

ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT STUDY REPORT



OCTOBER 2020

This report has been prepared in accordance with the requirements of the Environmental (Impact Assessment and Audit) Regulations, amended in 2019 under the Kenya Gazette Supplement No. 62, Legislative supplement No.16, Legal notice No. 31 of 2019, pursuant to The Environmental Management and Coordination Act, (EMCA) cap 387.

PROJECT
PROPOSED
COMMERCIAL
INCINERATION PLANT

LOCATION
KINANIE AREA, KINANIE
WARD, MAVOKO SUB-
COUNTY, MACHAKOS
COUNTY

**GEOGRAPHICAL
COORDINATES**
LATITUDE:1°21'14.238 "S
LONGITUDE 37°3'38.316
"E

**LAND REGISTRATION
NUMBER**
LR.NO.23961



ASSIGNMENT

Environmental Social Impact Assessment study report for the proposed establishment of a Commercial Incineration Plant within Kinanie Area, Kinanie Ward, Mavoko Sub-County, Machakos County.

This ESIA study was prepared by the following experts;

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PROJECT PROPONENT

Boredo Supplies Limited

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NAIROBI

DOCUMENT CERTIFICATION

ENVIRONMENTAL EXPERTS

We hereby submit the following Environmental Social Impact Assessment study Report for the proposed establishment of a Commercial Incineration Plant within Kinanie Area, Kinanie Ward, Mavoko Sub-County, Machakos County. To the best of our knowledge, all information contained in this report is an accurate and truthful presentation of all findings as relating to the proposed project.

Vincent Muli Mwanza (Reg.No. 1850)

Signature: _____ **Date:** October 30th, 2020

Mr. Eric M.Miriti (Reg No: 7068)

Signature: _____ **Date:** October 30th, 2020

Mr. Onyango Dan Amollo (Reg No: 6078)

Signature: _____ **Date:** October 30th, 2020

THE PROPONENT

We confirm that this ESIA study report has been prepared and forwarded to NEMA with our authority as the project proponent. We also confirm our commitment to implementing the Environmental Management Plan as proposed in this project report, as well as any other conditions that the NEMA may prescribe.

Name: _____ Position: _____

Signature: _____ Date: _____

DECLARATION

This study report was prepared for submission to the National Environment Management Authority (NEMA) in accordance with Part VII, Section 58 of Environmental Management and Coordination (Amendment) Act cap 387,(EMCA 1999, Amendment 2015), the Environmental (Impact Assessment and Audit) Regulations of 2003 (Amendment 2019), and other gazette legislations related to Environmental Management in Kenya.

The Environmental Consultants exercised due diligence during data collection and assessment of relevant data, in order to address potential significant environmental issues.

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LIST OF ACRONYMS AND ABBREVIATIONS

ASL	Above Sea Level
CBD	Convention on Biological Diversity
CDE	County Director of Environment
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Carbon Monoxide
COP	Conference of Parties
CSDS	Chemical Safety Data Sheets
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
EOSH	Environmental and Occupational Safety and Health
ESA	Environmental and Social Audit
EPZA	Export Processing Zone Authority
ESIA	Environmental and Social Impact Assessments
ESMP	Environmental and Social Management Plan
GoK	Government of Kenya
HAIs	Health Care-Associated Infections
HBV	Hepatitis B Virus
HCW	Health Care Waste
HCWM	Health Care Waste Management
HFC	Hydrofluoro carbons
IESA	Initial Environmental and Social Audits
ILO	International Labour Organization
IPC	Infection Prevention and Control
MOH	Ministry of Health
MSDS	Material Safety Data Sheets

NCA	National Construction Authority
NEAP	National Environmental Action Plan
NEMA	National Environment Management Authority
NPEP	National Poverty Eradication Plan
OP	Operating Policy
OSH	Occupation Safety and Health
OSHA	Occupational Safety and Health Act
PFC	dioxins (polychlorinated dibenzo-para-dioxins
PC	Perfluorinated Compounds
PHO	Public Health Officer
POP	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PVL	Polyvinyl Chloride
SOP	Standard Operations Procedures
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WRA	Water Resources Authority

EXECUTIVE SUMMARY

Boredo Supplies Limited (herein after referred to as the proponent) is an environmentally conscious organization involved in commercial waste management; innovatively offering integrated solutions for the collection, recovery and disposal of different waste streams, ranging from industrial wastes, biomedical wastes, hazardous wastes and domestic wastes. The proponent proposes to install a modern waste incinerator on plot LR.NO.23961, which is leased from the Export processing Zone Authority (EPZA) and is currently involved in waste collection, sorting and dispatching of all the combustible hazardous waste for incinerating in other licensed commercial incinerators and approved dumpsites for all biodegradable wastes. The proposed installation of a modern incinerator is envisioned to enhance the handling capacity of hazardous waste which will not only impact the economic growth of industries located within the Export Processing Zone positively, but also offer an increased capacity for proper treatment and disposal of the hazardous waste streams.

According to the World Bank's Operating Policies (OP), the Environmental Management and Coordination Act, Cap 387, The Environmental Impact Assessment (EIA) and Environmental Audit Regulations as revised in 2016 as well as the Legal Notice Number 31 of 2019, such as project should be subjected to an EIA Study. EIA is a planning tool generally accepted as an integral component of sound decision-making. EIA is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allow the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts. This particular EIA sought to review the potential overall environmental and social impacts of the proposed incinerator in terms of regulatory compliance, incineration process, waste material management, emission compliance, safety and health management system, environmental management system and information disclosure. This is because an EIA is a tool for environmental conservation and has been identified as

a key requirement for proposed projects such as the said incineration plant, to ensure sustainable operations with respect to environmental resources and socio-economic activities in the neighborhoods of such projects.

The ESIA study involved meetings with representatives of Boredo Supplies Limited management, site visit/data collection, public consultation/questioning and Baraza (for public participation), documentation and review, consolidation of findings, exit meeting and preparation of the EIA Study Report that includes an Environmental and Social Management Plan (ESMP).

