWANIKI JOSEPH

Contacts: 0723 420895 **I.D. No. :** 28809 01

Date: 10/03/2023 **Signature:** .....

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   NO

3. Are you aware of the proposed project? YES

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[✓]	Other

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

- Watering the ground/Road when there is dust
- Disposal pit in case of wastes.
- Generate road signs, bumps, traffic police.

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

- Create employment to the community.
- Business will open up
- Air pollution.
- Water pollution.

7. Do you object the project? *(If Yes, give reasons)*

YES ☐ NO ☑

Name: Solomon Kuphenya Dalu

Contacts: 0715280300 **I.D. No.:** 11244813

Date: 06-03-2023 **Signature:** [signature]

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   NO

3. Are you aware of the proposed project? YES

4. What are the environmental issues that you may experience when this project is implemented? *(tick in box that you think will affect you)*

   - [✓] Noise
   - [✓] Dust
   - [✓] Increased waste generation
   - [ ] Flooding
   - [✓] Increased traffic
   - [ ] Other

5. Suggest possible mitigation measures for the above-mentioned anticipated impacts

- Erection of a long chimney up in the sky so that must to be emmited in sky
- Building of septic tank and drainage system so as waste products to disposed.
- Tree planting.
- Expansion of road and tarmacking

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

Advantages

- Employment Creation.
- Infrastructure development
- It will turn into industrial area.

Disadvantage

- Dust pollution
- Air pollution
- Traffic jam.
- Forestration

7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

Name: RAMA KIBERA KADZINGO.

Contacts: 0717156018. I.D. No. : 28310597

Date: 10TH MARCH, 2023 Signature:

Company stamp here

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THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT ON LR. KWALE/MWAVUMBO/1, WITHIN MWAVUMBO RANCH , KALALANI, KWALE COUNTY

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   No any conflicts have arise of and I haven't heard one of them.

3. Are you aware of the proposed project? Yes, I am aware of this project.

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

- Emission of mist into the air.
- Harmful Products into the air thus creating problems of Breathing.

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

[illegible]

6. *Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? (mention the benefits/disadvantages or what should be done/observed during construction)*

[illegible]

[illegible]

7. Do you object the project? (*If Yes, give reasons*)

YES ☐ NO ☑

Name: [illegible]

Contacts: 0748102699 I.D. No. : 28037384

Date: 10/3/23 Signature: [signature]

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   NO

3. Are you aware of the proposed project? YES

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[ ]	Increased traffic	[ ]	Other

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

Plant trees
Road tarmacing

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

Put cabros & put cabros all over the Site

7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

Name: Hamisi Mbao

Contacts: 0732076208796 I.D. No.: 33455544

Date: 10/3/23 Signature:

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

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3. Are you aware of the proposed project? Yes

   .....

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[ ]	Increased traffic	[✓]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

- Expansion of roads to easy traffic.
- Planting of trees to easy dust.
- Tarmacking of roads.

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

Advantage. Disadvantage.

- Creation of Jobs. Dust.
- Development of Infrastructure. Air pollution.
- Growth of Industrialisation.

7. Do you object the project? (*If Yes, give reasons*)

YES ☐ NO ☑

Name: CHIOJA MWEZA.

Contacts: 0706664927 I.D. No. : 24483269.

Date: 10TH MARCH, 23 Signature:

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   ☑ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   No.

3. Are you aware of the proposed project? Yes.

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

   - ☑ Noise
   - ☑ Dust
   - ☑ Increased waste generation
   - ☐ Flooding
   - ☑ Increased traffic
   - ☐ Other

5. Suggest possible mitigation measures for the above mentioned anticipated impacts

- Waste Pit

6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

- Creating job opportunities.

7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

Name: GEOFFREY MSUKO DZOMBO

Contacts: 0723617710 **I.D. No. :** 4965431

Date: 10/8/2023 **Signature:**

Company stamp here

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1. Do you reside in this area?

   ☑ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... NO .....

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3. Are you aware of the proposed project?.....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

☑	Noise	☑	Dust
☑	Increased waste generation	☐	Flooding
☑	Increased traffic	☐	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? *(If Yes, give reasons)*

YES ☐ NO ☐

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Name: JIRA MTUMKEX

Contacts: 0111808664 I.D. No.: 8135603S

Date: 10/3/2023 Signature: ....

