# Environmental and Social Impact Assessment Study Report for the Proposed Liquefied Petroleum Gas (LPG) Terminal Depot on Plots L.R. Nos. MN/VI/4689 & MN/VI/2428, Port Reitz area, Mombasa County.

| Proponent | Firm of Experts |
|---|---|
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|---|
| Version: Final ESIA Study Report |
| Date: 21st December, 2020 |

## CERTIFICATION

### Certification by Lead Experts

We hereby certify that this Environmental and Social Impact Assessment Study Report has been done under our supervision and that the assessment criteria, methodology and content reporting conform to the requirements of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya.

Signed: _____ _____

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### Certification by Proponent

We, **Mahadi Energy Limited**, confirm that this Environmental and Social Impact Assessment Study Report has been submitted to NEMA with our authority as the project proponent.

Signed for and on behalf of **Mahadi Energy Limited;**

Name: _____

Signature: _____ Date: _____

Proponent Contact Details
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Official Rubberstamp or Seal

## ACKNOWLEDGEMENTS

The preparation of this ESIA study report was made possible by a collaborative effort involving the proponent, the consultants, neighbors and project stakeholders. The proponent, Mahadi Energy Limited, provided the requisite logistical, financial, human resources and documentation on the proposed project. To this end we acknowledge the support by the management and the Project Engineer, Mr. Anthony Muchoki, who worked directly with the team throughout the ESIA study period.

We acknowledge the contribution from the Ministry of Interior and Coordination of National Government through the Deputy County Commissioner, Mr. Khalif Abdullahi, the Sub-County Administrator, Mr. Hezron Katana, the Assistant County Commissioner for Port Reitz Location, Mr. Sironka Masaa and the office of the Chief Port Reitz Location, Mr. Faraji Kibwana during the stakeholders' consultative meetings.

We are indebted to the neighbors and stakeholders for accepting to participate in the public consultations and providing their views, comments and concerns in respect to the proposed project.

Sampling and analysis of environmental media which included air quality, noise levels, soil tests and water quality measurements were undertaken by Polucon Services (K) Limited. The consultants are grateful for their invaluable input in the preparation of the ESIA study report.

We acknowledge the staff of Envasses Environmental Consultants Limited who assisted the consultants in data and information collection, interpretation and analysis, draft material write-up and the printing of the final report. In this regard, we thank Ms. Carolyne Njeri, Ms. Swalha Khan, Mr. Zephania Lagat and Mr. Daniel Njagi.

## EXECUTIVE SUMMARY

The proponent, Mahadi Energy Limited, proposes to construct and operate a Liquefied Petroleum Gas (LPG) Terminal Depot in Port Reitz area, Mombasa County. Transport and related infrastructure including oil and gas pipelines and hydrocarbon projects including depots and refinery facilities for hydrocarbons as well as oil and gas field developments are listed under the Second Schedule (4d, 11a and 11c respectively) of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya as high risk and should therefore undergo an Environmental and Social Impact Assessment (ESIA) Study process. The ESIA study report is prepared pursuant to Section 58 of Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya.

The methodology for preparing the ESIA report was guided by the Third Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. These included site visits and observations, photography, public and stakeholder consultations and baseline monitoring of environmental media. The public and stakeholder engagement strategy included administration of questionnaires to the neighbors, holding a first stakeholders consultative meeting on 9th December, 2020 at the project site to obtain comments and concerns regarding the proposed project, a zoom meeting with the staff of Kenya Pipeline Company on 10th December, 2020 and holding a second stakeholders consultative meeting held on 17th December, 2020 at Bomu primary school to review and validate the ESIA report. Baseline environmental data was collected on air quality, noise level, soil tests and water quality in collaboration with a NEMA designated laboratory, Polucon Services (K) Limited. The findings of the baseline monitoring indicated that both air quality and noise level measurements were within the stipulated EMCA standards. The Soil tests showed that BTEX and PAH were below 0.01mg/kg while TPH was 3.67mg/kg and the tank water sampled does not conform to Water Quality Regulations, 2006 due to high suspended solids.

The findings of the ESIA study demonstrate that the proposed project is expected to have both positive and negative environmental and social impacts. The proposed project is considered important as it will contribute towards attainment of the social economic pillar of Kenya's Vision 2030, United Nations Sustainable Development Goal 7 on affordable and clean energy and United Nations' Sustainable Energy for All Initiative. The project will lead to a significant increase of LPG bulk supply hence will serve an already growing LPG market in Kenya and other regions where the demand is high. Additionally, it will help in eradication of the current bottlenecks in the current supply chain which has resulted in the situation of inevitable rise of the LPG distribution cost. It will also contribute towards the socioeconomic growth of the area through employment creation and revenue generation to the government.

The proposed project is expected to result in a number of negative environmental and social impacts at the various stages of implementation. At construction phase, the main negative impacts will include risks from installation of LPG tanks and pipeline, environmental risks of obtaining raw materials, occupational safety and health risks, noise and air pollution, water demand and effluent generation, solid waste generation, fuel, oil and grease management and increased traffic.

Prior to installation of the LPG tanks and pipeline, the proponent should ensure compliance with the Kenya Standard i.e. KS 1938-3:2012 for the eventual safety of the workers, visitors to the site and neighbors, and reducing the risks on investment.

Actual construction activities such as building of offices, truck loading bays, store, containment walls and changing rooms among others will require raw materials such as building blocks, aggregates, cement, steel, timber and sand. The raw materials will be sourced from the environment and will have negative environmental impacts at their points of origin. Recommended mitigation measures include procuring quantities of construction materials in line with the Bill of Quantities prepared by

a licensed quantity surveyor, sourcing raw materials from sites that are licensed as per the EMCA Cap. 387 of the Laws of Kenya and recycling of construction wastes where practical. Delivery of materials to the site will increase Heavy Commercial Vehicles (HCVs) traffic to and from the area. The contractor should prepare a traffic management plan and comply with the Traffic Act Cap. 403.

Workers undertaking construction activities, visitors to the project site and neighboring properties will be exposed to potential safety and health risks such as from use of machinery, falling objects or even falls, air and noise pollution, potential fire outbreaks from highly flammable material and COVID-19 among others. To mitigate these impacts, the proponent should register the site as a workplace with the Directorate of Occupational Safety and Health Services (DOSHS), provide and enforce the use of Personnel Protective Equipment (PPE), provide the correct equipment for the jobs assigned and train the employees on their use, obtain insurance cover for the employees, comply with the set National Government and County Government Directives and guidelines on prevention of the spread of COVID-19 and the provisions of Occupational Safety and Health Act, 2007.

The construction works, delivery of construction materials by heavy trucks and the use of machinery will lead to high levels of noise and vibration within the construction site and the surrounding area. Additionally, air pollution will be as a result of dust generated during excavation, concrete mixing activities and exhaust fumes from heavy commercial vehicles accessing the site. The proponent should comply with the provisions of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 and the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014.

The construction activities will utilize water for concrete mixing, casting and curing works, general cleaning, drinking and sanitation which will be sourced from water bowsers. Based on the projected workforce of 100 people at construction, domestic water use will be approximately 6$m^3$ per day. Seventy percent (70%) of domestic water use will generate effluent which will need to be managed efficiently. The project site has existing sanitary facilities which will not be adequate for use by the workers. The proponent should sensitize the workers on the need to conserve available water resources, procure and deliver to the site 2 additional mobile toilets from a NEMA licensed waste contractor for use by the workers and comply with the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006.

Construction activities and workers are expected to generate significant quantities of solid waste which should be disposed off by contracting the services of a NEMA licensed waste handler. The proponent should also ensure compliance with the provisions of the Environmental Management and Coordination (Waste Management) Regulations, 2006.

Machinery used for construction activities and vehicles delivering construction materials to the site will need petroleum products such as fuel, oils, lubricants etc. There is potential for leakage and spillage during fuelling, servicing and maintenance of machinery and vehicles which threatens ground and surface waters. The contractor should ensure prevention of oil/grease spillages by employing skilled mechanics and sensitization, procure and train workers on the use of spill containment kits and contract a NEMA licensed waste oil handler to manage the waste oil from the construction site.

The operations of the LPG terminal depot will have the potential to have adverse effects on the environment, workers, visitors to the site and the neighbors. The associated negative impacts during operations include occupational safety and health risks, fire risks and emergency preparedness, air and noise pollution, increased energy demand, increased water demand, waste generation and Storm water management.

The potential safety and health risks from the LPG terminal depot include fire outbreaks and explosions, cold burns from LPG, health related problems due to inhalation and prolonged exposure to the LPG and which can act as an asphyxiant at high concentrations, accidents from use of machinery, vehicular movement and falls among others. All these risks have potential to cause injuries, permanent disability or even death. The report recommends compliance with the Kenya Standard i.e. KS 1938-3:2012 throughout operations, providing workers and visitors with adequate and appropriate PPE, conducting occupational safety and health audits annually and implement recommended mitigation measures and complying with the provisions of Occupational Safety and Health Act, 2007.

Liquefied petroleum gas is highly flammable and thus high potential for fire outbreak and explosions. This may occur as a result of LPG leaks and vaporization during refilling of the cylinders, spillage on other flammable materials, operational negligence and electrical faults. Further, a LPG tanks that has held LPG and is empty can cause fire risks. In this state, the internal pressure is approximately atmospheric and, if the valve leaks or is left open, air can diffuse into the LPG tanks and form a flammable or explosive mixture. Fire hazards can result to injuries and loss of lives and property. To manage potential fire outbreaks and explosions, the management should ensure appropriately designed and operated LPG tanks and other installations as guided by various existing sources of standards and codes such as Kenya Standards 1938-3: 2012, conduct regular trainings to workers and community members to enable them understand the fire precautions and action to be taken in the event of fire or leakage of LPG, conduct fire drills annually and consult with the Fire Department-Mombasa at an early stage regarding the placing of LPG tanks and any other guidance in respect to fire-fighting and fire protection facilities.

LPG contains hydrocarbons, sulphur dioxide, oxides of nitrogen, volatile organic compounds and other gases that are a pollutant in case of a leakage during filling and decanting of LPG from the tank and tanker respectively or from relief valves provided on the storage tanks in the event of rise in temperature or pressure. LPG is non-toxic but, it can induce headaches and dizziness through inhalation and prolonged exposure to the gas. Other sources of air pollution include exhaust fumes from vehicles accessing the facility. The proponent should develop a plan of action to guide transfer of LPG and ensure strict adherence to the operational procedures, ensure that only qualified personnel are deployed to undertake the tasks, tests on the LPG tank should be scheduled regularly and actions prescribed to safeguard tank integrity, install gas detectors to detect gas release and monitor fugitive emissions to ensure compliance with the limits set under the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014.

Noise is likely to emanate from vehicle movement in and out of the facility. It should be noted that the noise produced at the facility will be in keeping with the background noise emanating from Port-Reitz Road. Additionally, the immediate neighbors venture in logistic solutions for/and transportation services as well as container depots. The facility management should ensure compliance with Environmental Management and Coordination (noise and excessive vibration pollution) (control), 2009.

The proposed development will exert an extra demand on energy mainly electricity for powering machine and equipment and for lighting purposes. Energy will be sourced from the national grid and supplemented by the existing diesel powered generator. The report recommends use of solar to power the lighting system in areas such as offices and walkways, installing compact fluorescent lights in high use areas within the facility, create awareness among employees and guests on energy conservation and conducting energy audits at least once every three years and implement the recommended actions.

The facility will require large amounts of water especially for fire risks management and hence the proponent proposes to install a 3million litre water capacity tank for storing water in case of any fire emergency. Other uses of water will include cleaning, drinking purposes and sanitation among others. Water will be sourced from the reticulated supply by Mombasa Water Supply and Sanitation Company Limited (MWSSCL) supplemented by borehole water. The proponent should obtain a water permit for drilling and abstracting water from the proposed borehole, install sanitation facilities such as water closets that use minimal amounts of water and self-closing taps and create awareness among employees and visitors on water conservation.

During operations, both solid wastes and effluent will be generated. Solid wastes will include mainly domestic waste from the workers and visitors to the site. Effluent will be generated from sanitation areas. The report recommends procuring the services on a NEMA licensed waste contractor to dispose off wastes from the facility, designing and constructing a bio-digester to manage effluent, applying for and obtaining an Effluent Discharge License (EDL) from NEMA, complying with the Environmental Management and Coordination (Waste Management) Regulations, 2006 and the Environmental Management and Coordination (Water Quality) Regulations, 2006.

The paved surface prevents water from infiltrating resulting to generation of runoff during rainy seasons hence the need for storm water management. The proponent should install a storm water drainage system to manage runoff and prevent flooding and water sealed interceptors (gas traps) to prevent LPG from entering the storm water drains and sewers.

A decommissioning phase is possible in the event of end of project life, closure by government agencies due to non-compliance with environmental and health regulations, an order by a court of law due to non-compliance with existing regulations, potential fire outbreak, natural calamities and change of user of land. Key environmental and social concerns at this phase will be loss of the LPG terminal depot, economic decline, fire risks and emergency preparedness, safety and health risks, waste generation and insecurity. To address these, the proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance.

The proposed project is considered important as it will contribute towards attainment of the social economic pillar of Kenya's Vision 2030, United Nations Sustainable Development Goal 7 on affordable and clean energy and United Nations' Sustainable Energy for All Initiative. The project will lead to a significant increase of LPG bulk supply hence will serve an already growing LPG market in Kenya and other regions where the demand is high. Additionally, it will help in eradication of the current bottlenecks in the current supply chain which has resulted in the situation of inevitable rise of the LPG distribution cost. It will also contribute towards the socioeconomic growth of the area through employment creation and revenue generation to the government. The key concern of the proposed project include fire risks and emergency preparedness due to the highly flammable nature of LPG. The proponent is committed to ensuring appropriately designed and operated LPG tanks and other installations as guided by various existing sources of standards and codes such as KS 1938-3: 2012, NFPA 58 standards and EEMUA publication 190 standards among others. Other anticipated negative environmental and social impacts during the entire project cycle include Occupational safety and health risks, increased water and energy demand, pollution of environmental media, storm water management and traffic. The ESIA study proposes a suite of comprehensive Environmental Management and Monitoring Plans to address the anticipated negative environmental and social impacts during the entire project cycle and improve the environmental performance of the proposed project. On the basis of a commitment by the proponent to implement the proposed Environmental Management and Monitoring Plans, we recommend the issuance of an EIA License as per the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya and Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003.

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| | |
|---|---|
| **AGOL** | Africa Gas & Oil Limited |
| **API** | American Petroleum Institute |
| **CO** | Carbon Monoxide |
| **$CO_2$** | Carbon Dioxide |
| **DOSHS** | Directorate of Occupational Safety and Health Services |
| **EA** | East Africa |
| **EDL** | Effluent Discharge License |
| **EEMUA** | Engineering Equipment and Materials Users Association |
| **EIA** | Environmental Impact Assessment |
| **EMCA** | Environmental Management and Coordination |
| **EMP** | Environmental Management Plan |
| **EPRA** | Energy and Petroleum Regulatory Authority |
| **ESD** | Emergency Shut Down system |
| **ESIA** | Environmental and Social Impact Assessment |
| **ESMP** | Environmental and Social Management Plans |
| **GPS** | Global positioning system |
| **HCVs** | Heavy Commercial Vehicles |
| **ISO** | International Organization for Standardization |
| **ITCZ** | Inter-Tropical Convergence Zone |
| **KNBS** | Kenya National Bureau of Standards |
| **KOT** | Kipevu Oil Terminal |
| **KPA** | Kenya Ports Authority |
| **KPC** | Kenya Pipeline Company |
| **KS** | Kenya Standards |
| **LPG** | Liquefied Petroleum Gas |
| **MT** | Metric Tonnes |
| **NEMA** | National Environment Management Authority |
| **NFPA** | National Fire Protection Association |
| **NOx** | Nitrogen Oxide |
| **OSHA** | Occupational Safety and Health Act |
| **PAH** | Polycyclic Aromatic Hydrocarbons |
| **PM** | Particulate Matter |
| **PPE** | Personal Protective Equipment |
| **SDGs** | Sustainable Development Goals |
| **$SO_2$** | Sulfur Dioxide |
| **SOT** | Shimanzi Oil Terminal |
| **TORs** | Terms of Reference |
| **TPH** | Total Petroleum Hydrocarbon |
| **TVOC** | Total Volatile Organic Carbon |
| **UNDP** | United Nations Development Programme |
| **WRA** | Water Resources Authority |
| **WRB** | Water Services Regulatory Board |
| **WSBs** | Water Service Boards |
| **WSPs** | Water Service Providers |

# 1 INTRODUCTION

## 1.1 Background information

The proponent, Mahadi Energy Limited, proposes to construct and operate a Liquefied Petroleum Gas (LPG) terminal depot in Port Reitz area, Mombasa County. Transport and related infrastructure including oil and gas pipelines and hydrocarbon projects including depots and refinery facilities for hydrocarbons as well as oil and gas field developments are listed under the Second Schedule (4d, 11a and 11c respectively) of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya as high risk and should therefore undergo an Environmental and Social Impact Assessment (ESIA) Study process. To fulfill this legal requirement, ensure sustainability of the development activities and improve its environmental performance, the proponent contracted Envasses Environmental Consultants Limited to carry out the ESIA Study.

## 1.2 Overview of liquefied petroleum gas

Liquefied petroleum gas is a flammable mixtures of hydrocarbon gases. It is liquefied by moderate changes in pressure or by a drop in temperature below its atmospheric boiling point. The unique properties of LPG allow it to be stored or transported in liquid form and used in vapor form. Due to its higher energy content than natural gas, it is used as fuel in heating appliances, cooking equipment and vehicles. It is increasingly used as an aerosol propellant and a refrigerant, replacing chlorofluorocarbons in an effort to reduce damage to the ozone layer. LPG is colorless and odorless therefore an odorant is normally added to it making it possible for humans to detect leaks.

LPG has significant health, safety and environmental benefits compared to traditional fuels i.e. wood, kerosene, coal and charcoal. Although burning LPG releases carbon dioxide ($CO_2$), a greenhouse gas, and some carbon monoxide, it does however release less $CO_2$ per unit of energy than does coal or oil. Overall, LPG burns more cleanly than higher molecular weight hydrocarbons because it releases less particulates. LPG can be relatively quickly deployed to its point of use without the need for pipeline infrastructure, but does require significant storage capacity at points across the supply chain to buffer demand fluctuations and accommodate intermodal transportation management.