The EIA established that the proposed incineration plant has not yet been installed. But if installed and put into optimal use as per the manufacturers user guide and as per the expectations, its benefits will be immeasurable in terms of efficiency in disposing hazardous waste as well as Health Care Waste (HCW). But not to be forgotten is that some challenges that may be encountered and are central to the incinerator could be lack of adequate fuel to support its operations. Other challenges could be related to Occupation Health and Safety (OSH) of the operators due to lack of adequate and appropriate Personal Protective Equipment (PPE). Other potential social and environmental impacts related to the implementation and operationalization of the proposed incinerator could include overall Environmental Management of the facility, proper waste segregation, proper functionality of the incinerator, fencing off the waste management site/the incinerator site, Noise Monitoring and Control, Air Quality Monitoring and Control, need for an Environmental Management System Set Up, Staff Awareness and Training; Community Health and Safety Issues, Adequacy of the Design of the Shelter, Emergency Response Procedures, Sanitation and Cleanliness of the Facility, Fire Outbreak Preparedness, Adequacy of the Design of the Shelter and Compliance to Environmental Standards.

The proposed plant will be handling hazardous wastes through incineration among other modes. It is therefore, expected that there will be potential emission of various gases and particulate matter into the atmosphere, depositions of particulate matter onto land and vegetation to the west of the plant and discharge of effluent and contaminated runoff into

open drains around the premises. This scenario implies potential linkages with the surrounding environment and ecological setting that require to be addressed during the construction and upon commissioning. The following sections outline these linkages as well as proposed corrective measures.

ANTICIPATED IMPACTS

Positive Impacts

The plant has an overall positive implication to the country, and especially urban, biomedical and industrial sectors. One of the major threats to the environment and human health today is risks associated with waste management. Not all waste sources are capable of handling hazardous and toxic materials within the premises without compromising the health of their own workers or the neighboring communities. As such, the end result of waste generators disposing wastes without appropriate equipment has been pollution of environmental resources and particularly water sources, air pollution, land contamination and even direct effects to human health. In this regard, therefore, the following are considered main benefits of the proposed plant;

- ✦ The facility is a blue print of vision 2030 aimed at having a clean and healthy environment for all. It also encourages private investments in environmental conservation within the country.
- ✦ Cleaning up of hazardous and toxic materials from the industrial and agro-chemical sectors and particularly manufacturers and dealers as well as major users such as to include expired chemicals and chemical products (including food grade substances that become toxic once they expire), hazardous substances packaging materials and obsolete equipments among others.
- ✦ Provision for disposal of expired drugs and medicines from hospitals and health centers across the country, most of whom do not have a professional mode of the waste disposal,
- ✦ The facility will provide a safe point for reducing the volumes of hazardous waste and toxic wastes before disposal into appropriate county's landfills, most of which

currently is dumped into public garbage disposal sites with adverse implications to the ecology and human health.

- ✦ The facility will provide a multiple of direct and indirect employment opportunities within the county

Potential Negative Impacts

The project is anticipated to create negative impacts as well. This will emanate from the construction and subsequent operation activities of the facility. They may include the following:

- Air pollution: Emissions released to the atmosphere both during the installation and operation,
- Impact to soil (soil erosion and degradation) especially when laying the foundation and other earthworks.
- Potential contamination of soil and water; due to oil spills and other leakages/releases.
- The health and safety of workers and immediate residents and neighbours may be compromised due to accidents, pollution and disturbance.
- Impact (constraints/pressure) to the existing infrastructure i.e. water, power, surface drains, roads among others.
- Vegetation clearing
- Increased storm water/run off resulting from the roof catchments and as a result of decreased recharge areas, after pavement of most areas
- Visual Intrusion; likely to occur during earthworks for the foundation of the project.
- Increased waste generation (both solid and liquid) during construction and operation phases.

Proposed mitigation measures

To minimize the occurrence and magnitude of the negative impacts, mitigation measures have been proposed against each of the anticipated impact. Some measures have been

integrated in the project designs with a view to ensuring compliance with applicable environmental laws and guidelines. The measures include the following:

- Erection of warning / informative signs (bill boards) at the site during the installation/construction phase.
- Suppressors or silencers on equipment or noise shields for instance corrugated iron sheet structures. Management strategies to reduce impacts including truck speed. Sensitize workers on the need to switch off engines whenever possible; ensure that the machineries are well maintained; ensure that the work is carried out during the recommended time.
- Workers should be provided with appropriate personal protective equipment (PPE) to beef up their health and safety and they should be sensitized on EHS safety measures.
- The site should be fenced off during installations to keep off animals and the general public.
- Provision of sound waste management systems and procedures. This will involve provision of solid waste collection bins; segregation of waste at source, appointing a reputable garbage collector etc. during operation phase. During the installation phase, the contractor should put in place effective and efficient waste disposal systems. Waste, including excavated soil and debris should be properly disposed of by backfilling or dumping in approved grounds by the County Council.
- An emergency power control switch will be strategically installed in order to facilitate general power cut of the entire workplace in case of emergency.
- An adequately stocked "First Aid Box" will be provided and the employees at the incinerator will be properly trained on how to administer first aid.
- Following the completion of the construction phase, measures will be undertaken to restore the affected biodiversity through landscaping; i.e. planting of trees and grasses to cover unpaved areas.
- The surface drainage system shall be appropriately designed to direct all potentially contaminated surface waters from the incinerator area into waste

interceptor. The drainage and interceptor maintenance will be carried out regularly, including cleaning the interceptors of foliage, rubbish and grit.

- Capacity building of the workers and staff; to create awareness towards potential risks and recommended preventive measures through training. This will ensure that health and safety measures are followed. Conduction of regular drills on fire prevention and control will be encouraged to ensure proper preparedness for fire control.
- Formal procedures will be put in place for energy and water saving to optimize their use. The staff will be encouraged to turn off unnecessary lights and not to leave water taps running.
- A comprehensive firefighting system with separate water storage and assorted equipment shall be provided after completion of the project. This will be installed or provided at strategic points. The fire extinguishers should be serviced accordingly i.e. after every six months to ensure effective and efficient performance when required.
- The contractor and the proponent will implement the proposed mitigation and monitoring plan in order to protect the environment from any negative impacts.
- During the operation phase, the proponent shall conduct annual environment audit, health/Safety and Fire audits; noise level and air quality monitoring. Further, the proponent shall carry out effluent discharge licensing and stack emissions measurements and licensing from NEMA
- Realization of cordial relations among various community, economic, social and cultural groups as well as between the local community and the contractor and proponent shall form a key component of the project from its implementation through to operation and decommissioning.
- Soil compaction and watering of loose soils on all unpaved access areas, construction materials at the construction sites to minimize air pollution and erosion by the agents of soil erosion i.e. water and wind.