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1. Do you reside in this area?

   ☑ YES ☐ NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... XCO .....

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3. Are you aware of the proposed project?..... YES .....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

☑	Noise	☑	Dust
☑	Increased waste generation	☐	Flooding
☑	Increased traffic	☐	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

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Name: KABZINGO KIBERIA MTUMWA

Contacts: 0729029804 **I.D. No. :** 13487052

Date: 10/8/2023 **Signature:**

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1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... No .....

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3. Are you aware of the proposed project?.....

   .....

4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

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Name: MKEEZA MGANDI KADUCHE

Contacts: 0705663985 **I.D. No. :** 9400884

Date: 10/3/2023 **Signature:**

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Kindly give your views by filling this questionnaire.

NOTE: Failure to give feedback within a period of fourteen days apon receiving this letter, it shall be presumed you have no objection to the proposed project.

1. Do you reside in this area?

   [✓] YES [ ] NO

2. If Yes, are there any conflicts experienced between you and the Plot owner/developer?

   ..... N/D .....

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3. Are you aware of the proposed project?.....

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4. What are the environmental issues that you may experience when this project is implemented?*(tick in box that you think will affect you)*

[✓]	Noise	[✓]	Dust
[✓]	Increased waste generation	[ ]	Flooding
[✓]	Increased traffic	[ ]	Other

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5. Suggest possible mitigation measures for the above mentioned anticipated impacts

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6. Do you think the proposed development is beneficial of disadvantageous and is there anything you would need done during construction period? *(mention the benefits/disadvantages or what should be done/observed during construction)*

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7. Do you object the project? (*If Yes, give reasons)*

YES ☐ NO ☑

.....

.....

.....