## 1.3 Demand of liquefied petroleum gas in Kenya

According to the National Petroleum and Energy Policy, 2015, the consumption of LPG in 2007 was about 75,000 MT, of which 35,000 MT was produced at the Kenya Petroleum Refineries Limited (KPRL). The Economic Survey, 2014 indicated that the consumption of LPG between the year 2009 and 2013 rose from 74,600 tonnes to 92,900 tonnes. Over the same period, the refinery production declined from 29,400 tonnes to 12,400 tonnes. The growth projected in Kenya's Vision 2030 implies an increased demand for cheap energy which is essential for socio-economic development. Adoption of cheaper LPG as a source of clean energy in Kenya is lagging behind due to low investment in LPG storage facilities resulting in the situation of inevitable rise of the LPG distribution cost. Deliberate efforts have been made by the Government to provide cheaper LPG in Kenya including provision of gas offloading infrastructure such as the ongoing construction of the New Kipevu Oil Terminal (KOT), zeroing taxation of gas at policy level and encouraging investors to invest more in LPG storage facilities.

Meanwhile, Kenya depends 100% on imports for LPG and which is offloaded at the old KOT and the Shimanzi Oil Terminal (SOT) owned by Kenya Ports Authority (KPA). Another terminal is exclusively used by a private enterprise; Africa Gas & Oil Limited (AGOL). The construction of the new KOT will supplement the KOT and SOT terminals and will facilitate importation of refined petroleum products and exportation of crude oil using bigger tankers. The terminal will also have an LPG line that is expected to help stabilize gas supply in the country. The proposed project will be fed by a 12 inch pipeline from the new KOT and will address gaps in bulk LPG storage facilities and local availability.

## 1.4 Project location and neighbourhood

The project site will be located on Plots L.R. Nos. MN/VI/4689 & MN/VI/2428 along Port Reitz Road, Port Reitz area, Mombasa County on an 8.5 acres piece of land. The Geo-reference points are **Latitude 1°29'26.03" S and Longitude 37°3'11.80" E** (Figure 1). The site has good road access to the Port, Mombasa Mainland South through Dongo Kundu By-pass, Mombasa Mainland North via Mazeras, and the Nairobi – Mombasa high way to the hinterland. It also has a connection to the Standard Gauge Rail system. The project neighborhood features industrial, commercial and residential land uses (Figure 2 and 3). The neighborhood is characterized by light industries such as Dodwell & Co (E.A) Limited, Bashaeb Brothers Limited, Pasta Enterprise Limited, Tornado Carriers Limited and Primefuels (Kenya) Limited among others.

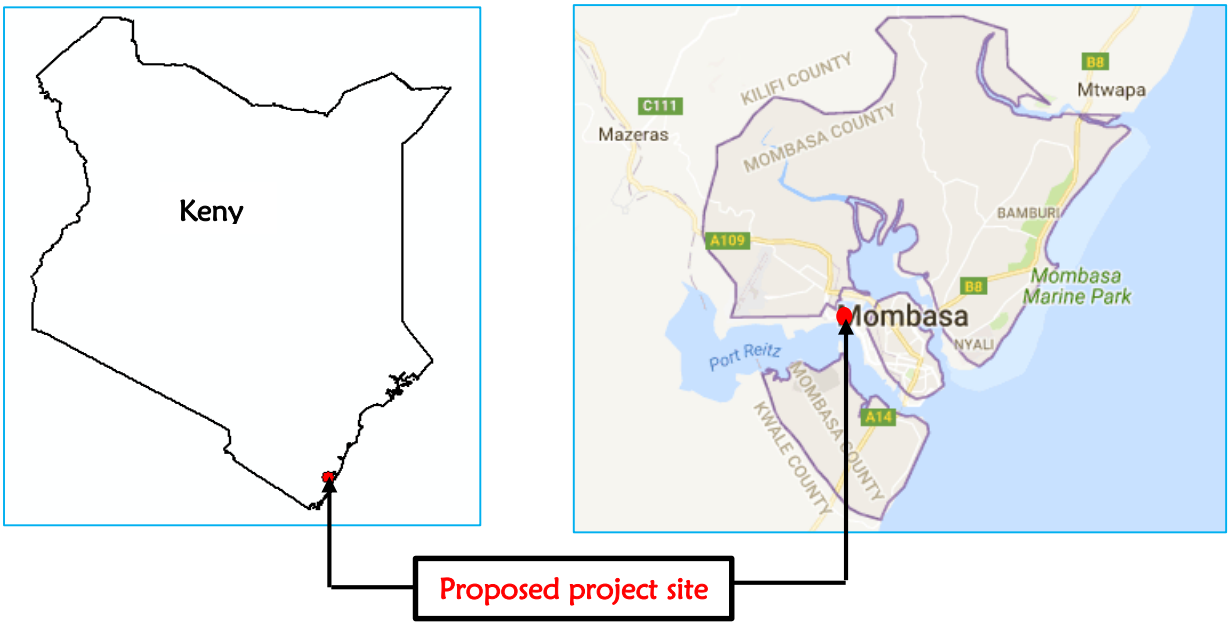



**Figure 1: The location of the proposed project site (Source: Google Earth, 2020).**

**Figure 2: Some industrial developments neighboring the project site (Source: Site visit, November 2020).**

**Figure 3: A section of informal settlements near the project site (Source: Site visit, November 2020).**

## 1.5 The site status

The proposed project site was initially used as a storage container depot by the proponent. The site has a well-drained cabro paved surface and is secured by a boundary wall with an entry and exit gate (Figure 4). There exists a one storey administration block (Figure 5), a guard house and sanitation facilities which will be retained. There are other existing supporting infrastructures which include power, water supply and a water storage tank, septic tanks and a soak pit among others (Figure 6). Only a small section of the project site is covered with vegetation mainly grasses and few trees including a coconut tree and mainly neem trees.

One of the plots (Plot L.R. No. MN/VI/4689) was subjected to an ESIA study process for the proposed petroleum fuel depot and an EIA licence (Licence No. 0016824) was issued but the client did not proceed due to financial constraints and change in priorities.

Figure 4: A section of the proposed project site (Source: Site visit, November 2020).

Figure 5: The existing one storey administration block (Source: Site visit, November 2020).

**Figure 6: A section of the project site showing some of existing supporting infrastructure (Source: Site visit, November 2020).**

## 1.6 Project design and components

The proposed project involves construction and subsequent operation of an LPG terminal depot with a total storage capacity of 15000 MT of LPG held in 9 mounded / buried LPG tanks of 1650 MT each (Figure 7). The tanks will be fed by a 12 inch pipeline from the common user manifold being constructed by Kenya Ports Authority (New Kipevu Oil Terminal) which is 2.4km away. The pipeline will pass through the Kenya Pipeline way leave and the proponent is in the process of applying for authority to use it.

The proposed LPG terminal depot will consist of the following installations and components.

- 9 LPG tanks each 64m long and 8m wide
- LPG truck loading bays
- 1.5 acre LPG truck parking area
- LPG pumps and compressor shed
- LPG rail gate
- LPG rail wagon siding
- LPG gas trap
- LPG containment/evaporation wall (600m high)
- Fire water tank with a capacity of 3million litres, height of 17m and a diameter of 15m
- Fire equipment store
- Fire water pumps
- Office block with 2 floors
- Car parking area
- General store
- Sentry shed
- Generator room
- Switch room
- Changing room
- Entry and exit gates
- Emergency gates
- Open storm water channel

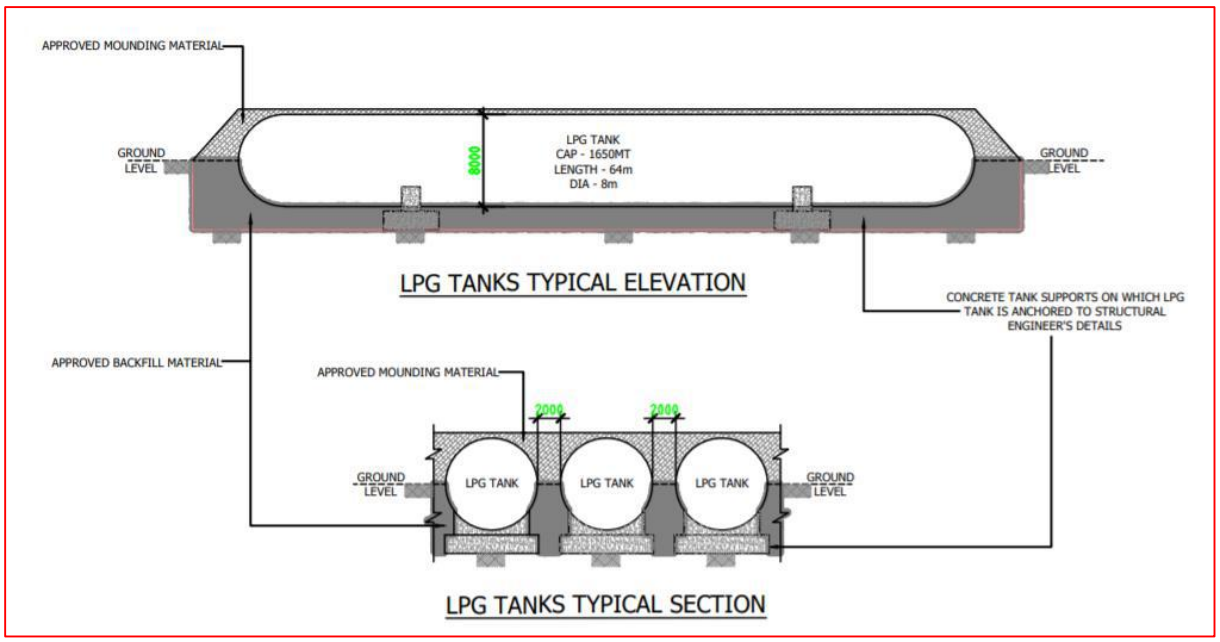


**Figure 7: Liquefied petroleum gas tanks typical structural layout after mounding (Source: Eng. A. Muchoki, November 2020).**

## 1.7 Study approach and methodology

### 1.7.1 Introduction

The methods adopted for preparing the ESIA study report were guided by the Third Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. The consultants prepared a scoping report and Terms of Reference (TORs) as required under Regulation 11 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 and submitted them to NEMA for consideration for approval. The scoping report and TORs were approved on 30th November 2020 and the consultants began preparation of the ESIA study report.

### 1.7.2 Data collection

The methods for carrying out the study included site visits and observations, photography, consultations with the neighbors through three stakeholders meeting as well as administration of questionnaires, literature review of relevant documents and baseline monitoring of environmental media (air quality, noise levels, soil tests and water quality). A site visit was undertaken in November 2020 (Figure 8) for purposes of area reconnaissance, assessing the baseline environmental conditions of the proposed project site and screening of environmental risks associated with the proposed development as well as the applicable environmental safeguards and standards. Environmental screening criteria was informed by the Second Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. As per this schedule, the issues considered by the experts included ecological impacts, socio-economic issues, landscape changes, land use character and water (Table 1).

**Figure 8: The ESIA study team carrying out a reconnaissance survey at the project site (Source: Site visit, November 2020).**

**Table 1: Summary of the results from the screening exercise.**

| Screening criteria | Results |
|---|---|
| Ecological impacts | – Excavation and vegetation clearance will occur<br>– No endangered species of trees and plants found at the site<br>– No endemic species reported on site |
| Social-economic considerations | – Contribution of the project towards attainment of the social pillar of Vision 2030, the United Nations Sustainable Development Goal 7 on affordable and clean energy and United Nations' Sustainable Energy for All Initiative<br>– Significant increase of LPG bulk supply hence will serve an already growing LPG market in Kenya and other regions<br>– Eradication of the current bottlenecks in the current supply chain which has resulted in the situation of inevitable rise of the LPG distribution cost<br>– Reduction of LPG consumer prices and thus increase consumer offtake<br>– Reduction of illegal gas cylinder refilling<br>– Direct and indirect creation of employment within the Kenya and beyond<br>– Revenue to the government through taxes & licenses<br>– Workers and neighbors during construction and operational phases will be exposed to safety and health risks<br>– No cultural or heritage issues at the site |
| Landscape impacts | – The landscape of the area will be altered and new views created |
| Land uses | – The project neighborhood features industrial, commercial and residential land uses |
| Water | – The construction and subsequent operations of the proposed project will increase water demand and impact on water resources |

### 1.7.3 Baseline monitoring of environmental media

Baseline environmental data was collected on ambient air quality, ambient noise level, soil tests and water quality in collaboration with a NEMA designated laboratory, Polucon Services (K) Limited. The methodology for sampling and analysis of the environmental media is discussed in the following sections.

#### 1.7.3.1 Ambient air quality measurements

A Fixed-Point monitoring strategy was used to obtain baseline ambient air quality for the proposed project site which was conducted on 3rd December 2020 (Figure 9). Air monitoring was conducted over a 1 hour time weighted average period and a calculated 24 hour time weighted average period for the measurements of Carbon Monoxide, Nitrogen dioxide, Sulfur dioxide, Total VOC and particulate matter (dust particles). Sampling of gases was done by use of Aeroqual portable air monitors which uses a mix of sensor technologies. Sampling for Nitrogen Oxide (NOx), Sulfur Dioxide ($SO_2$), Particulate Matter (PM), Total Volatile Organic Carbon (TVOC) and Carbon Monoxide (CO) was done using the gas sensitive electrochemical methods of active and continuous sampling. Particulate matter was sampled using the laser particle sensors. The results interpretation and analysis as well as sampling duration information was used to calculate the gases concentrations.

#### 1.7.3.2 Ambient noise level measurements

Ambient noise measurements were conducted on 3rd December, 2020 (Figure 9). Prior to recording the noise measurements, an inspection of the monitoring points and implicated activities of the area was undertaken, perimeter walls was identified and noise level meter calibrated. Noise levels were determined by the noise level meter, with an inbuilt, ῶoctave/octave band filter which does real time and octave analysis. The noise level meter was raised 2 meters above the ground and fitted with a ½" electrets condenser microphone with a measurement range of between 30 - 130dB and a frequency range and weighting of 25Hz – 10KHz and A, C & Z respectively. For all measurements taken to establish the ambient noise levels, the equivalent noise level (LAeq), the sound pressure level at 5%, 50% & 95% (L5), (L50), (L95) respectively during that measurement period was at one hour interval. The noise level was measured in terms of the A-weighted equivalent continuous sound pressure level Leq. Each individual measurements was taken simultaneously with the nature of the noise climate of the area. This involved an auditory observation and identification of noise incidents influencing the noise level meter readings by the surveyor.

**Figure 9: Ambient air quality (left) and noise level (right) monitoring at the proposed project site (Source: Polucon Services (K) Limited, December 2020).**

#### 1.7.3.3 Soil sampling and analysis

Soil samples were obtained at the proposed project site and analyzed for BTEX, Polycyclic Aromatic Hydrocarbons (PAH) & Total Petroleum Hydrocarbon (TPH) (Figure 10). The purpose of soil sampling and analysis was to give a general indication of the existing potential contaminants and for future monitoring of the impact of the proposed project.

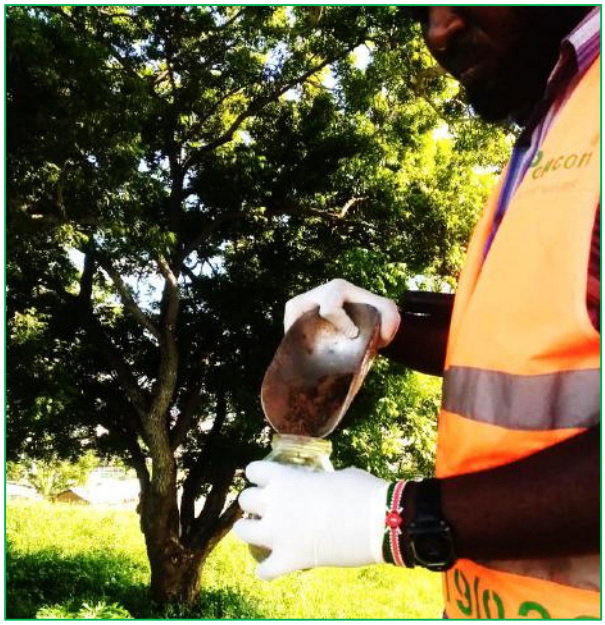

**Figure 10: Soil sampling at the proposed project site (Source: Polucon Services (K) Limited, December 2020).**

#### 1.7.3.4 Water quality sampling

As explained under the site status, the project site has existing supporting infrastructure such as water tanks used to store water supplied by water bowsers. The water is used for domestic water use except for drinking purposes. The baseline water quality sampling targeted the existing tank water and analyzed for sources of domestic water as per the First Schedule of the Environmental Management and Coordination (Water Quality) Regulation 2006.

### 1.8 Analysis of project alternatives

Analyzing project alternatives is important as it allows the proponent to evaluate possible project options that could mitigate the environmental risks identified during the ESIA process through prevention, elimination of the risks all together or reduction of the severity of an impact. The analysis will also assist NEMA and lead agencies in decision making by either approving the project as proposed or advising the proponent on the need for a particular alternative such as an alternative site or technological and design changes. In the current proposal, the alternatives identified are discussed in detail below.

#### 1.8.1 The 'No project' alternative

The 'No Project' alternative has the advantage of retaining the status quo, meaning that the predicted environmental and social impacts will not occur and is ideally the best case scenario for mitigation. The status quo however adds no value to the land, denies the market a supply of clean and dependable LPG, the proponent and potential workers a source of income, the government a source of revenue. The 'No project' alternative is therefore not considered viable in the light of the benefits and deprivations of the project.