Conclusion

The proponent should take note that apart from the positive impacts created, the project has negative impacts which should be closely monitored and evaluated. This will ensure that the environment is always safeguarded. It is important that the proponent conducts regular site assessments to provide early indication of leaks or releases of waste into the ground and air pollutants to the atmosphere. Considering the proposed project, mitigation measures that will be put in place and the project's contribution to the environment and the economy, its implementation is considered important and beneficial. The key effort should be geared towards safeguarding the environment. This can be effectively overcome through close following and implementation of the recommended Environmental Management Plan (EMP), consequently attaining sustainable development.

It is concluded that the project is important for economic development of the county and has a balanced environmental considerations and benefits. This report gives adequate measures to mitigate the negative impacts and a management plan. The proponent is committed the proposed measures during the construction, operation and decommissioning phase of the project. Accordingly, as per part 11 section 10 (2) of the Legal Notice No. 101 on The Environmental (Impact Assessment and Audit) Regulations, 2003, we recommend that the project is granted an EIA license.

CHAPTER ONE

1.0 BACKGROUND INFORMATION

1.1 Introduction

Boredo Supplies Limited is a company involved in collection of waste from households, businesses and factories. They take the waste to their decentralized sorting sites where it is sorted into more than 40 fractions. They then compost the organic waste into high quality compost; the other materials (paper, plastic, glass and metal) which they either recycle themselves or do so through their partners. This allows them to achieve one of the highest recycling rates in the country. The company is proposing to install a modern incinerator on its leased land where they are currently licensing it from the Export processing Zone Authority (EPZA) to carry out waste sorting with the intention of incinerating all the combustible hazardous waste thus facilitating waste management.

The neighbors adjacent to the proposed site are a few residential dwellings some belonging to EPZA staff, EPZ Waste treatment works, Synergy waste processing facility and leather city. The land, on which this proposed project is to be put up, is described as for such land use. It is expected that this project will improve waste management. In addition, it will create employment opportunities for area residents and other surrounding environs during the construction and operation phase of the project.

1.2 Justification for the need of the Incinerator

Kenya, like many other low- and middle-income countries, is keen to ensure that it accelerates the pace of its industrial development, much of which is occurring in its major urban centers. Increasing urbanization, rural–urban migration, rising standards of living, and rapid development associated with population growth have resulted in increased solid waste generation by industrial, domestic and other activities. It has been noted in other contexts too that increasing population, changing consumption patterns, economic development, changing income, urbanization and industrialization all contribute to the increased generation of waste. Just as the generation of waste involves a complex interplay

of social, cultural, economic and technological processes, the proper management of waste cannot be divorced from the same processes. While it is necessary, for conceptual purposes, to view waste management as a clear and distinct category of activity in society, in practice any successful waste management strategy has to address such diverse issues as patterns of consumption, incentive systems (the economics of waste management), waste handling technology, and legal frameworks. In its broadest sense, the issue of waste management is an aspect of the search for sustainable development strategies.

The environmental risks associated with poor waste management are well known and understood. Carelessly disposed of wastes, such as solvents, can leach into the groundwater and contaminate drinking water supplies. Poorly planned and managed landfills will create a significant neighborhood nuisance, and where landfill gas and leachate are not properly treated there will be a serious threat to the safety of local residents. Old, closed dumps and landfills are likely to be contaminated land which may be difficult or dangerous to remediate and redevelop. Incinerators operated without adequate pollution abatement equipment will release highly toxic dioxins. Even recycling and composting facilities can be a source of litter and unpleasant odor if not properly regulated. Waste producers carry their share of responsibility to ensure that such polluting incidents do not occur.

Under no circumstances should hazardous wastes be discharged into the environment in an effort to save money, as a matter of convenience, or due to carelessness in planning, preparation, operations or design. Thus the proposed incinerator will increase the handling capacity of hazardous waste which will both assist the economic growth of industries and provide a proper treatment and disposal route that is affordable.

1.3 Justification for Preparation of Safeguards Instruments/EIA

According to the World Bank, the proposed project can be assigned environmental category B and the safeguards policy triggered for the project is Environmental Assessment (OP/BP 4.01) and Indigenous People (OP/BP 4.10). This means that before implementation, the project proponent, Boredo Supplies Limited, should subject the proposed incinerator project to an ESIA. The same is required by the EMCA 2015, the EIA

and Audit Regulations as Amended in 2016 as well as the provisions of the Legal Notice Number 31 of 2019. The ESIA/IEA is meant to ensure that there is due diligence in the application of environmental and social safeguards during installation and to plan for mitigating and/or addressing any potential adverse risks in operation of the incinerator. The ESIA is required for systematic documentation, objective determination and evaluation of the environmental and social liabilities of the incinerator installation, commissioning and operations to ascertain if they are in full compliance with the World Bank Safeguard policies/ the EMCA 2015, the EIA and Audit Regulations as Amended in 2016 as well as the provisions of the Legal Notice Number 31 of 2019 including the recommended Waste Management Plan (WMP). The ESIA indicates compliance with environmental, health and safety guidelines with the objective of protecting the health of workers and the general public living in the area as well as to protect the biophysical environment. It has also generated an ESMP that describes in detail the mitigation measures to be carried out, the costing, scheduling and responsibility of such measures.