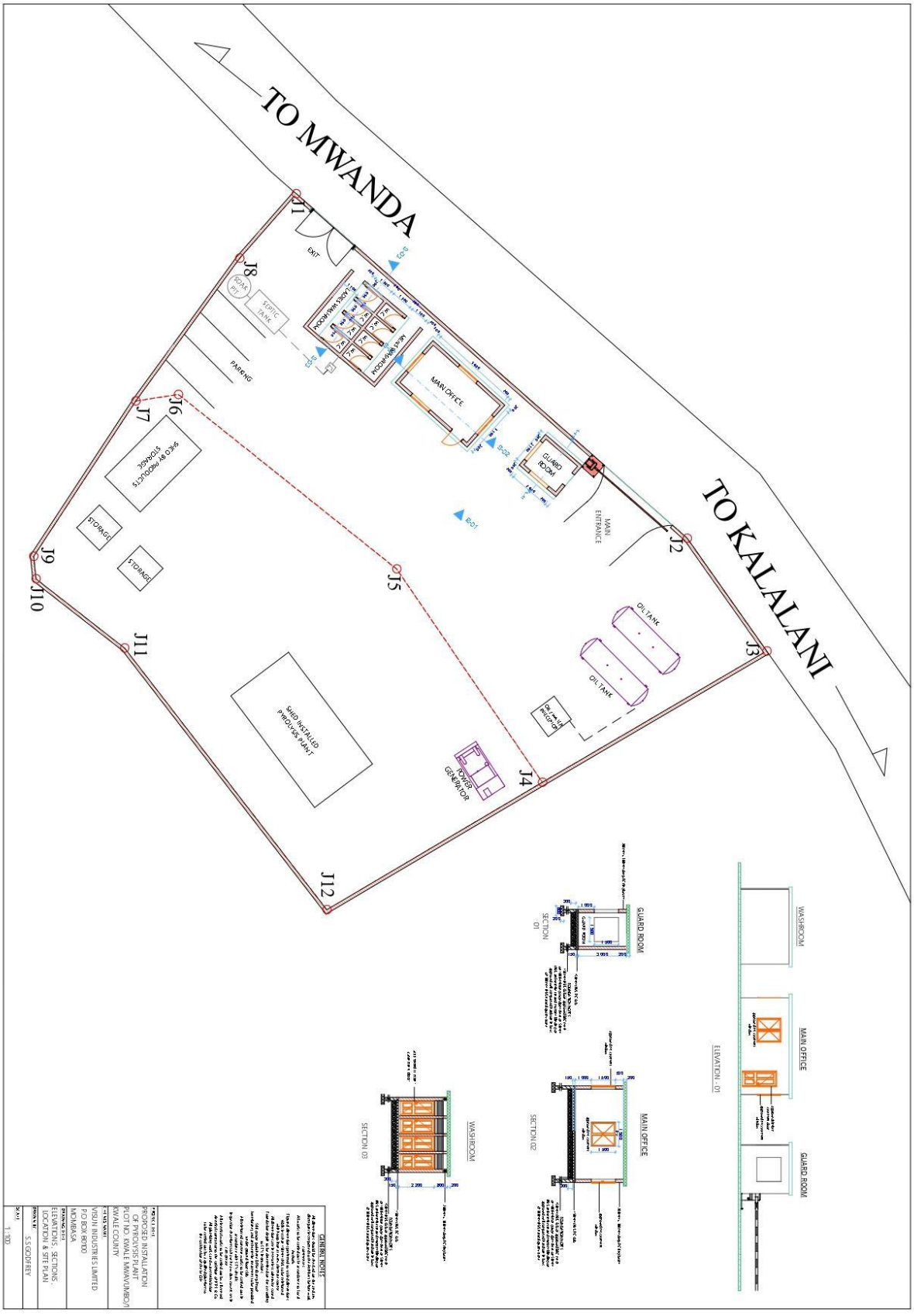
Name: CHENGO RAMA LEKU

Contacts: ~~0702~~ 0723459443 **I.D. No. :** 9471928

Date: 10-3-2023 **Signature:** Kuku

Company stamp here

For enquiries, please contact: 0732766984/0724634944
zebahltd@gmail.com
THANK YOU FOR YOUR CORPERATION


TO MWANDA
TO KALALANI
J1
J2
J3
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J11
J12
EXIT
SOAK PIT
SEPTIC TANK
PARKING
MAIN OFFICE
GUARD ROOM
MAIN ENTRANCE
STORAGE
STORAGE
STORAGE OF PRODUCTS
OIL TANK
OIL TANK
SAID INSTALLED PYROLYSIS PLANT
POWER GENERATOR
WASHROOM
MAIN OFFICE
GUARD ROOM
SECTION 01
SECTION 02
SECTION 03
ELEVATION 01
PROJECT
PROPOSED INSTALLATION OF PYROLYSIS PLANT
PLOT NO. KWALE MWAVUMBO/1
KWALE COUNTY
CLIENT
VITSUN INDUSTRIES LIMITED
P.O BOX 89700
MOMBASA
DRAWING TITLE
ELEVATIONS, SECTIONS, LOCATION & SITE PLAN
DRAWN BY
S.SIGOI EREY
SCALE
1:100

ATTENDANCE LIST FOR PUBLIC BARAZA ON 17TH/FEB/2023TO GATHER STAKE HOLDERS/PUBLIC COMMENTS FOR THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT KWALE/MWAVUMBO/1, MWAVUMBO LOCATION OFF MSA – NRB ROAD, KWALE COUNTY FOR VISUN INDUSTRIES LTD,

NO.	NAME	TEL NUMBER	ID NO & AREA OF RESIDENCE	SIGNATURE	REMARK
1	JUSTUS C. NYAWA	0797905203	4991006		
2	MWEZA MGANDI	0756639 85	9A00884		
3	SWALEH LELU NZOMO	0717570348	2206051		
4	Ilumna Hamisi Mvurya	0701381833	28122347		
5	TYSON K. GATISE	0743448525	40232664		
6	HAMISI KWAKA				
7	GILBERT M GANDI				
8	MENZA MBAO				
9	ROBERT KAPHILA				
10	SWALEH LELU NZOMO	0717570348	2206051		V/ELDER
11	MWEZA MGANDI				
12	MGANGA CHENGO				