#### 1.8.2 The "Yes Project" alternative

This option envisages that the proposal will be implemented thus was considered as the most viable because of the following reasons;

- Contribution of the project towards attainment of the social-economic pillar of Kenya Vision 2030
- Contribution towards attainment of the United Nations SDGs-Affordable and clean energy and United Nations' Sustainable Energy for All Initiative
- Dependable supply of LPG into Kenya and eradication of current bottlenecks in the supply chain
- Significant increase of LPG bulk supply within Kenya and regionally
- Reduction of LPG consumer prices and thus increase consumer offtake
- Reduction of illegal gas cylinder refilling
- Reduction on dependence on biomass fuel and increase in forest cover
- Direct and indirect creation of employment opportunities
- Revenue generation to the government

### 1.8.3 Alternative site

An alternative site could be considered for the proposed terminal depot if the proposed project would present serious environmental challenges that cannot be effectively managed. However, the proposed mitigation measures are considered adequate to minimize the impacts to levels that do not warrant significant environmental damage. Other advantages of the proposed project site include;

- The site has a well-drained paved surface sitting on an 8.5 acres piece of land. Hence all the project facilities and related infrastructure will be located within the site thus greater control
- The site is 2.4 km from proposed Government owned LPG receiving manifold
- There is good road access to the Port, Mombasa mainland south through Dongo Kundu By-pass, Mombasa mainland North via Mazeras, and the Nairobi – Mombasa highway to the hinterland
- Easy connection to the Standard Gauge Rail system
- There is already an existing office block and a perimeter concrete wall

Therefore, an alternative site is not viable.

### 1.8.4 Design alternatives

#### 1.8.4.1 Spherical LPG pressure tanks vs LPG cylindrical/bullet tanks

LPG storage options include spherical LPG pressure vessels and both above ground and underground ('mounded') LPG cylindrical vessels, also called bullet tanks. The proponent proposes to install a bulk LPG storage facility with a total capacity of 15000 MT of LPG held in 9 mounded / buried LPG bullet tanks of 1650 MT each.

One of the most significant benefits of using spherical storage tanks is the ability to hold very large liquid volumes within a proportionally small amount of space. However, they are less safe since it weight is not distributed evenly on a larger area thus increasing chances of failure and collapse as compared to bullet LPG tank. The use of multiple storage bullet LPG tanks also reduces the possibility of uneven settlement; another potential cause of vessel failure; by dividing the overall load into lesser volumes.

#### 1.8.4.2 Above ground and underground ('mounded') LPG bullet tanks

The proposed design alternative (mounded bullet LPG tanks) is deemed safer for the proposed project and the neighbourhood. An advantage of mounded LPG tanks is that mound cover protects the vessels against

- Heat radiation from nearby fire
- Pressure wave originating from an explosion
- Impact by flying objects
- Sabotage

Additional measures such as strict adherence to operational procedures and obtaining relevant permits during installation and subsequent operations will be implemented.

# 2 ENVIRONMENTAL SETTING OF THE PROPOSED PROJECT SITE

## 2.1 Soil and topography

The soil profile within the project area is dictated by the physiographic characteristics of Changamwe area as a whole which is within a broken, severely dissected and eroded belt of Jurassic shale overlain in places by residual sandy plateau. The soils in the area are developed on higher level lagoonal` deposits (kilindi sands) and are light as well as of low to very low fertility. In terms of character, the soil profile presents excessively drained, very deed, reddish yellow to white, loose sand in some areas of the site to loamy sand to the North West area.

The topography of the area is a rolling terrain. The proposed project site is relatively flat except for the undeveloped area covered with vegetation; which slopes steeply towards the South.

## 2.2 Climate

The proposed project site lies along Kenya's coastal zone where the climate is greatly influenced by the Migratory Inter-Tropical Convergence Zone (ITCZ) characterized by monsoon winds which create a bimodal rainfall pattern. The long rain season occurs from March to May and the short rains from October to December. The average annual rainfall for the area has been recorded as 940mm. Temperatures are fairly constant throughout the year ranging from 24°C to 30°C. The warmest temperatures are generally recorded during the months of November to April (mean daily temperature of 27°C) while slightly cooler temperatures are experienced from May to October (mean daily temperature of 24.5°C) (Figure 11).

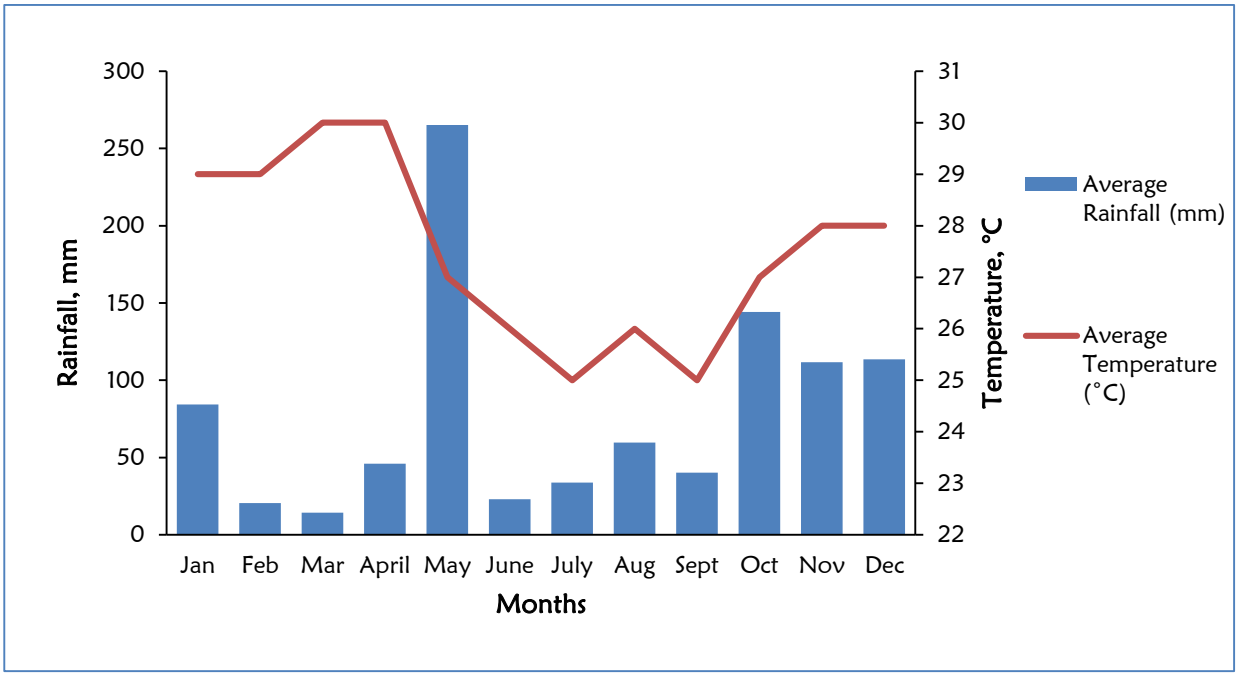


**Figure 11: Annual rainfall and temperature distribution for Mombasa county in 2019 (Data Source: World Weather Online).**

## 2.3 Demographic patterns

The total population of Mombasa County is 1,208,333 (KNBS, 2019). The County has a total land area of 220Km$^2$. Mombasa has a cosmopolitan population with the Swahili people and Mijikenda predominant. Other communities include the Kamba and Taita as well as a significant population of Luo and Luhya people from Western Kenya. The major religions practiced in the city are Islam, Christianity and Hinduism. Over the centuries, many immigrants and traders have settled in Mombasa, particularly from the Middle East, Somalia, and the Indian sub-continent, who came mainly as traders and skilled craftsmen. Port Reitz is located within Changamwe constituency which has an estimated population of 11,346 people.

## 2.4 Infrastructure

### 2.4.1 Transport network

The proposed project site is accessible via the Port Reitz Road (Figure 12) which the proponent intends to use to transport bulk LPG using ISO certified containers for wider circulation to the entire country and within the East Africa region. The site has good road access to the Port (Figure 13), Mombasa Mainland South through Dongo Kundu By-pass, Mombasa Mainland North via Mazeras, and the Nairobi – Mombasa high way to the hinterland. It also has a connection to the Standard Gauge Rail system and is in close proximity to Moi International Airport.

**Figure 12: A section of the Port Reitz Road. The proposed project site lies to the Right (Source: Site visit, November 2020).**

**Figure 13: A section of Kenya Ports Authority (Container Terminal 2 and the ongoing construction of Mombasa Port Development Plan Phase 2) neighboring the project site (Source: Site visit, November 2020).**

### 2.4.2 Water supply

The area has natural water sources including underground water. Most existing major development in the area have exploited underground water sources through drilling of boreholes which have proofed as adequate and reliable source of water. Others source water from the reticulated supply by Mombasa Water Supply and Sanitation Company Limited while others depend on water vendors. The proposed project will source water from the reticulated supply supplemented by borehole water.

### 2.4.3 Energy supply

Port Reitz area has proper network of Kenya Power lines. Some development in the area have also exploited solar energy as an alternative or back up source of electricity. The community in the area mostly use charcoal, Liquefied Petroleum Gas and firewood as sources of cooking energy. By implementing the project, the proponent will be able to provide and promote clean energy and reduce the use of environmentally degrading source like charcoal burning, kerosene etc. During operations, the proposed project will source electricity from Kenya power and supplemented by a generator.

### 2.4.4 Telecommunication

The proposed project area is well served with communication network including the main mobile phone services such as Safaricom, Airtel and Telkom.

## 2.5 Baseline environmental quality

### 2.5.1 Ambient air quality measurements

There were notable gaseous concentrations of CO, NOx, $SO_2$ and TVOC within the project site. Movement of motor vehicles along the busy Port Reitz Road could have resulted in combustion of fossil fuels in engines hence the emission levels measured. Notable levels of particulate matter ($PM_{10}$ and $PM_{2.5}$) were also detected. However, all the gaseous and particulate parameters measured were all within the stipulated standards under the First Schedule of Environmental Management and Coordination (Air Quality) Regulations, 2014 (Table 2).

**Table 2: Baseline air quality measurements for the proposed project site (Source: Polucon Services (K) Limited, December 2020).**

| Location | CO mg/m³ | NOx ppm | $SO_2$ µg/m³ | TVOC µg/m³ | $PM_{2.5}$ µg/m³ | $PM_{10}$ µg/m³ |
|---|---|---|---|---|---|---|
| Proposed project site | 1.7 | 0.11 | 155.65 | 55.5 | 38.05 | 73.35 |
| Precision of results | 1.7±0 | 0.11±0.01 | 155.65±0.75 | 55.5±6.5 | 38.05±0.25 | 73.35±0.25 |
| **EMCA (Air Quality) Regulations, 2014** | **4** | **0.8** | **500 Instant peak** | **600** | **75** | **150** |

### 2.5.2 Ambient noise level measurements

The results of noise level measurements were within the limits stipulated under the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 (Table 3). Sources of noise levels measured were mainly traffic plying the nearby busy Port Reitz Road.

**Table 3: Baseline noise level measurements for the proposed project site (Source: Polucon Services (K) Limited, December 2020).**

| Location | LAeq (dBA) | L5 (dBA) | L50 (dBA) | L95 (dBA) | EMCA Guidelines (Day time) |
|---|---|---|---|---|---|
| Proposed project site | 54.7 | 70.0 | 46.5 | 55 | 60 |

### 2.5.3 Soil sampling and analysis

Soil sampling results indicated that BTEX and PAH were below 0.01mg/kg while TPH was 3.67mg/kg (Table 4). Kenya has not developed a specific environmental legislation on soil standards but relies on existing legislation on pollution such as the Environmental Management and Coordination (Water Quality) Regulations, 2006 and the Kenya Constitution 2010 to prosecute environmental crimes on soil contamination.

**Table 4: Baseline soil tests for the project site (Source: Polucon Services (K) Limited, December 2020).**

| Test | Method | Results (mg/kg) | Specifications |
|---|---|---|---|
| **BTEX** | | | |
| Benzene | PQA/LIM/002 | <0.01 | |
| Toluene | PQA/LIM/002 | <0.01 | - |
| Ethyl benzene | PQA/LIM/002 | <0.01 | - |
| Xylene | PQA/LIM/002 | <0.01 | - |
| **TPH** | | | |
| Total Petroleum Hydrocarbon | PQA/LIM/003 | 3.67 | - |
| **PAH** | | | |
| Naphthalene | PQA/LIM/004 | <0.01 | - |
| Acenaphthylene | PQA/LIM/004 | <0.01 | - |
| Acenaphthene | PQA/LIM/004 | <0.01 | - |
| Fluorene | PQA/LIM/004 | <0.01 | |
| Phenanthrene | PQA/LIM/004 | <0.01 | |
| Anthracene | PQA/LIM/004 | <0.01 | |
| Fluoranthene | PQA/LIM/004 | <0.01 | |
| Pyrene | PQA/LIM/004 | <0.01 | |
| Benzo(a)anthracene | PQA/LIM/004 | <0.01 | |
| Chrysene | PQA/LIM/004 | <0.01 | |
| Benzo(b)fluoranthene | PQA/LIM/004 | <0.01 | |
| Benzo(k)fluoranthene | PQA/LIM/004 | <0.01 | |
| Benzo(a)pyrene | PQA/LIM/004 | <0.01 | |

Limit of detection=0.01mg/kg

### 2.5.4 Water quality measurements

The results indicated that the tank water does not conform to the First Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006 due to high suspended solids (Table 5).

**Table 5: Baseline water quality measurements as prescribed under the First Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006 (Source: Polucon Services (K) Ltd, December, 2020).**

| Parameter | Method | Results | Guide value (Max allowable) |
|---|---|---|---|
| pH Value @29.10 °C | APHA 4500-H+B | 7.13 | 6.5-8.5 |
| Suspended solids | APHA 2540D | **36.40** | 30 mg/L |
| Ammonia $NH_3$ | APHA 4500 $NH_4$+G | Nil | 0.5 mg/L |
| *Escherichia coli* | KS 05 459 | Absent | Nil/100ml |
| Nitrite as $NO_2$ | APHA 4500 $NO_2$ | <0.003 | 3 mg/L |
| Nitrates as $NO_3$ | APHA 4500 $NO_3$B | 4.48 | 10 mg/L |
| Phenols | APHA 5530 | <0.001 | Nil |
| Selenium | AOAC 993.14 | <0.01 | 0.01 mg/L |
| Cadmium | APHA 3111B | <0.01 | 0.01 mg/L |
| *Zinc | APHA 3111B | 0.18 | 1.5 mg/L |
| *Copper | APHA 3111B | 0.05 | 0.05 mg/L |
| *Lead | APHA 3111B | <0.01 | 0.05 mg/L |
| Arsenic | APHA 3500 As | <0.01 | 0.01 mg/L |
| Fluoride | APHA 4500-F | <1.0 | 1.5 mg/L |
| Total Dissolved Solids | APHA 2540C | 54.80 | 1200 mg/L |
| Alkyl benzyl sulphonates | APHA 5540 D | <0.01 | 0.5mg/L |

# 3 IDENTIFICATION OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The proposed project will have both socio-economic benefits and attendant negative environmental and social impacts. The purpose of the ESIA process is to therefore systematically assess the value of the benefits against the environmental concerns and provide measures to avoid, prevent or reduce the magnitude of the impacts. The following section provides details on these impacts and proposed mitigation measures to address the identified negative environmental and social impacts. The mitigation measures are based on the underlying principle of EIA that everyone is entitled to a clean and healthy environment and a duty to enhance and safeguard the environment.

## 3.1 Positive impacts of the proposed project

The project's direct benefits include but are not limited to the following;

1. **Contribution of the project towards attainment of Kenya Vision 2030**. Kenya's Vision 2030 is the national long-term development blueprint to create a globally competitive and prosperous nation with a high quality of life by 2030 in a clean and secure environment. Energy is one of the key enablers of Kenya's Vision 2030 development programs. Kenya considers access to competitively-priced, reliable, quality, safe and sustainable energy as an essential ingredient for the country's social–economic development.
2. **Contribution towards attainment of the United Nations Sustainable Development Goals and United Nations' Sustainable Energy for All Initiative.** SDG 7-Affordable and clean energy; aims at ensuring access to affordable, reliable, sustainable and modern energy for all. The proportion of the world's population with access to clean fuels and technologies for cooking increased from 51% in 2000 to 58% in 2014, although there has been limited progress since 2010. Inefficient energy use worsen the dangerous warming of our planet from energy-related emissions. The proposed LPG depot will promote the use of cleaner energy. Additionally, increasing household use of LPG is one of several pathways to meet the goal of universal access to clean cooking and heating solutions by 2030, as stated in the United Nations' Sustainable Energy for All Initiative.
3. **Market supply of Liquefied Petroleum Gas**. The project will lead to a significant increase of LPG bulk supply hence will serve an already growing LPG market in Kenya and other regions where the demand is high.
4. **Provision of a green and cleaner source of energy**. More than 40 percent of the world's population (3 billion) rely on polluting and unhealthy fuels such as wood, coal, charcoal or animal waste for cooking and heating (UNDP, 2020).The main environmental advantages of LPG lie in its clean combustion characteristics due to the simple molecular structure compared with petrol or diesel. The calorific value per litre of LPG is lower than petrol, so fuel consumption tends to increase but the carbon content is lower, leading to lower $CO_2$ emissions. Toxic emissions of oxides of nitrogen, hydrocarbons and carbon monoxide are also reduced. There are no benzene emissions, and particulate matter emissions are minimal.
5. **Providing employment opportunities**. During the project planning and design, the project proponent has already employed consultants including architects, engineers and ESIA consultants. During the construction and operational phases, several skilled and unskilled personnel from within and outside the local community will be employed to provide different services. As a result, many will benefit from improved livelihood and increased income from employment at the facility.
6. **Income to the proponent**. The facility through its operations will accrue income to the proponent thus enabling expansion of business and creating more employment opportunities to the locals.
7. **A market for local goods and services**. The proposed project will be a market base for various goods and services required to run its operations. Goods include cement, sand and aggregate among others while services include energy, telecommunication and environmental audits among others

8. **Revenue to the government**. The government will get revenue in terms of taxes generated during the acquisition of statutory licenses. The construction material to be used during construction will also be taxable. Through the revenues generated, the government will be capable of financing its obligations to the country.

## 3.2 Anticipated negative environmental and social impacts

Against the background of positive impacts, the proposed project is expected to result in a number of negative environmental and social impacts at the various stages of implementation as discussed below.