1.3.1 Definition and Purpose of the ESIA/EIA

ESIA/EIA is a systematic analysis of projects, policies, plans or programmes to determine their actual and potential environmental impacts, the significance of such impacts and to propose measures to mitigate the negative ones, (*NEMA, 2002*). ESIA is mainly used at the level of specific developments and projects such as the mentioned proposed incinerator (*IIED, 1998*). They are site specific, i.e. for specific and definable projects, in specific areas; hence each project must have its own ESIA report. The underlying key principles of ESIA are that every person is entitled to a clean and healthy environment and that every person has a duty to enhance and safeguard the environment.

ESIA is both a planning and decision-making tool. As a planning tool, ESIA presents methodologies and techniques for identifying, predicting and evaluating actual and potential environmental impacts of projects, policies, plans and programmes in the project cycle (planning, implementation, operation and decommissioning phases). As a decision-making tool, the ESIA process presents decision-makers with the information necessary to determine whether or not a project should be fully implemented (if still under

implementation or not yet implemented), its operations continued or not (if up and running), and if it should, then under what conditions (NEMA, 2002). Thus, this ESIA is intended to identify the impacts-actual and potential (both beneficial and adverse-environmental (biophysical) social and economic) of the proposed incinerator project implementation and operation activities.

1.4 Objective of the EIA Study

The principal objective of this assessment was to carry out a systematic examination of the present environmental situation within the project area in an attempt to determine whether the proposed project will have adverse environmental and social impacts to the surrounding area.

Specifically, the study set out to achieve the following objectives:

- a) To determine the compatibility of the proposed Incineration plant project with the neighboring land uses and evaluate local environmental conditions
- b) To assess and analyze the environmental costs and benefits associated with the proposed project;
- c) To evaluate and select the best project alternative from the various options available; and,
- d) To identify and evaluate the significant environmental and social impacts of the proposed project with special emphasis on:
 - i. Solid waste management
 - ii. Wastewater management
 - iii. Water supply for the proposed project and its implication to the neighbours
 - iv. Impacts on sensitive biotic environment in the vicinity of the project area
- e) To incorporate environmental management plans and monitoring mechanisms during implementation and operation phases of the projects.

1.5 Terms of Reference (ToR)

This ESIA study report includes several provisions that are outlined in the following ToR:

- a) Description of the baseline environmental conditions;
- b) Description of the proposed project i.e. project objectives, project design, activities, technology, procedures and processes, materials to be used, and waste expected to be generated during the project construction, operation and de-commissioning phases;
- c) Review of relevant legislative and regulatory framework that influence various aspects of the project;
- d) Identification of potential environmental and social impacts of the project;
- e) Consultation and public participation;
- f) Suggestion of sensible mitigation measures against identified environmental and social impacts of the project;
- g) Development of an ESMP to mitigate potential negative impacts; and,
- h) Preparation and submission of the final ESIA study report to NEMA.

1.6 The ESIA Scope

The scope of the ESIA covered all the civil works and installation related activities of the incinerator, as well as the operationalization of the whole project. The scope of activities included the following:

- I. Determining how far the activities that relate to the installation of the incinerator as well as its operation can be made to comply with sound environmental health and safety (EHS) management practices.
- II. Identifying any mitigation to improve its implementation and operation effectiveness.
- III. Identifying gaps in environmental management measures and to prepare an action plan that will be implemented during the rest of the project period

IV. Preparing this environmental study report on the potential environmental consequences on the environment, and socio-economic impact of the operationalization of the incinerator if any.

1.5 Methodology Applied for the ESIA

There are many different plans and processes for carrying out ESIA's. Different circumstances require different approaches and plan frameworks. But for this particular ESIA, we applied the following process:

a. Pre-ESIA Activities which included:

- i. Selection of EIA team;
- ii. Via the guide/contact person from the project proponent, reached out to the area administration and
- iii. There was planning of the ESIA.

b. Site Activities: which were divided into 3 steps as follows:

- i. Understanding and Assessment of planned environmental controls;
- ii. Gathering of ESIA evidence;
- iii. Evaluation of ESIA findings

Under this section, there was also environmental scoping that provided the key environmental issues being addressed in this report. It involved the following activities:

- I. Desktop studies and interviews;
- II. Public consultation;
- III. Physical inspection of the project site and surrounding areas;

c. Post ESIA Activities that include:

- i. Production of draft ESIA Study report that included draft ESMP;
- ii. Review of the draft ESIA Study report by the client;
- iii. Production of a final ESIA Study report

The above process was married with the following activities:

- I. Preparation of an ESIA framework and checklist;

- II. Review of relevant documents such as the existing environmental laws and regulations, World Bank standards, OSH standards, good EHS management practices, the client's own environmental and social management plans etc. and existing environmental and occupational safety and health (EOSH) legislations and standards, environmental safeguard policies and guidelines of the World Bank and the Government of Kenya;
- III. Site visits to where the incinerator will be installed. This included physical inspection of the proposed facility site and its surroundings, carrying out interviews and discussions with project management and staff, and holding meetings and consultations with key stakeholders and the surrounding communities;
- IV. Verification of procedures, instructions and equipment in place designed to help the facility apply and adhere to existing environmental laws, regulations, World Bank standards/policies, OSH standards, good environmental and safety management practices
- V. Evaluation of findings, developing a prioritized list of concerns related to past and ongoing activities at the facility site, making recommendations (including the Expert's opinion of the facility's overall environmental/social performance with respect to regulatory, World Bank corporate environmental requirements, cost estimates for the implementation of remediation action plan deemed necessary to comply with World Bank's Safeguard Policies and those provided for by the EMCA, 2015 etc.);
- VI. Review of safeguards instruments including WMP for the safe and effective management of the incinerator by incorporating appropriate remediation measures; and
- VII. Compiling the findings / report writing

1.7 Organization and Structure of the ESIA Study Report

The ESIA was carried out to full completion within a period of 10 days from the date of undertaking. The Consultants coordinated day-to-day functions and any related

institutional support matters. All formal communications were directed to NEMA through the proponent.

The ESIA report is divided into a main body, an ESMP plan and supporting documentation assembled into several appendices. Basically, the main body of the report:

- a) Establishes clear procedures and methodologies for the ESIA assignment, review, approval and implementation of the proposed project;
- b) Specifies appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social concerns related to project activities;
- c) Determines the technical assistance needed to successfully implement the provisions of the ESMP; and,
- d) Proposes a budget to implement recommendations defined in the ESMP.