13	SOLOMON DALU	0715286380	11244818		
14	MGANDI CHONGONGWE				
15	MARIAM MBOVU				
16	MLONGO KEMBA				
17	NEEMA GILBERT				
18	MWANAMISI CHENGO				
19	MAKUMBA MWUKYA				
20	MBOM MVURYA				
21	MGENDI MTUMWA				
22	MUNGA KATEMBE				
23	MGANDI MWAMBO				
24	MBOM KENGA				
25	BONFACE MUTUA				
26	JSANGARI MANGALE				
26	CHIBERYA MWAMBOGA				

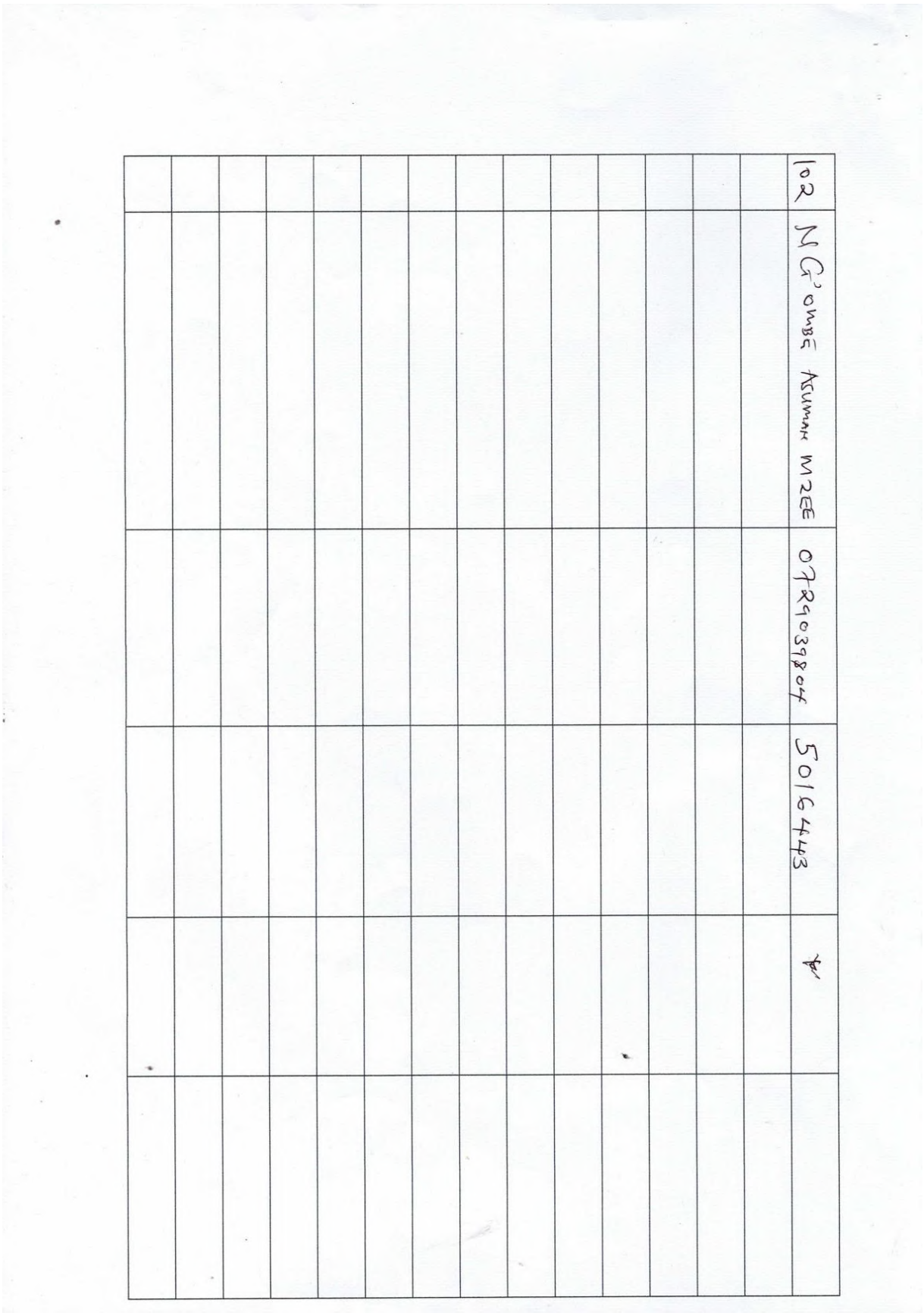
27	MWERO CHIKOPHE				
28	RAMA TSUMA				
29	KADZINGO BAYA				
30	JIRA MTWMWA				
31	GEOFREY DZOMBO				
32	MAMBO FUSI				
33	BANJU. [illegible] MVU[illegible]				
34	MVURYA BURU				
35	NDURYA MREMA				
36	KATEMBE FUSI				
37	SAMSON KITHOME				
38	MENZA KOMBO				
39	NDARO MWAMBA				
40	MWAKALAM MGANDI				
41	CHENGO RAMA	9471928	0723459443	[illegible]	