### 3.2.1 Negative impacts at the construction phase of the LPG Terminal Depot

#### 3.2.1.1 Installation of the LPG tanks and pipeline

Prior to installation of the LPG tanks and pipeline, the proponent should address the following issues which are covered under Kenya Standard i.e. KS 1938-3:2012 for the eventual safety of the workers and neighbors, and reducing the risks on investment.

**Recommended mitigation measures**

1. LPG tanks/pipeline should be installed generally in accordance with NFPA 58 and EEMUA publication 190
2. The pipe works should comply with the KS 1938-3: 2012 and BSEN 1600 and ISO 3183 standards while valves and other fittings should comply with the relevant API and ISO standards
3. The installation of the LPG tanks will be preceded by a soil investigation to determine the expected overall and differential settlement as required by Kenya Standard i.e. KS 1938-3:2012. This will address the potential future loss or risks associated with the collapse of the installed tanks
4. Consultations with the Fire Department of Mombasa County Government regarding the placing of the LPG tanks and any other guidance in respect to firefighting and fire protection facilities

#### 3.2.1.2 Environmental risks of obtaining raw materials

Construction activities will require raw materials such as LPG tanks, sand, and cement, ballast, lining materials and steel bars / rods among others which will be sourced from the environment. These materials will have negative environmental impacts at their points of origin.

**Recommended mitigation measures**

1. Source raw materials from sites that are licensed as per the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya
2. Have a procurement plan based on the Bill of Quantities prepared by a Quantity Surveyor to avoid potential oversupply of materials and wastage
3. Sensitize personnel on wastage of construction materials. Remnants should be collected each day and re-used accordingly

#### 3.2.1.3 Occupational safety and health risks

Workers undertaking construction activities, visitors to the project site and neighboring properties will be exposed to potential safety and health risks during construction activities. The potential safety risks will be from the use of machinery, falling objects or even falls, air and noise pollution, potential fire outbreaks from highly flammable material and COVID-19 among others. These risks have a potential to cause disturbances, injuries, permanent disability or even death.

**Recommended mitigation measures**

1. Register the site as a workplace with the Directorate of Occupational Safety and Health Services (DOSHS)
2. Obtain insurance cover for the workers at the site

3. Provide adequate and appropriate Personal Protective Equipment (PPE) and enforce their use for both workers and visitors
4. Provide employees with correct tools and equipment for the jobs assigned and train on their use
5. Ensure moving parts of machines and sharp surfaces are securely protected with guards to avoid unnecessary contacts and injuries
6. Provide first aid services and an emergency vehicle at the site
7. Ensure proper storage and management of flammable materials within the project site
8. Prepare and implement a fire and emergency response plan for the construction site
9. Supervision of works shall be done regularly to ensure safety conditions at work
10. Comply with the set National Government and County Government Directives and guidelines on prevention of the spread of COVID-19
11. Comply with the provisions of the Occupational Safety and Health Act, 2007

#### 3.2.1.4 Noise pollution

Disturbance or discomfort resulting from construction noise cannot be ruled out given that the proposed site is located in proximity to not only other commercial and light industrial developments but also residential areas. Though the level of discomfort caused by noise is subjective, the most commonly impacts of increased noise levels are interference in oral communication and disturbance in sleep or during resting time. Construction sites such as the proposed project can only emit noise levels of up to 60dB (A) during the day and 35dB (A) at night as per the Second Schedule of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.

**Recommended mitigation measures**

1. Procure, provide and enforce the use of earmuffs to workers and visitors to the site
2. Machinery and equipment in use to be serviced regularly to ensure that they are in good condition to minimize excessive noise
3. Delivery of raw materials, excavation and construction work should be limited to day time hours only between 8am to 5pm
4. Locate machinery that are likely to produce noise as far as practical from neighboring properties
5. Sensitize truck drivers to avoid unnecessary hooting and running of vehicle engines
6. Comply with the Environmental Management And Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

#### 3.2.1.5 Air pollution

Air pollution during the construction phase will be in form of dust and emissions. Dust will emanate from excavation works, concrete mixing, construction materials stock piles and material handling whereas emissions will be from machinery use and vehicles accessing the site. The most relevant pollutant considered is particulate matter because of its potentially significant increase during the construction phase. Respirable particulate matter may present respiratory diseases, cause eye irritation and visual intrusion to workers, visitors to the project site and the neighbors if it is in excess of 100 $\mu g/Nm^3$ as per the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014.

**Recommended mitigation measures**

1. Procure, provide and enforce the use of dust masks to the workers and visitors to the project site
2. Install dust screens around the project site during construction
3. Cover stock piles of construction materials to reduce dust emissions especially during windy conditions
4. Sprinkle water at the excavation areas to suppress dust
5. Use of serviceable machinery/equipment and trucks

6. Monitor fugitive emissions to ensure compliance with the limits set under the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014
7. Comply with Environmental Management and Coordination (Air Quality) Regulations, 2014

#### 3.2.1.6 Water demand and effluent generation

The construction activities will utilize substantial quantities of water for concrete mixing, casting and curing works, general cleaning, drinking and sanitation which will be sourced from water bowsers. Based on the projected workforce of 100 people at construction, domestic water use will be approximately 6m$^3$ per day. Seventy percent (70%) of domestic water use will generate effluent which will need to be managed efficiently. The project site has existing sanitary facilities which will not be adequate for use by the workers.

**Recommended mitigation measures**

1. Sensitize the workers on the need to conserve available water resources
2. Procure and deliver to the site 2 additional mobile toilets from a NEMA licensed waste contractor for use by the workers during the construction
3. Comply with the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006

#### 3.2.1.7 Solid waste generation

Site preparation and construction activities are expected to generate significant quantities of solid waste such as overburden, rock rubbles, cuttings and rejected materials among others. Workers and visitors to the site will generate domestic wastes such as food left overs, plastics and wrappings among others. Poor disposal of solid waste is an eyesore, can harbor pests and disease causing pathogens as well as pollute the environment. Therefore, there is need for proper solid waste management and disposal.

**Recommended mitigation measures**

1. Procure and strategically place adequate solid waste collection bins with a capacity for segregation within the construction site
2. Procure a sizeable central solid waste collection bin with chambers to accommodate separated waste
3. Sensitize construction workers on the process of solid waste collection, segregation and proper disposal
4. Procure the services of a NEMA licensed waste handler to dispose off the solid waste
5. Comply with the Environmental Management and Coordination (Waste Management) Regulations, 2006

#### 3.2.1.8 Fuel, oil and grease management

Machinery used for construction activities and vehicles delivering construction materials to the site will need petroleum products such as fuel, oils, lubricants etc. There is potential for leakage and spillage during fueling, servicing and maintenance of machinery and vehicles. A release of petroleum products to the environment threatens ground and surface waters thereby endangering drinking water supplies.

**Recommended mitigation measures**

1. Prevent oil/grease spillages by employing skilled mechanics and sensitization
2. Procure and train workers on the use of oil spill containment kits
3. Contract a NEMA licensed waste oil handler to manage the waste oil from the construction site

#### 3.2.1.9 Traffic congestion

Heavy Commercial Vehicles (HCVs) delivering construction materials to the site are likely to increase traffic along the busy Port Reitz road in case of stalling and breakdowns. This will cause inconveniences to other road users

**Recommended mitigation measures**

1. Prepare and implement a traffic management plan
2. Provide sufficient parking for HCVs and machinery at the site
3. Offloading construction materials should be done on site and not on the road reserve
4. HCVs delivering raw materials will observe designated speed limits for the area
5. Comply with the Traffic Act, 2016

### 3.2.2 Negative impacts at the operational phase of the LPG Terminal Depot

#### 3.2.2.1 Occupational safety and health risks

The operations of the facility will pose safety and health risks to workers, visitors to the site and the neighboring community. These may be in the form of fire outbreaks and explosions, cold burns from LPG, health related problems due to inhalation and prolonged exposure to the LPG and which can act as an asphyxiant at high concentrations, accidents from use of machinery, vehicular movement and falls among others. All these risks have potential to cause injuries, permanent disability or even death and hence the management should be committed to ensuring safety and health of workers and visitors to the facility.

**Recommended mitigation measures**

1. Register the facility as a workplace with the DOSHS
2. Enclosing of the area by an industrial type fence of height at least 1.8m and providing at least two means of gaining access to the area in case of emergency
3. Provide at least two warning notices measuring 200mm by 200mm which should be securely attached to the outer side of the fence surrounding the LPG storage area
4. LPG tanks should be installed generally in accordance with NFPA 58 and EEMUA publication 190
5. Protect buried and mounded LPG tanks from loads due to vehicular traffic or other causes, either by erecting a barrier around the area in which the LPG tanks are buried or by protecting the LPG tanks with reinforced concrete slabs
6. The pipe works will comply with the KS 1938-3: 2012 and BSEN 1600 and ISO 3183 standards while valves and other fittings should comply with the relevant API and ISO standards
7. All LPG tanks and vaporizers should be tested and inspected in accordance with the relevant regulations framed under the DOSHS
8. Display of precautionary signage at appropriate locations within the facility
9. Provide adequate and appropriate PPE such as such as gloves, goggles, aprons, and gumboots (leather or conductive rubber soles) and enforce on their use
10. Sensitize employees on work procedures
11. Provision of well-stocked first aid kits within the facility
12. Train workers on occupational safety and health and first aid
13. Provide documentation of all incidences and accidents occurring on the site including near misses and actions taken to prevent future occurrences.
14. Develop and implement a policy on health and safety at the workplace as well as an effective Emergency Response Plan
15. Conduct occupational health and safety audits
16. Comply with the provisions of Occupational Safety and Health Act, 2007

#### 3.2.2.2 Fire risks and emergency preparedness

Liquefied petroleum gas is highly flammable and thus high potential for fire outbreak and explosions. This may occur as a result of LPG leaks and vaporization during refilling of the cylinders, spillage on other flammable materials, operational negligence and electrical faults.

Further, an LPG tank that has held LPG and is empty can cause fire risks. In this state, the internal pressure is approximately atmospheric and, if the valve leaks or is left open, air can diffuse into the LPG tank and form a flammable or explosive mixture. Fire hazards can result to injuries and loss of lives and property. To manage potential fire outbreaks and explosions, the management should put in place appropriate measures and accord adequate attention and swift action in case of an outbreak. Careful consideration has to be given to the properties of the gas when the location of LPG vessels and the construction of installations for conveying this gas are decided on.

### Recommended mitigation measures

1. Consult with the Fire Department at an early stage regarding the placing of LPG tanks and any other guidance in respect to fire-fighting and fire protection facilities.
2. All persons concerned with the installation of LPG tanks and appliances should be registered with the Kenya Accreditation Services in conjunction with the Energy and Petroleum Regulatory Authority
3. Installation of LPG tanks to comply with minimum safety distance as per Kenya Standard i.e. KS 1938-3: 2012 as follows
    - 15m from buried and mounded LPG tanks to buildings, property boundaries and points of gas release. The proposed LPG terminal depot design has taken into account a safety distance of more than 15m
    - ¼ of the diameters of adjacent LPG tanks between above LPG tanks
    - Sides of adjacent LPG tanks should be separated by not less than 1 m
4. Because of the hazards involved with the filling of LPG tanks, no one should fill a LPG tanks with gas unless
    - He is fully conversant with the relevant subsections of the Kenya Standard
    - He is satisfied that the LPG tanks complies with the requirements of an approved manufacturing specification or the provisions of an approved manufacturing code (if necessary, this may be ascertained from the relevant LPG tanks documents)
    - He employs staff trained and experienced in the pre-filling inspection and actual filling of LPG tanks with those gases that he handles
    - The LPG tanks is not due for periodic inspection or testing.
5. Installation of LPG Detectors/Sensors to detect any Gas Leaks
6. Loose, or piled combustible material, weeds and long dry grass should not be permitted within 3m of any LPG tank
7. Installation of an appropriately designed fire alarm and an electrical, hydraulic or pneumatic emergency shut down system (ESD).
8. Provide adequate water supply for fire protection for use in an emergency at an application rate of 10.5l/M$^2$/Min. The primary fire water pump should be diesel driven.
9. Provide acceptable to deal with water used for fire protection and firefighting purposes. Water sealed interceptors (gas traps) should be fitted to prevent LPG from entering the storm water drains and sewers.
10. The surface below the LPG tanks shall be sloped (minimum 2%) away from the tanks and the piping to ensure that liquid gas that may escape from the tank or pipe work does not accumulate under the tank or pipes.
11. Fire precautions should be taken by providing Automatic or manual fixed sprays and hydrant and hose 20 mm hose reel 2 x 9 kg dry powder extinguisher
12. Monitor nozzles should be located and arranged in such a way that all LPG tanks surfaces likely to be exposed to fire will be wetted.
13. There should be sufficient, acceptable, portable firefighting equipment on site. The equipment should be selected and located to enable fires adjacent to the LPG tanks to be extinguished and so prevent fire spreading to, or jeopardizing, the LPG installation. Fire extinguishers or hose reels or an equivalent combination of the two types of equipment can be provided.

14. Access to and around the installation should be provided for firefighting and should be kept free at all times.
15. LPG tanks should be electrically earthed so as to provide complete protection against lightning and the accumulation of static electricity.
16. The pipeline should be installed as to ensure electrical continuity and should be effectively connected to earth. A resistance not exceeding 10 Ohms is recommended and the checks should be done annually.
17. Workers should receive adequate instructions with training as appropriate to enable them understand the fire precautions and action to be taken in the event of fire or leakage of LPG
18. The local community should also be sensitized on fire safety measures
19. Conduct fire drills annually and incorporate the local community in the exercise
20. Notices setting out the emergency procedures should be prominently displayed near the LPG storage area.
21. A fire safety audit should be undertaken annually by a reputable fire audit firm and recommendations promptly implemented and a fire inspection certificate issued.

#### 3.2.2.3 Air pollution

LPG contains hydrocarbons, sulphur dioxide, oxides of nitrogen, volatile organic compounds and other gases that are a pollutant in case of a leakage during filling and decanting of LPG from the tank and tanker respectively or from relief valves provided on the storage tanks in the event of rise in temperature or pressure. LPG is non-toxic but, it can induce headaches and dizziness through inhalation and prolonged exposure to the gas. Other sources of air pollution include exhaust fumes from vehicles accessing the facility.

Notably, the baseline ambient air quality measurements conducted on 3rd December, 2020 indicated notable gaseous concentrations of CO, NOx, $SO_2$ and TVOC within the project site as well as particulate matter ($PM_{10}$ and $PM_{2.5}$). However, all the gaseous and particulate parameters measured were all within the stipulated standards under the First Schedule of Environmental Management and Coordination (Air Quality) Regulations, 2014

#### Recommended mitigation measures

1. Develop a plan of action to guide transfer of LPG and ensure strict adherence to the operational procedures
2. Operations should be undertaken with utmost care ensuring that only qualified personnel are deployed to undertake the tasks
3. Tests on the LPG tanks should be scheduled regularly and actions prescribed to safeguard tank integrity
4. Install gas detectors to detect gas release
5. Workers should receive adequate instructions with training to enable them understand the precautions and actions to be taken in the event of leakage of LPG
6. Provide and enforce the use of appropriate PPE within appropriate sections by workers and visitors
7. Monitor fugitive emissions to ensure compliance with the limits set under the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014

#### 3.2.2.4 Noise pollution

Noise is likely to emanate from vehicle movement in and out of the facility. It should be noted that the noise produced at the facility will be in keeping with the background noise emanating from Port-Reitz Road. Additionally, the immediate neighbors venture in logistic solutions for/and transportation services as well as container depots. Notably, the baseline noise level measurements conducted on 3rd December, 2020 indicate that they were within the limits stipulated under the Environmental Management and Coordination (Noise and Excessive

Vibration Pollution) (Control) Regulations, 2009. The facility management should ensure compliance with Environmental Management and Coordination (noise and excessive vibration pollution) (control), 2009.

#### 3.2.2.5 Increased energy demand

The proposed development will exert an extra demand on energy mainly electricity for powering machine and equipment and for lighting purposes. Energy will be sourced from the national grid and supplemented by the existing diesel powered generator.

**Recommended mitigation measures**

1. Supplement electrical supply from the national grid with renewable energy such as solar to power the lighting system in areas such as offices and walkways
2. Install compact fluorescent lights in high use areas within the facility– they last longer and use 75% less energy than normal light bulbs
3. Keep records of power consumption to inform substantial practical guidelines for continuous improvement of consumption efficiency and identifying cost saving opportunities in energy efficiency
4. Create awareness among employees and guests on energy conservation such as switching off lights when they are not in use
5. Conduct energy audits at least once every three years and implement the recommended actions

#### 3.2.2.6 Increased water demand

The facility will require large amounts of water especially for fire risks management and hence the proponent proposes to install a 3million litre water capacity tank for storing water in case of any fire emergency. Other uses of water will include cleaning, drinking purposes and sanitation among others. Water will be sourced from the reticulated supply by Mombasa Water Supply and Sanitation Company Limited (MWSSCL) supplemented by borehole water.

**Recommended mitigation measures**

1. Obtain a water permit for drilling and abstracting water from the proposed borehole
2. Install sanitation facilities such as water closets that use minimal amounts of water and self-closing taps
3. Create awareness among employees and visitors on water conservation

#### 3.2.2.7 Waste generation

During operations, both solid wastes and effluent will be generated. Solid wastes will include mainly domestic waste from the workers and visitors to the site. Effluent will be generated from sanitation areas. Both the solid waste and effluent generated will need to be managed appropriately.

**Recommended mitigation measures**

1. Provide litter bins with a capacity for waste segregation within the facility
2. Procure the services on a NEMA licensed waste contractor to dispose off wastes from the facility
3. Design and construct a bio-digester to manage effluent
4. Apply for and obtain an Effluent Discharge License (EDL) from NEMA
5. Monitor the quality of effluent discharged from the proposed biodigester to ascertain conformity to the Third Schedule of Environmental Management and Coordination (Water Quality) Regulations, 2006
6. Comply with the Environmental Management and Coordination (Waste Management) Regulations, 2006
7. Comply with the Environmental Management and Coordination (Water Quality) Regulations, 2006

#### 3.2.2.8 Storm water management

The paved surface prevents water from infiltrating resulting to generation of runoff during rainy seasons hence the need for storm water management.