All relevant documentation that was available during the ESIA study is referenced in this document, where necessary. **Copies of these documents are and annexed in the appendices section.**

1.8 Responsibilities and Undertaking

The consultants undertook to meet all logistical costs relating to the assignment, including those of production of the report and any other relevant material. The consultant arranged for own transport and travels during the exercise.

The proponent provided the consultants with all the relevant information and contact person for further assistance. The proponent also provided site plan(s) showing roads, buildings layout and the actual sizes of the sites, details of raw materials, future development plans, operation permits and conditions, land-ownership documents and site history, and estimated investment costs (**as attached in Appendix**).

All relevant documentation that was available during the ESIA study is referenced in this document, where necessary. **Copies of these documents are annexed in the appendices section of this report.**

CHAPTER TWO

2.0 PROJECT DESCRIPTION

2.1 Nature of the project

The proponent intends to develop a waste handling facility by installing an incineration plant which will be located on LR.NO.23961, Off Mombasa Road, Off Athi-River–Kinanie Joska Road. The proposed site is 14 km from Devki steel Mills Limited. This is necessitated by the increased demand for proper waste handling facility by the increasing industrialization within the country and the desire for maintenance of a clean environment. The plant has been designed to handle 20-500 KG /Batch of hazardous waste in each set of the 2 incinerators. When complete, the project will have an incineration plant, waste handling and sorting yard and waste holding point.

The incineration plant will come along with the following components

- a) Boundary wall
- b) Entry points or access, main gate, security house
- c) Incinerator, mixing pit for liquid waste and an ash pit
- d) Washrooms, changing rooms Offices
- e) Firefighting equipment, generator room as backups, electricity connection, water supply connection
- f) storage warehouses
- g) Weighbridge
- h) Storm drainage or surface runoff, sewer connections

The following factors were considered in selection of an appropriate location and type of incinerator to install:

- i. The location to be at least 30 meters away from the closest occupied or inhabited building.
- ii. The prevailing winds at the location to blow in a direction away from occupied buildings.

- iii. There should be no regular public passage within immediate proximity of the incinerator.
- iv. There should be no horticulture or leaf crops within 300 meters of the incinerator in the direction of the prevailing winds.
- v. The bottom of the ash pit to be above the maximum level of the water table.
- vi. The location to be secure and free from risk of vandalism or theft.
- vii. The location to permit construction of a facility to house the incinerator (unless designed for external use) and store the waste awaiting disposal.
- viii. The site to also include an ash pit and placenta pit (as appropriate).
- ix. The incinerator and other materials stored inside are protected from rain and UV radiation from direct sunlight.
- x. The incinerator is well ventilated and the stack emissions are clear of the building or enclosure so that the operator is not exposed to fumes when the incinerator is in use.
- xi. The enclosure is robust and corrosion resistant, and its design-life is at least equivalent to the expected life of the incinerator.
- xii. Building can be securely locked against unauthorized entry.

Key steps for selecting an incinerator design

The following factors were considered in determining and designing the incinerator technology.

- a) Characterize waste of which will include
 - i. Hazardous industrial waste e.g carbon powder, expired or damaged chemical products
 - ii. Pharmaceuticals waste
 - iii. Sensitive packaging materials,
 - iv. Confidential company documents
 - v. Electronic waste,
 - vi. Anti-Counterfeit goods,
 - vii. Condemned goods,
 - viii. Agricultural waste (fertilizer) and farm inputs

- ix. Biomedical waste,
 - x. Industrial waste water
- b) Quantify waste expected for incineration per day 10tons or 10,000 kgs for 2 incineration plant. Note: Each approximately burn 5tons or 5,000 per day or 800kgs -1000kgs per hour
- c) Secondary burning chamber residence gas time should be 1seconds
- d) Latest technology in APCs -Air Pollution Control Systems e.g scrubber units
- e) An owner or operator of a controlled facility shall provide portholes, and platforms which shall be conveniently located for easy access and all other facilities required for taking samples of air or emission from any chimney (manufacturer should make the above matter readily available)
- f) The chimney or stack should have a minimum height of 10 metres above ground level and clear the highest of the building by not less than 3 meters for all roofs. The topography and height of adjacent buildings within 50 meters radius should be taken into account. (manufacture should abide by the specification)

The specification of the incinerator is listed below;

Table 1: Showing the specification of the incinerator

Fuel Type	Diesel & Gas
Standard	GB18484-2001
Capacity	20-500 KG /Batch 3-6 Batch / 8 working hour
Service Life	15-20 Years
Number of chamber	2
Gas Retention Time	2 Seconds
Refractory thickness :	350 MM
Primary combustion chamber temperature:	300-800 °C
Secondary combustion chamber temperature:)	500-1200 °C
Burning Time	1 hour / Batch

Gas Purification:	2 Combustion rooms + 2 Water scrubbers (Cold Water Spray Tower) + Cyclone dust collector + Chimney
Product Usage	Industrial waste, Agriculture wastes, biomedical waste , household waste, poultry farm ,animal pet cremation etc .,
Eco friendly	Smokeless and odorless, dioxin free

Note: Proponent will install 2 set as per attached layout plan

2.2 Objectives of the Proposed Project

This project seeks to achieve the following:

- a) To increase the handling capacity of hazardous waste which will both assist the economic growth of industries and provide a proper treatment and disposal route that is affordable.
- b) To improve waste management
- c) To ensure Generation of income both to the company proprietors and the central government in form of tax remittance;
- d) To provide market for goods and services, particularly during construction period. Goods and services will be sourced from local suppliers;
- e) To create employment opportunities during the project's construction and operational phases;
- f) To ensure Optimal use of land;
- g) To ensure Gains in the local and national economy.

2.3 Project Site

Administratively, the proposed project site is located in Kinanie area, Kinanie Ward, Mavoko Sub-County, in Machakos County. The proposed commercial incineration plant

will be located on LR .NO.23961, Off Mombasa Road, along Athi-River – Kinanie - Joska Road. The geographical positioning system (GPS) coordinates of the project site were determined to be: 1°21'14.238"S and 37°3'38.316 "E.