42	BAYA CHIRAPHO				
43	MWANBOKI JOSEPH				
44	MWARUA CHIKOPHE				
45	MCHOMBO J. MWERO				
46	MGUNYA - MWEZA				
47	MGANDI M. GONDA				
48	NDURO BENSON CHAKATH				
49	SALIM JUMAA				
50	LUVUNO MAMBO				
51	SALIM HAMISI				
52	SALIM BAGALA				
53	SUZANI MBAO				
54	MBOVU MGALLA				
55	LUVUNO DALU CHIDUNDU				
56	LUVUNO DALU				

57	NDINGO NDAO				
58	DAILY CHIGAMBA				
59	KAMENSE CHEMA				
60	TSAMA MBAO				
61	MGANDI KADZINGO				
62	KATEMBE DAILY				
63	CHIGAMBA MUNGA				
64	SAUMU NDAO				
65	MJENI MBORU				
66	UMAZI MGANGA				
67	RIZIKI ABDULLA				
68	FATUMA BATI				
69	MUNGA MUDIGE				
70	UMAZI BAJU				
71	MWAMAKAMBO NZEMBE				

72	AISHA MUNGA				
73	SALAMA KATEMBE				
74	LUVUNO MKAMBA				
75	SHAIBU MGANGA				
76	THABITHA WANJIRU				
77	MGANGA CHIBERYA				
78	JANET MUTUA				
79	KHADIJAH MALEMBI				
80	MBEYU MDUNE				
81	ZEINABU MANGALE				
82	BENYAMATA CHENGO				
83	FRANCIS TSUMA NGOWA	24683989	0702958572		
84	NGOWA NYONDO				
85	MDUNE NGOWA				
86	NYONDO NGOWA				

87	ISMAIL MBAJO MWAMOSE	13628502	0725602356		
88	MWANGOWA NGOWA				
89	Saumu Ndao	23960777	0706462388		
90	ANANIAS KOMWE	32265741	+112481578		
91	MWAMBA MKAHA BAYA	25037354	0748702699		
92	JOHN MGALA MBOVU	33227194	0799573401		
93	JIRA MGALA DALU	25003925	0114686432		
94	ALICE DISII	32632116	0700051156		
95.	KWEKWE SAIDI	35365667			
96	LUWINO DALU	40249087			
97	ZAINABU POMBE	27647330	0742902766		
98	MIONGO MANGALE	30021815	07		
99	BAHATI KADZO	27288455	0791398220		
100	KADZINGO .K. MTUMWA	13487052 ~~0729039804~~	0729039804		


NG'OMBE ASUMAN MZEE
0728903804
5016443

MINUTES FOR PUBLIC BARAZA FOR THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT ON 28RD FEBRUARY 2023 AT 10:00 AM, (PLOT NO. KWALE/MWAVUMBO/1,) HELD AT THE VISUN'S SITE – VISUN INDUSTRIES LIMITED.

ATTENDANCE

1. Mr. Abubakar – Developer/Proponent
2. Evans Totona – EIA expert/health and safety expert
3. Ezekiel Olukohe – EIA Expert
4. Hastings Sifuma – Environmentalist
5. Area Village elders – Mwanda
6. John dalo – Area Chief – Chairperson of meeting

Agenda

1. Preliminary
2. To inform the public about the proposed project and interested/affected parties to air their views/ concerns on the proposed project.
3. Issues raised in first and second meeting and how to mitigate them
4. Closing remarks

Min.1: Preliminary Remarks

The meeting was brought to order at 10:00AM by a word of prayer,.