**Recommended mitigation measures**

1. Install a storm water drainage system to manage runoff and prevent flooding.
2. Water sealed interceptors (gas traps) should be fitted to prevent LPG from entering the storm water drains and sewers.

### 3.2.3 Negative impacts at possible decommissioning phase of the LPG Terminal Depot

A decommissioning phase is possible in the event of end of project life, closure by government agencies due to non-compliance with environmental and health regulations, an order by a court of law due to non-compliance with existing regulations, potential fire risks, natural calamities and change of user of land. It is recommended that the proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance. For the purposes of prediction and information, the environmental and social concerns which may arise during decommissioning include;

1. Loss of the LPG terminal depot
2. Economic decline
3. Fire risks
4. Safety and health risks
5. Waste generation
6. Insecurity

#### 3.2.3.1 Loss of the LPG terminal depot

The proposed development will serve an already growing LPG market in Kenya and other regions where the demand is high. In addition, it will be a source of income to the proponent and employees as well as generate revenue to the government. Therefore, a decommissioning phase will lead to the loss of these benefits.

**Recommended mitigation measures**

1. Obtain demolition permits from the County Government of Mombasa and NEMA
2. Adequate notices on the impending decommissioning should be given to interested and affected parties to enable them make alternative arrangements

#### 3.2.3.2 Economic decline

The establishment and operation of the proposed project will bring about a lot of positive changes to the lives of the people around it and also to the surrounding economy. In the event of decommissioning of the proposed development, the proponent will incur huge financial loses and the employees will also lose their livelihoods. In addition, the government will lose revenue earned from the operations of the facility leading to economic decline.

**Recommended mitigation measures**

1. Train employees on alternative livelihoods prior to decommissioning
2. Prepare and issue recommendation letters to employees to seek alternative employment opportunities
3. Review potential job opportunities in other ongoing contracts by the proponent and recommend the employees who qualify
4. Comply with labor laws by paying the employees their terminal dues

#### 3.2.3.3 Fire risks and emergency preparedness

Fire risks and emergencies may occur from LPG leaks and vaporization during decanting from the storage tanks, negligence and spillage/leakage of flammable and ignitable chemicals while decommissioning the depot. Therefore, measures must be put in place to prevent fire occurrence.

Recommended mitigation measures

1. Provide firefighting equipment during decommissioning
2. Remove as much of the remaining LPG vapour through the venting connection (The vapour should be burnt-off or vented to the open air at a safe location in an approved manner)
3. Remove as much LPG liquid as possible through the LPG tanks liquid withdrawal connection
4. Purge the LPG tanks in accordance with appropriate requirements given in KS 1938-1

### 3.2.3.4 Safety and health risks

Safety and health risks during demolition and dismantling activities are likely to emanate from accidental falls and cuts, injuries from demolition and dismantling tools and machinery use. Noise and air pollution from demolition and dismantling works could pose safety and health risks to workers, neighbors and visitors to the site.

Recommended mitigation measures

1. Contract a licensed construction company to carry out demolitions
2. Install signage to forewarn people on ongoing demolition activities
3. Provide adequate and enforce the use of PPE throughout the demolition works
4. Avail first aid kits on site throughout the entire period
5. Ensure workers are given the correct hand tools and equipment for the jobs assigned
6. Comply with the Environmental Management and Coordination (Air Quality) Regulations, 2014
7. Comply with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009
8. Comply with the provisions of the Occupational Safety and Health Act, 2007

### 3.2.3.5 Waste generation

Demolition activities will result in generation of both effluent and solid waste. The waste generated will include wood cuttings, roofing waste and building rubbles among others. If not properly managed, these generated waste will pose safety and health risks and environmental pollution.

Recommended mitigation measures

1. Recover re-usable materials for sale or use in other project sites
2. Contract a NEMA licensed waste handler to handle and dispose both solid waste and effluent generated from the demolition activities
3. Comply with the Environmental Management and Coordination (Waste Management) Regulations, 2006
4. Comply with the Environmental Management and Coordination (Water Quality) Regulations, 2006

### 3.2.3.6 Insecurity

Insecurity will result from the site when it's abandoned after decommissioning. Unoccupied structures within the site will act as criminal dens and the security boost that had been provided by the depot to the local community would be lost.

Recommended mitigation measure

1. The proponent should extend the tenure of contracted security firm during the decommissioning phase of the facility

## 3.3 Impact analysis

Potential project impacts are predicted and quantified to the extent possible. The magnitude of impacts on resources such as water and air or receptors such as people, communities, wildlife species and habitats is defined. Magnitude is a function of the following impact characteristics;

1. Type of impact (direct, indirect, induced)
2. Size, scale or intensity of impact
3. Nature of the change compared to baseline conditions (what is affected and how)
4. Geographical extent and distribution( e.g. local, regional, international)
5. Duration and/or frequency (e.g. temporary, short-term, long term, permanent)

Magnitude describes the actual change that is predicted to occur in the resource or receptor. It takes into account all the various impact characteristics in order to determine whether an impact is negligible or significant. Some impacts can result in changes to the environment that may be immeasurable, undetectable or within the range of normal natural variation. Such changes can be regarded as essentially having no impact and are characterized as having a negligible magnitude (Table 6). The levels of impacts are defined using the following terms

1. **Negligible impact (very low) -** Where a resource or receptor would not be affected by a particular activity or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background variations.
2. **Less than significant impact (Low**) - Is a minor impact where a resource or receptor would experience a noticeable effect but the impact magnitude is sufficiently low (with or without mitigation) and /or the resource or receptor is of low sensitivity. In either case, a less than significant impact must be sufficiently below applicable standard threshold limits.
3. **Potentially significant impact (moderate) -** A moderate impact that meets applicable standards but comes near the threshold limit. The emphasis for such moderate impacts is to demonstrate that the impact has been reduced to a level that is as minor as reasonably practicable so that the impact does not exceed standard threshold limits.
4. **Significant impact (high) -** One where an applicable standard threshold limit would or could be exceeded or if a highly valued or very scarce resource would be substantially affected.

Table 6: Risk and impact significance matrix for the proposed LPG Terminal Depot.

| Environmental impact | Magnitude of impact at construction phase | Magnitude of impact at operational phase | Magnitude of impact at possible decommissioning phase |
|---|---|---|---|
| Installation of the LPG tanks and pipeline | 3 | 0 | 0 |
| Environmental risks of obtaining raw materials | 2 | 0 | 0 |
| Occupational safety and health risks | 3 | 3 | 3 |
| Fire risks and emergency preparedness | 0 | 3 | 3 |
| Air pollution | 2 | 1 | 2 |
| Noise pollution | 2 | 2 | 2 |
| Water demand | 2 | 3 | 2 |
| Energy demand | 1 | 3 | 1 |
| Effluent generation | 2 | 2 | 2 |
| Solid waste generation | 2 | 2 | 2 |
| Storm water management | 0 | 1 | 0 |
| Fuel, oil and grease management | 2 | 2 | 0 |
| Traffic management | 2 | 2 | 1 |
| Loss of the LPG depot | 0 | 0 | 3 |
| Economic decline | 0 | 0 | 3 |
| Insecurity | 0 | 1 | 2 |

Legend

| Magnitude | Impact score |
|---|---|
| Negligible | 0 |
| Low | 1 |
| Moderate | 2 |
| High | 3 |

## 3.4 Public and stakeholders consultations and findings

### 3.4.1 Introduction

Public and stakeholders participation in the ESIA process is a legislative requirement under Part 2, Section 69 (1d) of the Kenya Constitution 2010 and Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. The aim of public and stakeholders consultations was to obtain and document comments, views and concerns that the neighbors and stakeholders have regarding the proposed project. For the proposed project, public and stakeholders consultations were undertaken using two strategies;

1. Administration of questionnaire to the neighbors and stakeholders
2. Three stakeholders' consultative meetings held on 9th, 10th and 17th December, 2020

Brief details of the comments obtained during administration of questionnaires and stakeholders' consultative meetings are discussed below and the proceedings of all the meetings are annexed to this report.

### 3.4.2 Summary of comments obtained during administration of questionnaires

A total of 47 questionnaires were administered on 3rd and 9th December 2020 (Figure 14) and the main comments are summarized in Table 7 below. Due to the prevailing COVID-19 pandemic, the questionnaires were filled in by the interviewers where possible. Three of the respondents interviewed objected to the proposal citing main reasons as potential fire risks from the depot and impact on health from LPG inhalation. The rest of the respondents cited the main positive impacts as employment opportunities, provision of LPG, support to local businesses, income to the proponent, revenue to the government and development in the area. The main potential negative impacts cited and recommended mitigation measures included;

1. Potential fire outbreaks and impact on health form gas inhalation; take necessary precautions during operations and implement all the required precautions during the entire project cycle
2. Potential relocation of the residents of Salama Mwingo village; compensation to the residents
3. Effluent generation; ensure proper effluent management
4. Occupational safety and health risks including noise and air pollution; provision of PPE to workers and visitors to the site
5. Traffic congestion from truck movement; ensure good control of truck movements

Notably, the ESIA has proposed measures to ensure that the proposed project possess minimal or no environmental and social impacts cited by the local communities. The measures proposed aim at;

- Prevention of environmental pollution
- Preventing health and safety risks
- Preventing fire risks
- Preventing air pollution from gas leaks during operations
- Minimizing air and noise pollution at construction
- Minimizing the use of environmental resources such as water and energy
- Waste management

Figure 14: Public consultations with the neighbors to the project site through administration of questionnaires (Source: Site visit, December 2020).

**Table 7: Summary of comments obtained from neighbors and stakeholders of the proposed project.**

| No. | Respondents profile | | | |
|---|---|---|---|---|
| | Name | Tel contact | ID No. | Comments |
| 1. | Omar Kai | 0706250311 | 31187135 | – Objection to the proposed project<br>– Impact on the health from LPG inhalation<br>– Potential fire risks; if the project is issued with a license, they should be relocated |
| 2. | Zuma Bandi Chuchu | 0725662606 | 30891316 | – Objection to the proposed project<br>– Impact on the health from LPG inhalation |
| 3. | Mwakaga Suleimani | 0720973453 | 32861797 | – Objection to the proposed project<br>– Most residents of Salama Mwingo smoke a lot hence a source of potential fire outbreaks<br>– Put a boundary wall |
| 4. | Kamau Muguro Kamau | 0726499553 | 4660524 | – No objection to the proposed project<br>– Source of employment opportunities |
| 5. | Mariam Saru | 0725662606 | 30086605 | – No objection to the proposed project<br>– Development of the area<br>– Air pollution from gas leaks<br>– Possible fire outbreaks<br>– Compensation for possible relocation from the area |
| 6. | Kadama Toya Dawa | 0790627803 | | – No objection to the proposed project<br>– Development of the area<br>– Air pollution<br>– Possible fire outbreak; ensure fire prevention<br>– Potential relocation; compensation to the locals |
| 7. | Mercy Kwamboka | 0712498199 | 28102196 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Provision of LPG<br>– Potential fire risks; put in place mitigation measures |
| 8. | Charlet Lewa | 0713035350 | 11438765 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Improved security<br>– Availability of cheap clean gas<br>– Potential fire outbreaks; follow the protocol gas tanks installation and ensure fire prevention |
| 9. | Dorcas Kombe | 0727907856 | 32555127 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Potential fire outbreaks; implement recommended mitigation measures<br>– Potential air (gas) emissions |
| 10. | Sharon Mwandi | 0769059607 | 24228764 | – No objection to the proposed project<br>– Provision of LPG |
| 11. | Muhanvi Ndurya | | 27768643 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Potential fire risks |

| No. | Respondents profile | | | Comments |
|---|---|---|---|---|
| | Name | Tel contact | ID No. | |
| 12. | Hamisi Matano | 0741982155 | 34659245 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Provision of LPG<br>– Emissions from the LPG depot; put in place mitigation measures<br>– Potential displacement of people; prior consultations with the locals |
| 13. | Moses Katinga | 0793663719 | 28688643 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Development of the area<br>– Optimal use of land<br>– Income to the proponent<br>– Revenue to the government |
| 14. | Idi kalume Fondo | 0742898309 | 37325175 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Potential fire outbreaks; provide workers with the required PPEs |
| 15. | Omar Bostone | 0706791112 | 4594211 | – No objection to the proposed project<br>– Source of clean energy<br>– Emissions from LPG handling<br>– Noise pollution |
| 16. | Casgela C. Maghanga | 0723780960 | 14512179 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Support to other local businesses<br>– Potential fire outbreaks |
| 17. | Amin Hussein | 0719802758 | 27344200 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Availability of cooking gas<br>– Impact on health from gas leakages<br>– Potential fire risks |
| 18. | Lydia Chuphi | 070286317 | 30560502 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Air pollution from LPG leakages<br>– Potential fire outbreaks |
| 19. | Maureen Kombo | 0700513465 | 30632946 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Income to the proponent<br>– Support of local businesses<br>– Supply of LPG |
| 20. | Samson M. Kanja | 0717462001 | 30146215 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Support to local businesses<br>– Revenue to the government<br>– Provision of LPG<br>– Potential fire outbreaks<br>– Potential air emissions from gas leaks<br>– Traffic congestion from trucks |
| 21. | Samuel Kenga Karisa | 0728237121 | 4591954 | – No objection to the proposed project<br>– Source of employment opportunities; prioritize the locals<br>– Improved standards of living<br>– Cheaper access to LPG |

| No. | Respondents profile | | | |
|---|---|---|---|---|
| | Name | Tel contact | ID No. | Comments |
| | | | | – Potential fire risks<br>– Air emissions from LPG handling |
| 22. | Rose Atieno | 0717224374 | 22283078 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Proximity to cheap clean energy<br>– Air emissions during refiling<br>– Potential fire outbreaks |
| 23. | Joseph Avuova | 0777293455 | 25642745 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Accessibility to clean energy<br>– Improved living standards<br>– Revenue to the government<br>– Income to the proponent<br>– Improved security<br>– Potential fire outbreaks, air pollution and traffic congestion |
| 24. | Abdallah Omar | 0726808924 | | – No objection to the proposed project<br>– Source of employment opportunities<br>– Provision of LPG |
| 25. | Anonymous | | | – No objection to the proposed project<br>– Source of employment opportunities<br>– Proximity to gas supply<br>– Potential fire outbreaks; take necessary precautions during operations |
| 26. | Sada Dume | 0795342925 | 37402605 | – No objection to the proposed project<br>– Source of employment opportunities |
| 27. | Isaack Omar | 0719605810 | 33171989 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Improvement of infrastructure<br>– Youth empowerment |
| 28. | Esther M. John | 0727665913 | 26268847 | – No objection to the proposed project<br>– Source of employment opportunities |
| 29. | The new wakunde simba youth group C/o Gabriel Nyange | 0713908812 | | – No objection to the proposed project<br>– Source of employment opportunities; Prioritize the youth<br>– Have in place CSR programmes to help the community |
| 30. | Stellah Sululu | 0727468056 | 27239559 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Availability of LPG to the locals |
| 31. | Faith Ngache Mkumu | 0718688312 | 23279934 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Dust pollution<br>– Traffic congestion |
| 32. | Faith Kisiwi | 0725209592 | 25029176 | – No objection to the proposed project<br>– Source of employment opportunities |
| 33. | Riyaz Pasta | 0722590111 | 281600 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Dust pollution<br>– Waste generation<br>– Noise pollution |
| 34. | Joel Omondi | 0722534435 | 24474961 | – No objection to the proposed project |

| No. | Respondents profile | | | Comments |
|---|---|---|---|---|
| | Name | Tel contact | ID No. | |
| | | | | – Source of employment opportunities<br>– Increased energy demand; switch off machines when not in use<br>– Effluent generation; ensure proper effluent management<br>– Occupational safety and health risks including noise and air pollution; provision of PPE<br>– Traffic congestion from trucks movement; good control of trucks movements |
| 38. | Okoa mda youth group C/o Baushi Athman | 0114360365/ 0717678910 | 29004566 | – No objection to the proposed project<br>– Source of employment opportunities |
| 39. | Nasoro Mohamed | 0798231189 | 27182333 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Development of the area |
| 40. | Bihindi Athman Kombo | 0706551512 | 23908503 | – No objection to the proposed project |
| 41. | Vivian Achieng | 0716762701 | 25253028 | – No objection to the proposed project<br>– Source of employment opportunities |
| 42. | Ahmed Mohamed | 0721751705 | 22022803 | – No objection to the proposed project<br>– Source of employment opportunities |
| 43. | Joseph Baya | 0727880768 | 28298603 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Supply of LPG |
| 44. | Anthony Maluki | 0717678910 | 29004564 | – No objection to the proposed project<br>– Source of employment opportunities |
| 45. | Salame Abdalla Said | 0748689655 | 37371562 | – No objection to the proposed project<br>– Source of employment opportunities |
| 46. | Millicent Awuor Omondi | 0727889730 | 21748546 | – No objection to the proposed project<br>– Source of employment opportunities |
| 47. | Asha Suleiman | 0724858232 | 22779580 | – No objection to the proposed project<br>– Source of employment opportunities<br>– Provision of LPG<br>– Development of the area |

### 3.4.3 Stakeholders' consultative meetings

#### 3.4.3.1 First stakeholders' consultative meeting

The consultants in consultation with the local administration and the proponent organized and held the first stakeholders' consultative meeting on 9th December, 2020 at the project site (Figure 15). The proceedings of the meeting involved a brief presentation of the project scope and reactions by the participants on their social issues and environmental concerns that need to be addressed. The main concerns arising from the meeting included;

1. Impact of the operations of the project on the health and safety of the community members and neighbours
2. Prioritizing employment opportunities to the locals
3. Forming a committee between the proponent and the locals and a liaison office be established to ensure the community's grievances are addressed
4. Have Community Social Responsibilities programmes to help the communities including educating the locals on how best they can use LPG gas, a cleaner energy.

5. The ESIA report should address fire emergencies, noise and air pollution and poor effluent discharges among environmental other impacts

The detailed proceedings of the first stakeholders' consultative meeting is annexed to this report.