The proposed site is 14 km from Devki steel Mills Limited .The neighbours adjacent to the proposed site are a few residential dwellings some belonging to EPZA staff, EPZ Waste treatment works, Synergy waste processing facility and leather city.



Entrance to the site



Residential dwelling belonging to EPZA Staff



Ongoing Construction works of domestic & industrial waste water treatment nearby approximately 4km away from proposed site of Boredo Supplies Ltd

2.4 Project Components

2.4.1 Features of the Incinerator

The proposed incinerator will entail various components that will complement each other to ensure that wastes are burnt as per the desired levels and as per the design of the incinerator. The incinerator will be sheltered in a permanent structure designed to ensure that there is adequate ventilation. The shelter will be made of the Walling-natural building blocks; the Roofing-metallic trusses, iron sheets; a Burglar proof metallic door; Metallic grills (for ventilation); and Cemented floor. The incinerator machine entails the following components:

- a. Manual loading door
- b. Main/Primary and Secondary combustion chambers
- c. After burning emission control chamber
- d. Gas Scrubber
- e. Discharge chimney
- f. Control panel
- g. Fuel storage

I. Manual Loading Door

This is the inlet where solid waste will be fed to the incinerator.

ii. Primary Chamber

This is where combustion of the solid wastes will take place. The chamber is cylindrical in shape and will horizontally be fitted along the floor of the incinerator shelter.

iii. Secondary Chamber

The products of combustion from the primary chamber exhaust into the secondary chamber to be located directly above the primary chamber for treatment. Within the secondary chamber additional heat and air will be added to promote combustion in the gaseous phase, thus ensuring complete combustion of the volatile and solid particulate.

iv. Gas Scrubber/Emission Control Chamber

Treated gases will exit the secondary chamber, directly into the emission control chamber, what is popularly known as scrubber. The gas scrubber/ washer are designed to suck all particulate matter from gases emanating from the burning chambers. Particulate matter

from combustion process will be entrained within the spray of water which also will cool the gases to approximately 650°C.

v. Control Panel

The control panel is fitted with various control knobs that are used to operate the incinerator. The control panel entails controls for time and temperatures.

vi. Fuel Storage

The fuel (diesel) used in burning the wastes will be stored in metallic tank raised above the main machine. The incinerator will be fed by a 400L diesel tank. The tank will be fitted with a level gauge, feeder and fill pipes and a breather.

2.4.2 Expected Operation Procedures of the Incinerator

The following are the expected operation procedures in the event of incinerating HCW.

1) Ash Removal

Startup of the incinerator begins with removal of the ash generated from the previous operating cycle. The following are guidelines for good operating practice:

- I. In general, allowing the incinerator to cool overnight is sufficient for the operator to remove the ash safely. This cooling can take as long as 8h.
- II. The operator should open the ash cleanout door slowly both to minimize the possibility of damage to the door stop and seal gasket and to prevent ash from becoming entrained.
- III. The operator should exercise caution since the refractory may still be hot and the ash may contain local hot spots, as well as sharp objects.
- IV. The ash and combustion chamber should not be sprayed with water to cool the chamber because rapid cooling from water sprays can adversely affect the refractory.
- V. A flat blunt shovel, not sharp objects that can damage the refractory material, should be used for clean-up.
- VI. Avoid pushing ash into the under-fire air ports.

- VII. Place the ash into a noncombustible heat resistant container, i.e., metal. Dampen the ash with water to cool and minimize fugitive emissions.
- VIII. Once the ash has been removed and prior to closing the ash cleanout door, the operator should inspect the door seal gasket for frayed or worn sections. Worn seal gaskets should be replaced.
- IX. To prevent damage to the door seal gasket, the operator should close the ash cleanout door slowly and should not over tighten the door clamps.
- X. Over tightened door clamps may cause the seal gasket to permanently set and allow infiltration of outside air around the door face.

2) Waste Charging

The operator has the option of selecting which items are included in a particular charge. Waste properties which should be considered when the waste is segregated into charges include the heating value; the moisture content; the plastics content, and the amount of pathological wastes.

The heating value and moisture content of waste affects the performance of an incinerator. A charge of waste with a very high heating value may exceed the thermal capacity of the incinerator. The result is high combustion temperature, which can damage the refractory of the incinerator and can result in excessive emissions. Similarly, a charge of waste with very high moisture content will not provide sufficient thermal input, and the charge will require the use of more auxiliary fuel than usual. Plastic items are an example of materials with high heating values. Large quantities of plastic, which may contain polyvinyl chloride, should be distributed through many waste charges, not concentrated in one charge, if possible.

When sorting loads of waste to be incinerated, the operator should try to create a mixture of low, medium, and high heating value wastes in each charge, if possible, to match the design heat release rate of the incinerator. In general, lighter bags and boxes will contain high levels of low density plastics which burn very fast and very hot. Heavier containers may contain liquids (e.g., blood, urine, dialysis fluids) and surgical and operating room materials which will burn slowly. As a general rule for segregating waste into charges, the

operator may mix light bags and heavy bags to balance the heating value of each charge. If several different types of waste, (i.e., red-bag, garbage and trash) are being charged to the incinerator, charging the incinerator with some of each waste type is better than charging it with all of one waste type. Special care should be taken to avoid overcharging the incinerator (beyond its intended use) with anatomical wastes. Prior to initiating charging, operation of the combustion air blowers and ignition and secondary burners should be checked following the manufacturers' recommendations. The proper operation of the primary and secondary burners is best achieved by observing the burner flame pattern through the view ports in the incinerator wall or in the burner itself as well as the control panel.

The incinerator is charged cold and because the waste units generally are small, they are usually loaded manually. The waste is loaded into the ignition/primary chamber, which is filled to the capacity recommended by the manufacturer. Typically, it is recommended to fill the incinerator completely, but not overstuffing the chamber. Overstuffing can result in blockage of the air-port to the combustion chamber and in premature ignition of the waste and poor performance (i.e., excess emissions) during startup. Overstuffing also can result in blockage of the ignition burner port and damage to the burner. After charging is completed, the charge door seal gasket is visually checked for irregularities. The door is then slowly closed and locked. The charge door seal gasket should then be inspected for any gaps that would allow air infiltration into the primary chamber. Once operation is initiated, no further charges should be made until the next operating cycle is initiated, i.e., after cooldown and ash removal.