Min. 2: Proposed project for Pyrolysis plant

The EIA Expert team introduced themselves and the proposed project proponent representative who was in attendance Mr. Abubakar Salim. Team leader appreciated the neighbors for their positive response to attend the third meeting despite their tight schedule. The neighbors introduced themselves since it's very important to know each other before commencing on with the meeting. Stakeholders gave their positive and negative views. Members present recommended the approval for the proposed project due to its economic benefits to that Kalalani.

Min. 3: Views of the interested/affected parties concerning the proposed project

Members discussed the potential environmental issues of concern for the proposed project. Members recommended for the project's approval and the proponent should be allowed to continue with the project but there are things to be taken care of during implementation. The following issues were raised as of concerns:

- Dust emission
- Noise pollution
- Accidents and safety for workers

- Health of workers

Despite the concerns mentioned above, the community also identified the social, economic and environmental benefits that will be brought by implementation of the project. This include:

I. **Employment creation**

They agreed that the project is good since it will employ both the skilled and unskilled people. The proponent was requested to ensure priority for casual job opportunities is given to the needy residents.

II. **Local economy stability**

They said since the project will employ the locals, their living standard will be improved and the economy at large will be boosted.

III. **Socio-economic benefits for the community**

The project will lead to growth and development within the region as the proponent will put some projects for the community such as water tanks. The project will also bring potential business opportunities to the local community and Kilifi County at large.

Min. 4: Issues raised and how to mitigate them

The expert thanked neighbors for airing their views and concerns about the project and asked the neighbors to comment/suggest solutions for mitigating the issues that they have raised above. The solutions were as follows:

Dust emission

The proponent (Visun Industries Limited) is committed to its sustainable pyrolysis plant and mechanisms going to be used to ensure sustainability of the environment and work out put. Workers will be provided with protective gadgets.

Noise pollution

Pyrolysis doesn't results in Noise activities.

Accidents and safety for workers

Employees will be provided with personal protective equipment such as masks, gumboots, reflectors, overalls, goggles, helmet and gloves. First aid kit will also be made available at the site.

Health of the employees

Members enquired how the proponent will handle incase an employee falls sick. First aid kit will be made available at the site throughout. And incase one is seriously ill, then the proponent will cater for their medical bills.

Min. 5: Emmissions

The proponent will contract Eurolab to undertake statutory air emission's as it does in the other factories

Min. 6: A.O.B

Community projects: the community requested the proponent to set up some community projects for them which help in improving their livelihoods. The proponent told them to give their suggestions on the kind of projects they want. They were told to give those suggestions at the chief's office where the proponent will pick them from.

Min. 7: Closing remarks

The area chief, Millicent Pendo thanked all the members for attending the meeting and commended all the members on the punctuality observed. There being no other business, the meeting was closed at 01.30 p.m. with a word of prayer from Mr. Kombe Samson.

Minutes submitted by:

.....

On Behalf of the community,

.....

Area Chief

SOLOMON K. DALLU
CHIEF MWAVUMBO LOCATION
DATE: 28-2-2023

MINUTES FOR PUBLIC BARAZA FOR THE PROPOSED INSTALLATION AND OPERATION OF PYROLYSIS PLANT ON 23RD FEBRUARY 2023 AT 10:00 AM, (PLOT NO. KWALE/MWAVUMBO/1,) HELD AT THE VISUN'S SITE – VISUN INDUSTRIES LIMITED.

ATTENDANCE

1. Mr. Abubakar – Developer/Proponent
2. Evans Totona – EIA expert/health and safety expert
3. Benson Wemali – Environmentalist/trainer
4. Ezekiel Olukohe – EIA Expert
5. Nyumba kumi Representatives
6. Hastings Sifuma – Environmentalist
7. Area Village elders – Mwanda
8. John dalo – Area Chief – Chairperson of meeting
9. Fortune Kennedy

The meeting begun with a word of prayer from Zubeida, at 10;05 AM, followed by introduction of attendees of the meeting by Area Chief.