**Figure 15: A section of the stakeholders during the first stakeholders' consultative meeting held at the project site (Source: Stakeholders consultative meeting, December 2020).**

### 3.4.3.2 Stakeholders' consultative meeting with the staff from Kenya Power Company

The NEMA guidelines on public consultations encourage the use of ICT in stakeholder engagement during the COVID-19 pandemic. In line with this, the consultants convened a zoom meeting with some of the staff from Kenya Pipeline Company (KPC) on 10th December, 2020 in response to their request for a virtual meeting. The zoom meeting ID was 220 583 8840 and the passcode was Tj5gH8. The meeting was attended by 5 participants who included 2 staffs from KPC, the project engineer and 2 members from the consultancy team. The KPC staff advised the staff to write officially to the KPC Managing Director on the issue of use of their way leave. Overall, they noted that the project is beneficial to the country as it will address gaps in bulk LPG storage facilities and local availabilities. The detailed proceedings of the stakeholders' consultative meeting with the staff from KPC is annexed to this report.

### 3.4.3.3 Second stakeholders' consultative meeting

The second stakeholders' consultative meeting was held on 17th December 2020 at Bomu primary school to review and validate the ESIA Study Report (Figure 16). The proceedings of the meeting involved a detailed presentation of the ESIA study report followed by questions, comments and reactions to the presentation reactions by the participants. The main concerns arising from the meeting included;

1. Management of potential gas leakages by the proponent
2. Conducting risk assessments on potential use of the rail which currently posses transportation challenges
3. Continuous training to workers and community on fire precautions and action to be taken in the event of fire or leakage of LPG
4. Conducting fire drills annually and incorporate the local community in the exercise
5. Develop a Grievances Redress Mechanism to ensure the community's grievances are addressed

The detailed proceedings of the second stakeholders' consultative meeting is annexed to this report.

**Figure 16: A section of the stakeholders during the second stakeholders' consultative meeting held at Bomu Primary School (Source: Stakeholders consultative meeting, December 2020).**

### 3.4.4 Grievances Redress mechanism

#### 3.4.4.1 Introduction

The affected persons by the proposed project may raise their grievances and dissatisfactions about actual or perceived impacts in order to find a satisfactory solution. These grievances, influenced by their physical, situational and/or social losses, can emerge at the different stages of the project cycle. Not only should the affected persons be able to raise their grievances and be given an adequate hearing, but also satisfactory solutions should be found that mutually benefit both the affected persons and the project. It is equally important that the affected persons have access to legitimate, reliable, transparent and efficient institutional mechanisms that are responsive to their complaints.

#### 3.4.4.2 Grievances prevention

Grievances cannot be avoided entirely, but much can be done to reduce them to manageable numbers and reduce their impacts. This will be achieved by;

1. Providing sufficient and timely information to communities. Many grievances arise because of misunderstandings; lack of information; or delayed, inconsistent or insufficient information. Accurate and adequate information about a project and its activities, plus an approximate implementation schedule, should be communicated to the communities, especially affected parties, regularly.
2. Conduct meaningful community consultations. The project proponent should continue the process of consultation and dialogue throughout the implementation of the project. Sharing information, reporting on project progress, providing community members with an opportunity to express their concerns, clarifying and responding to their issues, eliciting communities' views, and receiving feedback on interventions will benefit the communities and the project management.
3. Overall good management of the facility will ensure a reduction in potential conflicts with the local community and other stakeholders.

During the consultative meetings, the stakeholders suggested a committee between the proponent and the locals be formed and a liaison office be established to ensure the community's grievances are addressed.

### 3.4.4.3 Grievances Redress Mechanism Tool

The depot will have a more prompt and efficient resolution on individual and collective complaint and provision of feedback on any grievances and dissatisfaction from stakeholders during operations. The flow chart below (Figure 17) shows a complaint and proposal consideration mechanism for the depot that provides an accessible channel for submission of complaints and feedback to stakeholders.

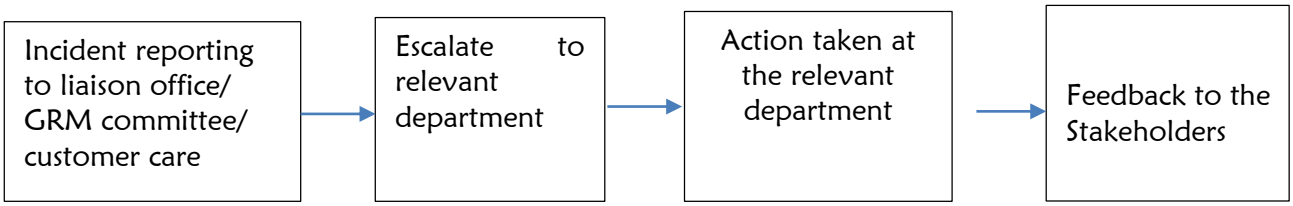


**Figure 17: Grievances Redress Mechanism Tool flow chart**

# 4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

## 4.1 Introduction

The preceding section has analyzed and identified the potential environmental and social impacts of the proposed LPG terminal depot as well as the mitigation measures to address the impacts. Under this section, three Environmental and Social Management Plans (ESMPs) are proposed to guide the proponent in implementing the mitigation measures. These are ESMPs for the construction, operational and possible decommissioning phases. Each of the ESMP is organized into five sections comprising of the environmental concerns, recommended mitigation measures, implementing party, timeframe and a budget. The strategies for mitigation include preventing the impact from occurring in the first place, minimizing the impact, taking corrective action where impact occurs among others. The overall focus is to ensure that the project complies with the substantive EIA Principle of ensuring the right to a clean and healthy environment during the entire project cycle.

## 4.2 Environmental and Social Management Plan for the construction phase

At the construction phase, the focus on the ESMP is on addressing the use of environmental resources, pollution of environmental media, occupational safety and health risks, community concerns and traffic management (Table 8).

## 4.3 Environmental and Social Management Plan for the operational phase

The main environmental concerns at this phase include occupational safety and health risks, fire risks and emergency preparedness, air and noise pollution, use of environmental resources, pollution of environmental media, community concerns and storm water management (Table 9).

## 4.4 Environmental and Social Management Plan for the decommissioning phase

The decommissioning ESMP is important in the event of end of project cycle, natural calamities and non-compliance with environmental and health regulations among others. The key issues of concern at this stage will be the economic decline, waste generation, safety and health risks and insecurity (Table 10).

**Table 8: Environmental and Social Management Plan for the construction phase of the proposed project.**

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| Installation of LPG tanks and pipeline | Install LPG tanks/pipeline in accordance with KS 1938-3: 2012 | Proponent/ Engineer/ EPRA | During LPG tanks/pipeline installation | Nil |
| | The pipe, valves and other fittings works should comply with the relevant standards | Proponent/ Engineer/ EPRA | During LPG tanks/pipeline installation | Nil |
| | Carry out a soil investigation to determine the expected overall and differential settlement | Proponent/ Engineer | During LPG tanks installation | 500,000 |
| | Consultations with the Fire Department regarding the placing of the LPG tanks and any other guidance in respect to firefighting and fire protection facilities | Proponent/ Engineer/ Fire Department | During LPG tanks/pipeline installation | Nil |
| Environmental risks of obtaining raw materials | Procure quantities of construction materials in line with the Bill of Quantities | Proponent/ contractor | Throughout construction | Nil |
| | Source raw materials from sites that are licensed as per the EMCA Cap. 387 of the Laws of Kenya | Proponent/ contractor | Throughout construction | Nil |
| | Sensitize personnel on wastage of construction materials | Proponent/ contractor | Throughout construction | Nil |
| Occupational safety and health risks | Register the site as a workplace with DOSHS | Proponent/ contractor | Prior to commencement | 5,000 |
| | Obtain insurance cover for the workers at the site | Proponent/ contractor | Prior to commencement | 2,000,000 |
| | Procure and provide adequate and appropriate PPE to workers and visitors to the site and enforce their use | Proponent/ contractor | Throughout construction | 800,000 |
| | Provide employees with correct tools and equipment for the jobs assigned and train on their use | Proponent/ contractor | Throughout construction | Nil |
| | Ensure moving parts of machines and sharp surfaces are securely protected with guards | Proponent/ contractor | Throughout construction | Nil |
| | Provide a fully equipped first aid box and an emergency vehicle at the site | Proponent/ contractor | Throughout construction | 1,000,000 |
| | Ensure proper storage and management of flammable materials within the project site | Proponent/ contractor | Throughout construction | Nil |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | Prepare and implement a fire and emergency response plan for the construction site | Proponent/ contractor | Throughout construction | Nil |
| | Supervision of works shall be done regularly to ensure safety conditions at work | Proponent/ contractor | Throughout construction | Nil |
| | Comply with the set National and County Governments Directives and guidelines on prevention of the spread of COVID-19 | Proponent/ contractor/ workers | Throughout construction | Nil |
| | Comply with the provisions of the Occupational Safety and Health Act, 2007 | Proponent/ contractor | Throughout construction | Nil |
| Noise pollution | Procure, provide and enforce the use of ear muffs to workers and visitors to the site | Proponent/ contractor | Throughout construction | 500,000 |
| | Service machinery and equipment regularly to ensure that they are in good condition to minimize excessive noise | Proponent/ contractor | Throughout construction | 20,000 |
| | Delivery of raw materials, excavation and construction work should be limited between 8am to 5pm | Proponent/ contractor | Throughout construction | Nil |
| | Locate machinery that are likely to produce noise as far as practical from neighboring properties | Proponent/ contractor | Throughout construction | Nil |
| | Sensitize truck drivers to avoid unnecessary hooting and running of vehicle engines | Proponent/ contractor | Throughout construction | Nil |
| | Comply with the Noise and Excessive Vibration Pollution (Control) Regulations, 2009 | Proponent/ contractor | Throughout construction | Nil |
| Air pollution | Procure, provide and enforce the use of dust masks to workers and visitors to the site | Proponent/ contractor | Throughout construction | 500,000 |
| | Install dust screens around the project site | Proponent/ contractor | Throughout construction | 3,000,000 |
| | Cover stock piles of construction materials to reduce dust emissions especially during windy conditions | Proponent/ contractor | Throughout construction | Nil |
| | Sprinkle water at the excavation areas to suppress dust | Proponent/ contractor | Throughout construction | Nil |
| | Use of serviceable machinery/equipment and trucks | Proponent/ contractor | Throughout construction | Nil |
| | Monitor fugitive emissions | Proponent/ contractor | Quarterly | 50,000 |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | Comply with the Air Quality Regulations, 2014 | Proponent/ contractor | Throughout construction | Nil |
| Water demand and effluent generation | Sensitize workforce on the need to conserve the available water resources | Proponent/ contractor | Throughout construction | Nil |
| | Procure and deliver to the site 2 additional mobile toilets from a NEMA licensed waste contractor | Proponent/ contractor | Throughout construction | 200,000 |
| | Comply with the Water Quality Regulations, 2006 | Proponent/ contractor | Throughout construction | Nil |
| Solid waste generation and management | Procure and strategically place adequate solid waste collection bins with a capacity for segregation | Proponent/ contractor | Prior to commencement | 100,000 |
| | Procure a sizeable central solid waste collection bin with chambers to accommodate separated waste | Proponent/ contractor | Prior to commencement | 100,000 |
| | Sensitize construction workers on the process of solid waste collection, segregation and proper disposal | Proponent/ contractor | Throughout construction | Nil |
| | Procure the services of a NEMA licensed waste handler to dispose off the solid waste | Proponent/ contractor | Throughout construction | Tender |
| | Comply with the Waste Management Regulations, 2006 | Proponent/ contractor | Throughout construction | Nil |
| Fuel, oil and grease management | Prevent oil/grease spillages by employing skilled mechanics and sensitization | Proponent/ contractor | Throughout construction | TBD |
| | Procure and train workers on the use of oil spill containment kits | Proponent/ contractor | Throughout construction | 50,000 |
| | Contract a NEMA licensed waste oil handler to manage the waste oil from the construction site | Proponent/ contractor | Throughout construction | Tender |
| Traffic congestion | Prepare and implement a traffic management plan | Proponent/ contractor | Prior to commencement | Nil |
| | Provide sufficient parking for HCVs and machinery at the site | Proponent/ contractor | Throughout construction | Nil |
| | Offload construction materials on the site and not on the road reserves to ensure smooth flow of traffic | Contractor/ truck drivers | Throughout construction | Nil |
| | Sensitize drivers to observe the designated speed limit for the area | Proponent/ contractor | Throughout construction | Nil |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | Comply with the Traffic Act, 2016 | Proponent/ contractor | Throughout construction | Nil |
| Stakeholders grievances | Develop and implement a grievances redress mechanism | Proponent/ community | Throughout construction | Nil |

**Table 9: Environmental and Social Management Plan for the operational phase of the proposed project.**

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| Occupational safety and health risks | Register the facility as a workplace with DOSHS | Proponent/ DOSHS | Annually | 5,000 |
| | Enclose the area by an industrial type fence and provide at least two emergency doors | Proponent/ Engineer | During construction | Nil |
| | Provide and secure two warning notices to the outside of the fence | Proponent | During construction | 20,000 |
| | LPG tanks should be installed generally in accordance with NFPA 58 and EEMUA publication 190 | Proponent/ Engineer | During construction | Nil |
| | Erecting a barrier around the area in which the LPG tanks are buried or by protecting the them with reinforced concrete slabs | Proponent/ Engineer | During construction | Nil |
| | The pipe works, valves and other fittings should comply with the relevant standards | Proponent/ Engineer | During construction | Nil |
| | Test and inspect all LPG tanks and vaporizers | Proponent/ Engineer | Throughout operations | Nil |
| | Display of precautionary signage at appropriate locations within the facility | Proponent | Throughout operations | 50,000 |
| | Provide adequate and appropriate PPE and enforce on their use | Proponent | Throughout operations | 500,000 |
| | Sensitize employees on work procedures | Proponent | Throughout operations | Nil |
| | Provision of well-stocked first aid kits within the facility | Proponent | Throughout operations | 25,000 |
| | Train workers on occupational safety and health and first aid | Proponent | Quarterly | 50,000 |
| | Provide documentation of all incidences and accidents occurring on the site | Proponent | Throughout operations | Nil |
| | Develop and implement a policy on health and safety as well as an effective Emergency Response Plan | Proponent | Immediately | Nil |
| | Conduct occupational health and safety audits | Proponent/ OSH officer | Annually | Tender |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | Comply with the provisions of Occupational Safety and Health Act, 2007 | Proponent/ workers | Throughout operations | Nil |
| Fire risks and emergency preparedness | Consult with the Fire Department regarding the placing of LPG tanks and any other guidance in respect to fire-fighting and fire protection facilities | Proponent/ Engineer/ Fire Department | Throughout operations | Nil |
| | All persons concerned with the installation of vessels and appliances should be registered with the EPRA | Proponent/ Workers | Throughout operations | Nil |
| | Installation of LPG tanks to comply with minimum safety distance as per the KS 1938-3: 2012 | Proponent/ Engineer | During installation | Nil |
| | Employ only competent persons to be involved with the filling of LPG tanks as per the KS 1938-3: 2012 | Proponent | Throughout operations | Nil |
| | Installation of LPG Detectors/Sensors to detect any Gas Leaks | Proponent/ Engineer | During construction | 200,000 |
| | Do not permit loose or piled combustible material within 3m of LPG tanks | Proponent/ Engineer | Throughout operations | Nil |
| | Install appropriate designed fire alarm and an electrical, hydraulic or pneumatic emergency shut down system | Proponent/ Engineer | During construction | Tender |
| | Provide adequate water supply for fire protection | Proponent | Throughout operations | Nil |
| | Slope the surface below the LPG tanks (minimum 2%) | Proponent/ Engineer | During Installation | Nil |
| | Providing automatic or manual fixed sprays and hydrant and hose 20 mm hose reel 2 x 9 kg dry powder extinguisher | Proponent/ Engineer | During construction | Tender |
| | Monitor nozzles should be located and arranged in such a way that that all LPG tanks surfaces likely to be exposed to fire will be wetted | Proponent/ Engineer | During construction | Nil |
| | There should be sufficient, acceptable, portable firefighting equipment on site | Proponent/ Engineer | Throughout operations | Tender |
| | Access to and around the installation should be provided for firefighting and should be kept free at all times | Proponent/ Engineer | During construction | Nil |
| | Notices setting out the emergency procedures should be prominently displayed near the LPG storage area | Proponent | Throughout operations | Nil |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | LPG tanks and pipeline should be electrically earthed | Proponent/ Engineer | During construction | Nil |
| | Train workers on fire precautions and action to be taken in the event of fire or leakage of LPG | Proponent/ fire department | Quarterly | 100,000 |
| | The local community should also be sensitized on fire safety measures | Proponent/ fire department | Quarterly | 100,000 |
| | Conduct fire drills annually and incorporate the local community in the exercise | Proponent/ fire department | Annually | 50,000 |
| | Undertake a fire safety audit and recommendations promptly implemented | Proponent | Annually | Tender |
| Air pollution | Develop a plan of action to guide transfer of LPG and ensure strict adherence to the operational procedures | Proponent/ Engineer | Before operations | Nil |
| | Deploy only qualified personnel to undertake the tasks | Proponent | Throughout operations | TBD |
| | Tests on the LPG tanks should be scheduled regularly and actions prescribed to safeguard tank integrity | Proponent/ Engineer | Throughout operations | Internal costs |
| | Install gas detectors to detect gas release | Proponent/ Engineer | During construction | 200,000 |
| | Train workers on the precautions and actions to be taken in the event of LPG leakage | Proponent/ fire department | Quarterly | 50,000 |
| | Provide and enforce the use of appropriate PPE within appropriate sections by workers and visitors | Proponent | Throughout operations | 500,000 |
| | Monitor fugitive emissions | Proponent | Quarterly | 50,000 |
| Noise pollution | Comply with noise and excessive vibration pollution (control), 2009 | Proponent | Throughout operations | Nil |
| Increased energy demand | Use renewable energy such as solar to power the lighting system | Proponent | Throughout operations | TBD |
| | Install compact fluorescent lights in high use areas within the facility | Proponent | Throughout operations | Nil |
| | Keep records of power consumption | Proponent | Throughout operations | Nil |
| | Create awareness on energy conservation | Proponent | Throughout operations | 50,000 |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | Conduct energy audits and implement the recommended actions | Proponent | at least once every three years | Tender |
| Increased water demand | Obtain a water permit for drilling and abstracting water from the proposed borehole | Proponent/ WRA | Before drilling | 12,500 |
| | Install sanitation facilities that use minimal amounts of water and self-closing taps | Proponent | During construction | 100,000 |
| | Create awareness on water conservation | Proponent | Throughout operations | 50,000 |
| Waste generation | Provide litter bins with a capacity for waste segregation within the facility | Proponent | Throughout operations | 100,000 |
| | Procure the services on a NEMA licensed waste contractor to dispose off wastes from the facility | Proponent | Throughout operations | Tender |
| | Design and construct a bio-digester to manage effluent | Proponent | During construction | 300,000 |
| | Monitor the quality of effluent discharged from the proposed biodigester | Proponent | Quarterly | 10,000 per sample point |
| | Apply for and obtain an EDL from NEMA | Proponent | Annually | 5,000 fee application |
| | Comply with the Waste Management Regulations, 2006 | Proponent | Throughout operations | Nil |
| | Comply with the Water Quality Regulations, 2006 | Proponent | Throughout operations | Nil |
| Storm water management | Install a storm water drainage system | Proponent/ Engineer | During construction | TBD |
| | Install Gas traps to prevent LPG from entering the storm water drains and sewers | Proponent/ Engineer | During construction | 500,000 |
| Stakeholders grievances | Develop and implement a grievances redress mechanism | Proponent/ community | Throughout operations | Nil |