3) Waste Ignition

Prior to ignition of the waste, the secondary combustion chamber should be preheated to a predetermined temperature by igniting the secondary burner. A minimum secondary chamber temperature of 980°C (1800°F) is recommended prior to ignition of the waste. After the secondary chamber is preheated, the secondary combustion air blower is turned on to provide excess air for mixing with the combustion gases from the primary chamber. The primary chamber burner is ignited to initiate waste combustion. When the primary

chamber reaches a pre-set temperature, mostly 600°C (i.e., the minimum operating temperature for the primary chamber) and the waste combustion is self-sustaining, the primary burner is shutdown. The primary combustion air and secondary combustion air are adjusted 'to maintain the desired primary and secondary chamber temperatures. (Typically this adjustment is automatic and can encompass switching from high to low settings or complete modulation over an operating range.) During operation, the primary burner is reignited if the ignition chamber temperature falls below a pre-set temperature. Similarly, the secondary burner is reduced to its lowest firing level if the secondary chamber rises above a pre-set high temperature setting. Again, control of the burners, like the combustion air, is typically automated.

4) Burndown

After the waste burns down and all volatiles have been released, the primary chamber combustion air level is increased to facilitate complete combustion of the fixed carbon remaining in the ash. The temperature in the primary chamber will continue to decrease indicating combustion is complete. During the burndown period, the primary burner is used to maintain the primary chamber temperature at the predetermined minimum level of the operating range. The length of time required for the burndown period depends on the incinerator design, waste characteristics, and degree of burnout desired. A typical burndown period is 2 to 4h. When combustion is complete, the primary and secondary burners are shutdown. Shutdown of the secondary burner which initiates the cooldown period usually is automatically determined by a pre-set length of time into the cycle. The combustion air blowers are left operating to cool the chambers prior to subsequent ash removal. The blowers are shutdown when the chambers are completely cooled or prior to opening the ash door for ash removal. Cooldown typically lasts 5 to 8h.

The final step in the cycle is examination of ash burnout quality. Inspection of the ash is one tool the operator has for evaluating incinerator performance. The operator should look for fine gray ash with the consistency of ash found in the fireplace at home or in the barbeque grill. Ash containing large pieces of unburned material (other than materials which are not combustible, such as cans) shows that incinerator performance is poor. It

may be necessary to return these large pieces of material to the incinerator to be re-burned. Ash color also is an indicator of ash quality. White or gray ash indicates that a low percentage of carbon remains in the ash. Black ash indicates higher carbon percentages remaining. Although carbon remaining in the ash indicates that available fuel has not been used and combustion has not been complete, the fact that carbon remains in the ash is not in itself an environmental concern or an indicator that the ash is not sterile. Nonetheless, ash color can be used to assist the operator in evaluating burnout and incinerator performance.

5) Special Considerations

If pathological waste is being burned, the ignition burner should be set to remain on until the waste is completely burned. Further, the volume of waste charged needs to be significantly reduced. The time required to burn an equivalent volume of such waste will be extended, since the waste contains high moisture and low volatile content. To destroy pathological waste efficiently, the waste must be directly exposed to the burner flame; consequently piling pathological waste in a deep pile (e.g., filling the entire chamber) results in inefficient combustion.

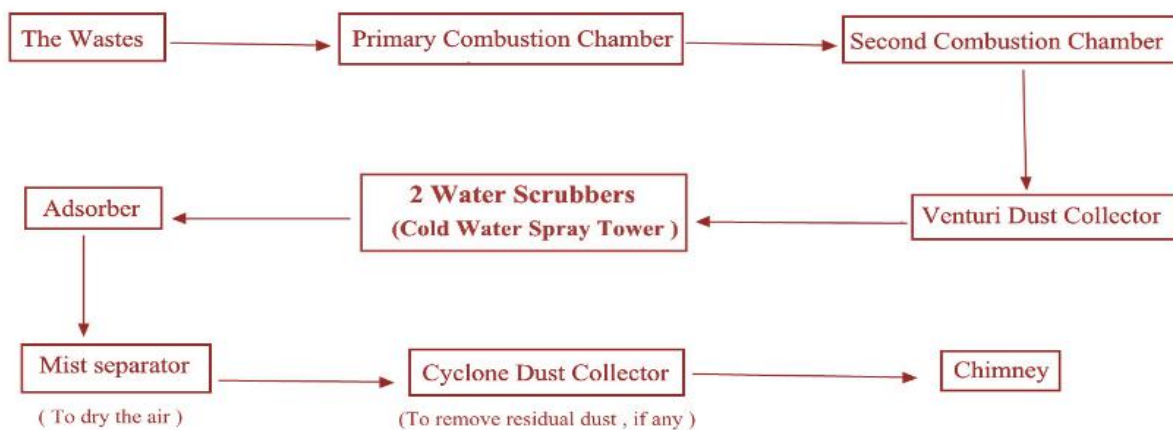


Fig 1: Showing the Working Flowchart of the waste Incinerator

2.4.3 Auxiliary Facilities

The proposed project will not be complete until support facilities are put into place. These will include;

- (i) Offices,
- (ii) Sanitation facilities (toilets, bathrooms, hydrants, wastewater drains,
- (iii) Health and safety provisions (fire extinguishers, hydrants, signage, exits, first Aid points etc.
- (iv) Security arrangements.

2.5 Project Implementation

2.5.1 Pre-Construction Stage Project Approvals

The project has been submitted for /approved by lead agencies for implementation as follows;

Approving Authority	Act	Status	Remarks
Physical Planning Department, Mavoko Sub-County , Machakos County,	Physical Planning Act, Cap 286 County Government Act, CAP 265	The architectural plans have been approved	Architect to supervise the implementation
NEMA	EMCA ,2015	This Report	The authority to review the report for approval and licensing.