AGENDA

1. To inform the public about the proposed Visun Industries Pyrolysis plant
2. Interested/affected parties to air their views/concerns on the proposed project
3. Any other Business (A.O.B)

Preliminary

The meeting was held at proposed site area at exactly 10.15 hours on 23rd February 2022 and was started with introduction from the members present presided by the Chief.

Minute 1-23-02-2023: Introduction and project elaboration

The EIA Expert Ezekiel Olukohe Introduced herself, her team and the Proposed Project Proponent (Visun Industries Limited). He also appreciated the members for their Positive response to attend the meeting despite their tight schedule. The attendee's introduced themselves since it's very important to know each other before commencing. The Expert then made project briefing to the meeting- that the proposed project involves two phases Construction and operations of pyrolysis facility, he further highlighted the benefits of the project to the baraza and how the facility is likely to transform the Kalalani area through the waste tyres recycling project, Job provisions and converting the idle land to more benefits for Mwavumbo people, he explained that both direct and indirect benefits will be a achieved from onset of the project through out to the operation phase, he further informed the gathering that, it has come a time that we people of Mwavumbo need to embrace changes and find alternative means of employment through such like projects.

Minute 2-23-02-2023: The Proposed Project

The Environmental Expert explained the purpose of the meeting. He said the meeting was called as part of fulfillment on the requirement by Kenya's Environmental laws on Public Participation/Consultation for any project (regardless of the magnitude) to be implemented, therefore the reason for calling the meeting to gather their views and concerns as required by the law.

Minute 3-23-02-2023: Views of the Interested/Affected Parties

The Evans Tononoka Safety Expert then asked the members if they've understood the project and what's their take on the project. One neighbor Justus said that the project is good and proponent should be allowed to continue but there are things to be taken care for during construction, with main concern on safety to be put in place putting in mind that the commodity to be processed is heavy industrial oil, he wished to be informed if the commodity is flamable, he lamented that they are not just out to reject projects but with proper mitigation measures in place and good economic value for the Mwavumbo community the project is highly to be considered beneficial. The neighbors raised the following issues as of concerns and need to be looked at/taken care of during the construction phase;

Chengo a resident within the Mwavumbo ranch requested to be informed on the negative impacts likely to be generated from the project, - the expert informed him that the construction part of the project is what is likely to have minimal disturbances which are to be experienced for a period of about two years which is the construction phase, he was informed with the operational phase may be emission's from loading and offloading trucks which will be rear, he was further informed that fire incidents have been catered for as per the design of the proposed plant, with installation of proper fire fighting equipments and escape routes.

Esther requested that noise issues to be adhered to during both construction and operational phase.

- ⇨ Noise
- ⇨ Dust
- ⇨ Fire safety
- ⇨ Solid waste Management
- ⇨ Accidents at the site (Occupational Hazards)

However despite of the concerns mentioned above, the neighbors also identified the social, economic and environmental benefits that will be brought by implementation of the project. They include the following;

i. Employment Creation

The neighbors said that the project is good since it will create employment opportunities to both the skilled and unskilled laborers within the neighborhood and this will help to reduce the antisocial behaviors especially in youths due to idling.

ii. Security

The neighbors unanimously agreed that the project if implemented will improve the security of the area since they can come together and employ security guards to over the neighborhood and also it will bring them together and be each other's keeper.

iii. Market demand

The implementation of the proposed project was said to be importation since the proponent will require resources such as raw material for construction and this will increase the market demand since the proponent will purchase the materials locally.

iv. Aesthetic Value of the Project

The neighbors said that if the project will be implemented it will improve the aesthetic value of the neighborhood, since the parcel of land had become an eye saw to the community, with parcel of land being appropriately used it will improve the environmental aspect of land in terms of beatification since they believe the project will be state of art kind of.

v. Local Economy stability

Since the project will create employment opportunities within the neighborhood, the local economy will improve thus raising the living standard of the local residents and the boosting the economy at large.