**Table 10: Environmental and Social Management Plan for the decommissioning phase of the proposed project.**

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| Loss of the LPG terminal depot | Obtain demolition permits from the County Government of Mombasa and NEMA | Proponent/ contractor | Prior to decommissioning | 10,000 |
| | Adequate notices should be given to interested and affected parties to enable them make alternative arrangements | Proponent | Prior to decommissioning | Nil |
| Economic decline | Train employees on alternative livelihoods | Proponent | Prior to decommissioning | 50,000 |
| | Prepare and issue recommendation letters to employees to seek alternative employment opportunities | Proponent | Prior to decommissioning | Nil |
| | Review potential job opportunities in other ongoing contracts by the proponent and recommend the employees who qualify | Proponent | Prior to decommissioning | Nil |
| | Comply with labor laws by paying the employees their terminal dues | Proponent/ workers | Prior to decommissioning | Nil |
| Fire risks and emergency preparedness | Provide firefighting equipment | Proponent | During decommissioning | Factored during operations |
| | Remove as much of the remaining LPG vapour through the venting connection (vapour should be burnt-off or vented to the open air at a safe location in approved manner) | Proponent/ Engineer | During decommissioning | Nil |
| | Remove as much LPG liquid as possible through the LPG tanks liquid withdrawal connection | Proponent/ Engineer | During decommissioning | Nil |
| | Purge the LPG tanks in accordance with appropriate requirements given in KS 1938 | Proponent/ Engineer | During decommissioning | Nil |
| Safety and health risks | Contract a licensed construction company to carry out demolitions | Proponent | During decommissioning | Tender |
| | Install signage to forewarn people on ongoing demolition activities | Proponent/ contractor | Throughout the decommissioning | 30,000 |
| | Provide and enforce the use of PPE to workers and visitors | Proponent/ contractor | Throughout the decommissioning | 200,000 |
| | Avail first aid kits on site | Proponent/ contractor | Throughout the decommissioning | 16,000 |

| Environmental concerns | Recommended mitigation measures | Implementing party | Timeframe | Cost (KES) |
|---|---|---|---|---|
| | Ensure workers are given the correct hand tools and equipment for the jobs assigned | Proponent/ contractor | Throughout the decommissioning | Nil |
| | Comply with the Air Quality Regulations, 2014 | Proponent/ contractor | Throughout the decommissioning | Nil |
| | Comply with the Noise and Excessive Vibration Pollution (Control) Regulations, 2009 | Proponent/ contractor | Throughout the decommissioning | Nil |
| | Comply with the Occupational Safety and Health Act, 2007 | Proponent/ contractor | Throughout the decommissioning | Nil |
| Waste generation | Recover re-usable materials for sale or use in other project sites | Proponent/ contractor | Throughout the decommissioning | Nil |
| | Contract a NEMA licensed waste handler to handle and dispose both solid waste and effluent generated | Proponent/ contractor | Throughout the decommissioning | Tender |
| | Comply with the Waste Management Regulations, 2006 | Proponent/ contractor | Throughout the decommissioning | Nil |
| | Comply with the Water Quality Regulations, 2006 | Proponent/ contractor | Throughout the decommissioning | Nil |
| Insecurity | Extend the tenure of contracted security firm during the decommissioning phase of the facility | Proponent/ contractor | Throughout the decommissioning | Tender |

# 5 ENVIRONMENTAL MONITORING PLAN

## 5.1 Introduction

A suite of Environmental Monitoring Plans is required to ensure full and systematic implementation of the Environmental Management Plan. It entails assessment of environmental performance of the proposed project by documenting, tracking and reporting any changes in environmental parameters in space and time. The objective of the monitoring plans is to enhance the environmental performance of the project by providing data and information on compliance with legislative standards and determining the levels of deviation from the values obtained during the baseline monitoring. This in turn informs the corrective measures if any that need to be implemented to comply with the legislative standards. For the proposed project, eight monitoring plans are proposed. These are;

1. Occupational safety and health monitoring plan
2. Fire safety monitoring plan
3. Air quality monitoring plan
4. Noise monitoring plan
5. Wastewater quality monitoring plan
6. Domestic water quality monitoring plan
7. Solid waste monitoring plan
8. Energy monitoring plan

### 5.1.1 Occupational safety and health monitoring plan

#### 5.1.1.1 Introduction

Potential safety and health risks during construction and subsequent operational phases will emanate from the accidents from the use of machinery, noise and air pollution, potential fire outbreaks and explosions, cold burns from LPG, health related problems due to inhalation and prolonged exposure to the LPG and which can act as an asphyxiant at high concentrations among others. All these have a potential to cause injures, permanent disability or even death to workers, neighbors and visitors to the site. The purpose of health and safety monitoring plan is to assess existing controls alongside potential health and safety risks in order to develop an effective plan of action and to ensure compliance with Occupational Safety and Health Act, 2007.

#### 5.1.1.2 Monitoring strategy

The proponent should be committed to ensuring, as far as is reasonably practicable, the health and safety of the workers, visitors to the site and neighbors is not put at risk during the construction phase and from the operations of the terminal depot. This will be achieved by;

- Conducting occupational safety and health reviews and reports.
- Hazard identification by analyzing activities that can be an immediate threat or cause harm over a period of time.
- Ensuring that all accidents and incidents occurring at the site are promptly reported and investigated.
- Keeping statistics of accidents, incidents and dangerous occurrences and ensuring that reportable cases are filed with the health, safety and environment officer.
- Administration of safety awareness and motivation scheme.
- Routine inspections of the facility and equipment.
- Visual inspection as well as interviewing key personnel to identify areas of improvement.
- Undertaking and reviewing of fire, energy and risk assessment reports
- Review of safety awareness, fire drills and fire safety training requirements.
- Evaluation of the effectiveness of health and safety training to the workforce.
- Action plans related to significant findings of the risk assessment.
- Having emergency evacuation plans and emergency routes and safety signage among others.
- Assessment of risks involving hazardous substances i.e. receipt, storage & handling.

The responsibility for implementing this monitoring plan will be vested in the Department of Occupational Safety and Health Services and overall the management.

#### 5.1.1.3 Indicator of success

The ideal indicators of success will include zero accidents and fatalities and reduction in the number of incidents and accidents at the site.

### 5.1.2 Fire safety monitoring plan

#### 5.1.2.1 Introduction

Liquefied petroleum gas is highly flammable and thus high potential for fire outbreak and explosions. This may occur as a result of LPG leaks and vaporization during refilling of the cylinders, spillage on other flammable materials, operational negligence and electrical faults. Fire impacts include burns, physical injuries, psychological trauma, loss of properties and even death. The purpose of the monitoring plan is to comply with the Occupational Health and Safety Act, 2007 and to minimize frequency of occurrence of fire at the development.

#### 5.1.2.2 Monitoring strategy

Fire audits should be undertaken annually by a reputable firm and recommendations promptly implemented. The inspection, testing and certification of LPG tanks should be under the supervision of an approved inspecting authority who should furnish each LPG tanks with a certificate giving. All LPG tanks and vaporizers should be tested and inspected in accordance with the relevant regulations framed under the DOSHS. Additionally, servicing of firefighting equipment should be done regularly by fire service providers and undertake regular inspection and maintenance of electrical installations.

#### 5.1.2.3 Indicator of success

The ideal indicators of success will include zero fire incidents. The responsibility for implementing this monitoring plan will be vested in the DOSHS.

### 5.1.3 Air quality monitoring plan

#### 5.1.3.1 Introduction

There are potential sources of air pollution during the construction phase and potential leakage during filling and decanting of LPG from the tank and tanker respectively or from relief valves provided on the storage tanks in the event of rise in temperature or pressure among others. Air pollution above acceptable limits are toxic to ecological systems and to human health. The purpose of the air quality monitoring plan is to ensure the concentrations air emissions from the construction and subsequent operations of the facility are within the stipulated standards set under the First Schedule of the Environmental Management and coordination (Air Quality) Regulations, 2014. In addition, the results will be used to evaluate if the adopted air pollution controls and management are effective.

#### 5.1.3.2 Monitoring parameters

Construction sites are listed as sources of fugitive emissions under the Fifth Schedule of the Environmental Management and coordination (Air Quality) Regulations, 2014. Additionally, potential leaks of LPG are sources of fugitive emissions. Therefore, the proponent should monitor fugitive emissions as per the First Schedule of the Environmental Management and coordination (Air Quality) Regulations, 2014 (Table 11).

**Table 11: Ambient air quality tolerance limits for fugitive emissions as per the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014.**

| Pollutant | Time weighted average | Industrial area |
|---|---|---|
| Sulphur oxides ($SO_x$) | Annual Average* | 80 $\mu g/m^3$ |
| | 24 hours** | 125 $\mu g/m^3$ |
| Oxides of Nitrogen ($NO_x$) | Annual Average* | 80 $\mu g/m^3$ |
| | 24 hours | 150 $\mu g/m^3$ |
| Nitrogen Dioxide | Annual Average | 150 $\mu g/m^3$ |
| | 24 hours | 100 $\mu g/m^3$ |
| Suspended Particulate Matter (SPM) | Annual Average | 360 $\mu g/m^3$ |
| | 24 hours | 500 $\mu g/m^3$ |
| Respirable particulate matter (< 10$\mu$m) (RPM) | Annual Average* | 70 $\mu g/m^3$ |
| | 24 Hours** | 150 $\mu g/Nm^3$ |
| $PM_{2.5}$ | Annual Average | 35 $\mu g/m^3$ |
| | 24 Hours | 75 $\mu g/m^3$ |
| Lead (Pb) | Annual Average* | 1.0 $\mu g/Nm^3$ |
| | 24 hours** | 1.5 $\mu g/m^3$ |
| Carbon monoxide/ Carbon dioxide | 8 hours | 5.0 $mg/m^3$ |
| | One hour | 10 $mg/m^3$ |
| Hydrogen Sulphide | 24 hours** | 150 $\mu g/m^3$ |
| Non methane hydrocarbons | Instant Peak | 700ppb |
| Total VOC | 24 Hours** | 600 $\mu g/m^3$ |
| Ozone | One hour | 200 $\mu g/m^3$ |
| | 8 hour (Instant Peak) | 120 $\mu g/m^3$ |

#### 5.1.3.3 Monitoring location

Air quality monitoring should be carried out within the project site.

#### 5.1.3.4 Monitoring frequency

Air quality monitoring should be done on a quarterly basis during the construction and subsequent operational phases in collaboration with a NEMA designated laboratory.

### 5.1.4 Noise monitoring plan

#### 5.1.4.1 Introduction

Potential sources of noise pollution will emanate mainly during construction activities, machinery use and from vehicle movement in and out of the facility. Noise may lead to hearing impairments which will reduce the workmanship of the employees. The purpose of noise monitoring plan is to therefore ascertain the extent of the impact due to the construction and subsequent operation of the terminal depot in compliance with the Environmental Management and Coordination (Noise and Excessive Vibrations pollution) (control) Regulations, 2009 (Table 12 and 13).

#### 5.1.4.2 Monitoring location

Noise monitoring should be carried out within the project site.

#### 5.1.4.3 Monitoring frequency

Noise monitoring should be done on a quarterly basis in collaboration with a NEMA designated laboratory. Noise levels will be measured in dB (A).

**Table 12: Maximum permissible levels for construction sites as stipulated under the Second Schedule of Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.**

| Zone | | Maximum Noise Level Permitted (Leq) in db(A) | |
|---|---|---|---|
| | | Day | Night |
| (i) | Health facilities, educational institutions, homes for disabled etc. | 60 | 35 |
| (ii) | Residential | 60 | 35 |
| (iii) | Areas other than those prescribed in (i) and (ii) | 75 | 65 |

**Table 13: The Maximum permissible intrusive noise levels as stipulated under the First Schedule of Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.**

| Zone | | Sound Level Limits dB (A) Leq, 14 h | | Noise Rating Level (NR) Leq, 14 h | |
|---|---|---|---|---|---|
| | | Day | Night | Day | Night |
| A | Silent Zone | 40 | 35 | 30 | 25 |
| B | Place of worship | 40 | 35 | 30 | 25 |
| C | Residential: Indoor<br>Outdoor | 45<br>50 | 35<br>35 | 35<br>40 | 25<br>25 |
| D | Mixed Residential (with some commercial and places of entertainment) | 55 | 35 | 50 | 25 |
| E | Commercial | 60 | 35 | 55 | 25 |

Day: 6.01 a.m. – 8.00 p.m. (Leq, 14 h) Night: 8.01 p.m. – 6.00 a.m. (Leq, 10h)

### 5.1.5 Wastewater quality monitoring plan

#### 5.1.5.1 Introduction

Sources of effluent from the development will be from sanitary facilities. The proponent should put in place a consistent wastewater quality monitoring plan targeting the quality of effluent discharging from the proposed bio-digester. The objective of the monitoring plan is to provide data and information to improve water quality and management of the effluent in order to comply with the standards prescribed under the Third Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006.

#### 5.1.5.2 Monitoring parameters

Effluent from the bio-digester should be monitored pursuant to the Third Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006 (Table 14).

**Table 14: Water quality monitoring parameters and the standards prescribed under the Third Schedule of Environmental Management and Coordination (Water Quality) Regulations, 2006.**

| Parameter | EMC (Water Quality) Regulations, 2006 Standards |
|---|---|
| PH Value | 6.5-8.5 |
| BOD; mg/L | 30max |
| COD; mg/L | 50 max |
| Total Suspended Solids; mg/L | 30 max |
| Ammonia-NH+; mg/L | 100 Max |
| Total Dissolved Solids; mg/L | 1200 Max |
| *E. Coli* Colonies; count/100ml | Nil |
| Total coliform; count/100ml | 1000/100ml |

#### 5.1.5.3 Monitoring location
Effluent sampling should target the discharge point of the proposed biodigester.

#### 5.1.5.4 Monitoring frequency
The frequency of wastewater monitoring should be quarterly in collaboration with a NEMA designated laboratory.

#### 5.1.5.5 Indicator of success
Apart from implementing measures to meet the legal standards, obtaining an EDL from NEMA will also form part of the indicators of success of the water quality monitoring plan.

### 5.1.6 Domestic water quality monitoring plan
#### 5.1.6.1 Introduction
As stated earlier, the project site has existing supporting infrastructure including water supply from water bowsers used for domestic purposes. There are plans to connect the facility to the reticulated supply by MWSSCL supplemented by borehole water. The proponent should have in place a domestic water quality monitoring plan targeting the quality of water supplied by the water bowsers, reticulated supply and borehole.

#### 5.1.6.2 Monitoring parameters
The water quality monitoring parameters and the specified target values to be monitored for domestic use are stipulated under the First Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006 (Table 15).

**Table 15: Water quality monitoring parameters and standards for sources of domestic water as per the First Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006.**

| Parameter | Guide value (Max allowable) |
|---|---|
| pH Value | 6.5-8.5 |
| Suspended solids | 30 mg/L |
| Nitrate $NO_3$ | 10 mg/L |
| Ammonia $NH_3$ | 0.5 mg/L |
| Nitrite $NO_2$ | 3 mg/L |
| Total Dissolved Solids | 1200 mg/L |
| E. Coli colonies count/100ml | Nil |
| Fluoride | 1.5 mg/L |
| Phenols | Nil |
| Arsenic | 0.01 mg/L |
| Cadmium | 0.01 mg/L |
| Lead | 0.05 mg/L |
| Selenium | 0.01 mg/L |
| Copper | 0.05 mg/L |
| Zinc | 1.5 mg/L |
| Alkyl benzyl sulphonates | 0.5 mg/L |
| Permanganate value | 1.0 mg/L |

#### 5.1.6.3 Monitoring location
Domestic water sampling should target the existing water supply from water bowsers, proposed borehole and from the reticulated supply.

#### 5.1.6.4 Monitoring frequency

Domestic water sampling and analysis should be undertaken once per month in collaboration with a NEMA designated laboratory.

### 5.1.7 Solid waste monitoring plan

#### 5.1.7.1 Introduction

Site preparation and construction activities are expected to generate significant quantities of solid waste such as overburden, rock rubbles, cuttings and rejected materials among others. Additionally, workers and visitors to the site will generate domestic wastes such as food left overs, plastics and wrappings among others. Poor disposal of the waste will cause odour problems, environmental pollution and therefore a health risk to the workers, visitors to the facility and neighbors. The purpose of the monitoring plan is to therefore ensure solid waste is managed in such a way that it protects both the public health and the environment.

#### 5.1.7.2 Monitoring frequency

The frequency of solid waste monitoring will differ from the collection to the disposal stage in order to ensure reduced odours and accumulated heaps of waste. Table 16 describes the outline for which the activity will be monitored but can be adjusted depending on the amount generated.

Table 16: Sample outline for solid waste monitoring plan.

| Activity | Frequency | Critical levels (Tons) | Target | Responsibility |
|---|---|---|---|---|
| Collection | Daily | | | |
| Storage | Daily | | | |
| Management | Daily | | | |
| Disposal | Weekly | | | |

#### 5.1.7.3 Monitoring strategy

The solid waste monitoring plan will document the collection, storage and disposal of solid waste from the proposed development. There is need to code each of the collection points, note the capacity and critical levels, frequency of disposal and the personnel and contractor responsible. In addition, it will be important to characterize the waste streams at the collection points to inform investments in segregation infrastructure.

#### 5.1.7.4 Indicator of success

Indicators of success will include timely collection and disposal of waste by the contractors, waste disposal tracking documents and certificates issued at the disposal sites in case of hazardous waste.

### 5.1.8 Energy monitoring plan

#### 5.1.8.1 Introduction

The proposed development will exert an extra demand on energy mainly electricity for powering machine and equipment and for lighting purposes. The aim of the monitoring plan is to inform substantial practical guidelines for continuous improvement of consumption efficiency and identifying cost saving opportunities in energy efficiency.

#### 5.1.8.2 Monitoring frequency

The monitoring frequency should be conducted once every three years by an energy expert certified by Energy and Petroleum Regulatory Authority.

#### 5.1.8.3 Monitoring strategy

Energy consumption should be monitored through power bills from the Kenya Power and the fuel consumption by the standby generators and other machinery on a monthly basis.

# 6 GOVERNANCE FRAMEWORK

## 6.1 Introduction

The Third Schedule of EIA/EA Regulations requires that environmental guidelines and standards which include Kenya government policies and strategies, national legislation and the institutional arrangements to render them should be incorporated in an EIA report. The legal and institutional frameworks provide important precautions for protection and conservation of the environment and ensuring community health and safety through compliance with the standards. Under this section, the ESIA will therefore review the relevant sets of institutional, legislative and regulatory framework relevant to the proposed LPG terminal depot.

## 6.2 Policy Framework

### 6.2.1 National Environment Policy, 2013

Kenya has a National Environment Policy prepared and approved in 2013 by the Ministry of Environment, Water and Natural Resources. Its overall goal is to provide better quality of life in Kenya for present and future generations through sustainable management and use of the environment and natural resources. Kenya's environmental resources contribute directly and indirectly to the local and national economy through revenue generation and wealth creation. Energy is essential for socio-economic development. The main sources for the country's power production are hydropower, petroleum and geothermal and It is projected that the country's energy requirements will substantially increase. The relevant policy statements are (1) promote adaptation of the cleaner production concept in all energy production and consumption activities and (2) develop comprehensive nuclear, petroleum and coal energy policies guided by research and the precautionary principle.

### 6.2.2 National Energy and Petroleum Policy, 2015

The overall objective of the energy and petroleum policy is to ensure affordable, competitive, sustainable and reliable supply of energy to meet national and county development needs at least cost, while protecting and conserving the environment. Adoption of the Kenya Vision 2030 and the promulgation of the Constitution of Kenya 2010, made it necessary to review both the policy and all the statutes so as to align them with the Vision and the Constitution.

### 6.2.3 Kenya Vision 2030

It is the national long-term development blueprint to create a globally competitive and prosperous nation with a high quality of life by 2030 in a clean and secure environment. It aims to transform Kenya into a newly industrializing middle income country. Energy is a critical component in the economy, standard of living and national security of a country. The level and the intensity of energy use in a country is a key indicator of economic growth and development. The Kenya Vision 2030 identified energy as one of the infrastructure enablers of its socio-economic pillar. Sustainable, competitive, affordable and reliable energy for all citizens is a key factor in realization of the Vision.

### 6.2.4 Sustainable Development Goals (SDGs)

The Sustainable Development Goals were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. The proposed project will contribute towards attainment of SDG 7- Affordable and clean energy that aims at ensuring access to affordable, reliable, sustainable and modern energy for all.

## 6.3 Other relevant policies

Other than the National Environment Policy and the National Energy and Petroleum Policy, there are other policies which are relevant to the proposed project as shown in Table 17.

Table 17. Summary of the National Policy Frameworks and their relevance to the LPG terminal depot.

| Policy Framework | Relevance to Shimoni Port |
|---|---|
| National Climate Change Framework Policy | To enhance adaptive capacity and resilience to climate change, and promote low carbon development for the sustainable development of Kenya |
| National Health Policy, 2014-2030 | It ensures that the country attains the highest possible standards of health, in a manner responsive to the needs of the population |
| The National Water Policy, 1999 | Enhances water resources management and pollution control through abstraction permits and standards for effluent discharge |
| National Land Policy, 2009 | Sets guidelines for sustainable land use and management practices |

## 6.4 Legislative Framework

### 6.4.1 The Constitution of Kenya, 2010

The Constitution of Kenya 2010 is the supreme law of the land. Under Chapter IV, article 42 provides for the right to a clean and healthy environment for all. Further, Chapter V of the Constitution deals with Land and Environment. Specifically, Part 2 elaborates on the obligations of the proponent in respect to protection of the environment and enforcement of environmental rights.

Specifically in relation to the energy sector, Part 1 of the Fourth Schedule provides that the National Government shall be responsible for Protection of the environment and natural resources with a view to establishing a durable and sustainable system of development, including Energy policy including electricity and gas reticulation and energy regulation. In relation to the County Governments, Part 2 of the Fourth Schedule provides that they shall be responsible for county planning and development including electricity and gas reticulation and energy regulation.

#### Relevance to the proposed project

- The proponent is entitled to a fair administrative decision-making process from NEMA and other State organs.
- The proponent must ensure that the development is carried out in an ecologically, economically and socially sustainable manner.
- The proponent should ensure that construction and operations of the facility do not infringe on the right to a clean and healthy environment for all.

### 6.4.2 The Environmental Management and Co-ordination Act (EMCA) Cap. 387 of the Laws of Kenya

The Act is the framework environmental law and aims to improve the legal and administrative co-ordination of the diverse sectoral initiatives in the field of environment so as to enhance the national capacity for its effective management. The Act harmonizes the sector specific legislations touching on the environment in a manner designed to ensure greater protection of the environment in line with the National Environment Policy, 2013.

#### Relevance to the proposed project

Section 58 of the Act requires proponents of a development likely to have deleterious effects on the environment to prepare and submit an EIA report to NEMA for consideration for decision making. This ESIA report is prepared to comply with the provisions of this section.

#### Regulations under the EMCA Cap. 387 of the Laws of Kenya

To operationalize EMCA, several Regulations have been gazetted since its enactment in 1999 and its amendment in 2015. These relevant ones are;

1. **Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003**
   These Regulations guide the preparation of EIA including how experts should conduct the EIA process and guidelines and standards to be met by the reports. The Regulations were reviewed in 2016 to align them to the Kenya Constitution 2010. They were also recently amended (2019) to address challenges that have been reported since they were gazetted. This report complies with the provisions of these Regulations.

2. **Environmental Management and Coordination (Water Quality) Regulations, 2006**
   These Regulations address the challenges of pollution of water resources and conservation. It consists of VI parts and eleven schedules dealing with protection of sources of water for domestic use to miscellaneous provisions. For the proposed development, the proponent and contractor should implement measures to prevent water pollution from construction activities and effluent discharge at operational phase. Once the facility is operational, the proponent should apply for and obtain an Effluent Discharge Licence from NEMA.

3. **Environmental Management and Coordination (Waste Management) Regulations, 2006**
   The Regulations focus on the management of solid waste, industrial waste, hazardous waste, pesticides, toxic substances and radioactive substances. In compliance with these Regulations, the proponent should ensure proper solid waste disposal throughout the project cycle and procure the services of a NEMA licensed contractor for solid waste management.

4. **Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009**
   These Regulations were gazetted to manage noise levels to levels that do not cause a disturbance to the public. The operations at the facility especially during construction and from machinery use and vehicles accessing the site during operations are likely to generate noise above the acceptable limits. Appropriate PPE should be provided to employees.

5. **Environmental Management and Coordination (Air Quality) Regulations, 2014**
   These regulations were aimed at controlling, preventing and abating air pollution to ensure clean and healthy ambient air. The activities of the proposed project will have a potential to pollute the air from construction works and potential gas leaks. The proponent should implement recommended measures to minimize air pollution and undertake quarterly air quality monitoring.

### 6.4.1 The Energy Act, 2019

It's an Act of Parliament to consolidate the laws relating to the production, supply and use of energy and for connected purposes.

**Relevance to the proposed project**

The proponent should ensure that all operations of the LPG terminal depot are duly licensed by the Energy and Petroleum Regulatory Authority (EPRA) in compliance with the Energy Act, 2006. The proponent should also ensure energy audits are carried out at least once every three years.

### 6.4.2 The Energy (Liquefied Petroleum Gas) Regulations, 2009

These Regulations, made under the Energy Act, provide rules for the trade in and storage and handling of liquefied petroleum gas.

**Relevance to the proposed project**

The proponent should comply with the provisions of the Regulations.

### 6.4.3 The Occupational Safety and Health Act, 2007

The OSHA, 2007 commenced on 26th October 2007. It is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces. Although the OSHA, 2007 repealed the Factories and Other Places of Work Act Cap. 514 of the Laws of Kenya, it inherited all the subsidiary legislation issued under Cap. 514. Examples of subsidiary legislation inherited include:

- Docks Rules L.N. 306 of 1962
- Eyes Protection Rules L.N. 44 of 1978
- Building Operations and Works of Engineering Construction Rules L.N. 40 of 1984
- Electric Power Special Rules L.N. 340 of 1979
- First Aid Rules L.N. 87 0f 1964
- Cellulose Solutions Rule L.N. 87 of 1964
- Health and Safety Committee Rules L.N. 31 of 2004
- Medical Examination Rules L.N. 24 of 2005
- Noise Prevention and Control Rules L.N. 25 0f 2005
- Fire Risk Reduction Rules L.N. 59 0f 2007
- Hazardous Substances Rules L.N. 60 of 2007

#### Relevance to the proposed project

Under OSHA, the proponent should register the site as a workplace with DOSHS, provide the workers with adequate and appropriate PPE and enforce their use at work and carry out occupational safety and health audit annually and implement the recommended measures.

### 6.4.1 Public Health Act, 2012

The Act aims at prohibiting activities that may be injurious to the general public. It outlines the responsibilities for the County Government to maintain a safe and clean environment by controlling the development activities during the construction and subsequent operational phases.

#### Relevance to the proposed project

The proponent should ensure the safety of the public and its employees during construction and subsequent operation of the proposed project.

### 6.4.2 The Water Act, 2016

The Water Act provides the legal framework for sustainable utilization and management of water resources through an elaborate governance framework. It has four key institutions charged with separate functions and decentralized decision making systems. These institutions are summarized in the table 16 below.

**Table 18: Water Resources Management Institutions and their roles as established under the Water Act, 2016.**

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

#### Relevance to the proposed project

The Water Act provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water, to provide for the regulation and

management of water supply and sewerage services. The proponent will obtain water from the reticulated supply by Mombasa Water Supply and Sanitation Company Limited supplemented by with borehole water. Hence, he should obtain drilling and abstraction permit for the borehole from WRA.

### 6.4.3 The Physical Planning Act, 2019

The Act provides for the planning, use, regulation and development of land and for connected purposes. It was enacted to ensure that every person engaged in physical and land use planning shall promote sustainable use of land and livable communities which integrates human needs in any locality. The Act allows the County Government to prepare a local physical and land use development plan in respect of a city, municipality, town or unclassified urban area.

#### Relevance to the proposed project

The proponent will obtain pertinent approvals and requisite operational licenses from the County Government of Mombasa.

### 6.4.4 The Occupiers Liability Act Cap. 34

The Act regulates the duty that an occupier of premises owes to his visitors in respect of dangers due to the state of the premises or to things done or omitted to be done on them.

#### Relevance to the proposed project

The act requires that the occupier warn the visitors of the likelihood of dangers within his premises to enable the visitor to be reasonably safe.

### 6.4.5 The County Government Act, 2012

The new constitution grants County Governments the powers to grant or to renew business licenses or to refuse the same. To ensure implementation of the provisions of the new constitution, the County Governments are empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and well-being of the general public.

#### Relevance to the proposed project

The Act gives right to access private property at all times by the County Government officers and servants for inspection purposes.

## 6.5 Institutional arrangements

To implement the above legal framework the government has established a number of institutions with varying mandates of implementation. These include;

1. The National Environment Management Authority to implement the Environmental Management and Coordination Act and associated Regulations.
2. The Energy and Petroleum Regulatory Authority to implement the Energy Act and subsidiary legislation.
3. The Directorate of Occupational Safety and Health Services to implement the Occupational Safety and Health Act alongside the subsidiary legislation.
4. The Water Resources Authority to implement the Water Act.
5. The County Government of Mombasa to implement the County Government Act, its by-laws and the Public Health Act.

# 7 CONCLUSIONS AND RECOMMENDATIONS

## 7.1 Conclusions

The proposed project is considered important as it will contribute towards attainment of the social economic pillar of Kenya's Vision 2030, United Nations Sustainable Development Goal 7 on affordable and clean energy and United Nations' Sustainable Energy for All Initiative. The project will lead to a significant increase of LPG bulk supply hence will serve an already growing LPG market in Kenya and other regions where the demand is high. Additionally, it will help in eradication of the current bottlenecks in the current supply chain which has resulted in the situation of inevitable rise of the LPG distribution cost. It will also contribute towards the socioeconomic growth of the area through employment creation and revenue generation to the government in terms of taxes generated during the acquisition of statutory licenses.

The key concern of the proposed project include fire risks and emergency preparedness due to the highly flammable nature of LPG. The proponent is committed to ensuring the safety and health of workers, visitors to the site and neighbors by ensuring appropriately designed and operated LPG tanks and other installations as guided by various existing sources of standards and codes such as Kenya Standards 1938-3: 2012 (handling, storage, and distribution of LPG) and NFPA 58 (LPG Code) and EEMUA publication 190 standards (Guide for the Design, Construction and Use of Mounded Horizontal Cylindrical Vessels for Pressurized Storage of LPG at Ambient Temperature)and API Standards among others.

Other anticipated negative environmental and social impacts during the entire project cycle include Occupational safety and health risks, increased water and energy demand, pollution of environmental media, storm water management and traffic. The ESIA study proposes a suite of comprehensive Environmental Management and Monitoring Plans to address the anticipated negative environmental and social impacts during the entire project cycle and improve the environmental performance of the proposed project.

## 7.2 Recommendations

The main recommendation of the ESIA is the need for concerted implementation of the Environmental Management and Monitoring Plans by the proponent. The specific key ones include;

1. Installation and operation of LPG terminal depot be undertaken in compliance with both International and Kenyan Standards and in line with the recommendations of the Energy and Petroleum Regulatory Commission to reduce the potential fire risks and other occupational health and safety issues
2. Conduct annual environmental audits in line with the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003
3. Conduct Occupational Safety and Health Audits, Fire safety audits and Energy audits, and recommendations promptly implemented
4. Comply with the provisions of the Energy Act, 2019
5. Comply with the provisions of the Environmental Management and Coordination Act Cap 387 of the Laws of Kenya
6. Comply with the provisions of the Occupational Safety and Health Act, 2007

On the basis of a commitment by the proponent to implement the proposed mitigation measures and the Environmental Management Plan, we recommend the issuance of an EIA License as per the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya and Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003.

# 8 REFERENCES

1. Kenya Standards for the handling, storage and distribution of Liquefied Petroleum Gas in domestic, commercial and industrial installations (KS 1938-3:2012).
2. Nzuki, S and Gitau, J. (2018). Environmental and Social Impact Assessment Study Report for the proposed LPG facility and construction of a Jetty terminal at Vipingo, Takaungu. A report submitted to the National Environment Management Authority (NEMA).
3. Documents provided by the proponent
   - Copy of the Title deeds for the project site
   - Copy of the site survey plan for the proposed project
   - Copy of the LPG tanks elevation sections for the proposed project
   - Other Relevant documents appended in the report
4. Government of Kenya Policies
   - National Environmental Policy, 2013
   - National Energy and Petroleum Policy, 2015
   - Kenya's Vision 2030
   - United Nation Sustainable Development Goals
   - United Nations' Sustainable Energy for All Initiative
5. Government of Kenya Statutes
   - The Kenya Constitution, 2010
   - Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya
   - Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003
   - Environmental Management and Coordination (Waste Management) Regulations, 2006
   - Environmental Management and Coordination (Water Quality) Regulations, 2016
   - Environmental Management and Coordination (Air Quality) Regulations, 2014
   - Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulation, 2009
   - The Energy Act, 2019
   - The Energy (Liquefied Petroleum Gas) Regulations, 2009
   - Occupational Safety and Health Act, 2007
   - The Public Health Act, 2012
   - The Water Act, 2016
   - Physical Planning Act, 2012
   - The Occupiers liability Act Cap. 34
   - The County Government Act, 2012

# 9 LIST OF ANNEXTURES

1. Copy of Certificate of Incorporation for Mahadi Energy Limited
2. Copy of PIN Certificate for Mahadi Energy Limited
3. Copy of the Title deeds for the project site
4. Copy of the site survey plan for the proposed project
5. Copy of the LPG tanks elevation sections for the proposed project
6. Copy of approval of the scoping report and Terms of Reference for the ESIA study
7. Copy of the baseline monitoring reports for air quality, noise level measurements, soil tests and water quality
8. Letters of invitation and evidence of receipt by the stakeholders for the first consultative meeting
9. Copy of the first stakeholders' consultative meeting programme
10. Proceedings of the first stakeholders' consultative meeting held at the project site on 9th December 2020
11. Proceedings of the stakeholders' consultative meeting held with the staff of Kenya Power Company on 10th December 2020
12. Letters of invitation and evidence of receipt by the stakeholders for the second consultative meeting to review and validate the ESIA study report
13. Copy of the second stakeholders' consultative meeting programme
14. Proceedings of the second stakeholders' consultative meeting held at Bomu social hall on 19th December 2020
15. Copies of neighborhood consultation questionnaires
16. Copy of NEMA practicing license for the firm, Envasses Environmental Consultants Limited
17. Copies of NEMA practicing licenses for Lead Experts, Mr. Simon Nzuki & Ms. Jane Gitau