Minute 4-23-02-2023: Issues Raised and how to mitigate them

The expert thanked the neighbors for airing their views and concerns about the project and asked the neighbors to comment/suggest solutions for mitigating the issues that they have raised above. The solutions suggested were as follows;-

i. Safety of the plant

The expert explained various measures will be put in place to prevent leakages which include an electronic check scale and manual leak detector. An emergency shutdown system will also be installed to improve the safety situation at the facility. A hazardous operability study (HAZOP) will be carried out during the design phase of the facility to incorporate health, safety and environmental considerations. The proposed project will be designed, constructed, and operated in conformance with applicable national and international EHS guidelines and standards. Regarding safety at the facility the proponent

will put in place all mechanisms, processes and procedures to eliminate mitigate or control identified risks and promotes continuous improvement.

i. Noise

The neighbors mentioned that during construction process a lot of noise is always produced by the machineries used such as concrete mixers and this may cause harm to even the workers at the site. They suggested that the contractors to be awarded the job be very keen to ensure that all the site workers are provided with ear muffs. They also suggested that the proponents to ensure that construction works are carried out ONLY during working hours that is from 0800hrs-1800hrs.

ii. Dust

A lot of dust is usually produced during the construction and the neighbors suggested that the proponent and contractor ensure that the site is fenced using galvanized iron sheet (hoarding) or use dust screen so as to minimize dust pollution. They also suggested that the contractor should ensure the site workers are provided with dust mask and should have spare for any visitor visiting the site.

iii. Solid waste management

Solid waste during construction is generated from the packing materials and maybe debris. The neighbors suggested that the solid waste be collected in centralized place and be disposed off accordingly so as to keep their neighborhood clean.

iv. Accidents at the site (Occupational Hazards)

Accidents maybe experienced at the site during construction either from falling objects or sharp objects at the site therefore the neighbors encouraged the proponent to purchase a first aid and advice the contractor to always ensure the kit is at the site. The neighbors also suggested that appropriate signage's be erected at the site and at the appropriate place so as to avoid unnecessary accidents at the site. They also advised the proponent to be visiting the site during closing hours so as to ensure all the equipment that may cause accident are kept in appropriate place.

In response to all these issued raised and suggested measures, the Expert thanked the neighbors and stated that the magnitude of the proposed project is small and the issues they've raised are less likely to result to any serious and irreversible damages since they have given solutions to avoid them. He also guaranteed the neighbors that all

the issues and concerns they have raised will be captured in the Environmental Impact Assessment Study Report and will make further recommendation for the Proponent to follow/adhere to.

Minute 5-23-02-2023: A.O.B

The area Chief addressed the meeting, he lamented that the Big Four is an economic blueprint that was developed by the government to foster economic development and provide a solution to the various socio-economic problems facing Kenyans. He insisted that big 4 agenda is enhancing the local manufacturing industry to offer employment to Kenyans and reduce the trade deficit that the country is currently experiencing. There are several planned initiatives for boosting the local manufacturing sector, top among them being the establishment of special economic zones, where manufacturing companies/plants will receive several benefits such as reduced taxation.

The Proponent Mr Abubakar thanked the attendees for accepting his request to attend the meeting.

He gave a few remarks on the importance of the pyrolysis project and the need for public participation and he committed to them that he would respect their decision and in case the project is approved, He shall work with the community to ensure all safety measures are followed.

He stated similar projects that have been established including Growwell and Sunraj tech, their significance to the Industrial economy and benefits to the public.

The Expert thanked the neighbors for their views and comments and their willingness to attend the meeting. He then asked if any of them has any comment, suggestion or objection concerning the project but the neighbors unanimously said they 'HAVE NO OBJECTION AND THE PROPONENT SHOULD BE GIVEN PERMISSION TO CONTINUE WITH THE PROJECT'.

There being no any other the business the meeting was adjourned at 12:30hrs by a word of prayer from Chisimeri.

The meeting adjourned at 12:30pm

Secretary

Name .....EZEKIEL OLUKOHE..... Sign/stamp.....

Area Chief

Name SOLOMON K. DALLU Sign/stamp.....

SOLOMON K. DALLU
CHIEF MWAVUMBO LOCATION
DATE: 23-2-2023