Table 2: Showing the project approvals

The pre-construction will also involve getting to collaborative agreements with key stakeholders including project manager, architects, quantity surveyors, engineers / contractors (structural, mechanical, electrical), material suppliers, landscapers, and financiers). A programme has been set and an agreement made between the proponent and the project consultants.

KEY SOCIAL CONSIDERATIONS IN DESIGN AND SUPERVISION OF THE PROJECT

The objective for incorporating Social considerations in this phase was to ensure designing of socio- cultural -friendly physical facilities with minimal negative impacts to the well-being of people around the project area and procuring contractor that will enhance the social well-being of the community members. Some of the key considerations included;

1. **Security:** Contractors to aim at providing maximum security for the workers at site, to also ensure workers maintain maximum cooperation that will not bring conflicts, fights and crime within the project site
2. **Safety and Health:** aims at constructing physical facilities that are safe and healthy for use, use materials and technology that will not be harmful to the people within the project sites
3. **Marginalization of Minority groups e.g. VMG, PLWDs and women:** Consider mechanisms of incorporating women, Vulnerable and Marginalized Groups and people living with disabilities in all phases and levels of construction
4. **Economic Empowerment-Income and Employment opportunities:** This aims at ensuring that contractors help in bringing income to the communities around the project site by sourcing materials that are available locally within the area, by hiring skilled and non-skilled labour from the local communities
5. **Sexual Exploitation, Gender based violence, prostitution and HIV:** The design and in the event of procuring contactors, should ensure the contractors brought on board will not bring activities that will enhance sexual exploitation, prostitution and increase HIV prevalence within the project sites
6. **Social Evils--** Substances use, crime, excessive alcohol consumption, physical attack: Ensure buildings are sited where they will not have impacts of promoting social evils like substance use, excessive alcohol consumption and physical attacks, contractors to ensure the workers on site are not on any kind of substance and alcohol
7. **Child protection-Child labour, Child safety, child delinquency, school dropout:** Ensure the design is one that will not allow violation of child rights, will provide

child safety all the time, will not incorporate children involved in the construction or any kind of labour at construction site

8. **Sustainability:** Consider the designs, technology that are user friendly, easy to maintain and cost effective for sustainability after the financier phases out.

2.5.2 Construction Phase

The following are processes that will be undertaken during the construction phase of the project.

a) Recruitment of staff

The commencement of the construction works of the incineration plant will require both skilled and semi-skilled labour. Cheap labour will be sourced from the Kinanie area locals and surrounding environs. This in turn will lead to employment opportunities to the many unemployed locals, thus leading to improvement of their livelihood.

Proposed number of employees will be approximately 100 persons in number.

b) Site preparation,

The site will be prepared by clearing any existing vegetation, levelling the ground and proper site hoarding.



Clearing of the site mainly bushes or shrubs leaving more indigenous trees

c) Transportation of building materials

Building materials will be transported safely from the distributors to the project site by the use of lorries. These materials include building stones, sand, cement, rubble, ballast, glass, tiles and cabro. These materials will be sourced from the nearest sources and distributors to give both environmental and economic logic to the proponent. The proponent intends to source these materials from hardware shops within Kinanie area and the surrounding environs, in order to minimize the materials' carbon footprint and reduce transportation costs.

d) Storage of the construction material

Construction material will be stored on site and guarded for safety purposes. The bulky materials such as the stones, ballast, steel and tiles will be piled in the site while the less bulky material such as cement, paints and glasses will be kept in the store. All these will be stored in an orderly manner to observe good housekeeping. Many accidents and near misses may occur due to poor housekeeping.

Additionally, the proponent will order for material in considerable quantities to minimize stockpile on site. Careful design, planning and good site management would be maintained to minimize over-ordering and waste of raw materials such as ready mixed concrete, mortars and cement grouts.

e) Installation and Civil Works

The project will be constructed based on applicable standards of Kenya and any other standards which may be incorporated. The construction will as well incorporate environmental guidelines, health and safety measures. The project inputs will include the following;

- i. Construction raw materials will include sand, cement, stones, gravel, ballast, metals, among others. All these will be obtained from licensed dealers and especially those that have complied with the environmental management guidelines and policies.
- ii. Construction machines will include machinery such as trucks, concrete mixers and other relevant construction equipment. These will be used for the transportation of

materials, clearing of the vegetation and resulting construction debris. Most of the machinery will use petroleum products to provide energy.

f) Installation of utility services

This will include plumbing works to install piping for water and waste water drainage, electrical supply and wiring, communication and information cables.

g) External works

This will entail the completion of the driveways, footpaths, parking lots, water supply, wastewater drainage, and solid waste disposal facilities. Landscaping will also be undertaken to restore and improve the aesthetic value of the site. This will include the renewal of the topsoil, establishment of flower gardens and grass lawns. A proper gate will be installed to limit access to the site to authorized personnel only and enhance security.

2.6.3 Operation Phase

Once the incineration plant is completed, the proponent will use the facility to conduct incineration for various clients. Maintenance activities will include facility cleaning, routine checks and other necessary repairs. Workers will be fully employed onsite including the truck drivers who will be transporting the waste for incineration.

a) Solid waste management;

The project proponent will provide facilities for handling solid waste generated within and around the facility. These will include dustbins/skips for temporarily holding waste within the premises before final disposal at the designated dumping site by NEMA approved solid waste handling company.

b) Effluent and waste water management;

The area is served by a sewer system. Waste water generated from the incineration plant mainly from washroom will be discharged into the sewerage system of EPZA who have waste water treatment upon approval, But during construction conservancy tank will be constructed , while storm water from the project area will be channeled into the storm water drainage system or directed to natural water courses with consideration of downstream effects. Inorganic waste generated from the facility such as oil and fuel should however be treated before release to the system.

c) **Cleaning**

The proponent will be responsible for ensuring regular washing and cleaning of the pavement of the entire facility. Cleaning operations will involve the use of substantial amounts of water, disinfectants, detergents etc.

2.5.4 De-commissioning stage

The commissioning of the project will take the duration agreed as per the conveyance document between the proponent and the concerned authorities. Later on, should there be need for decommissioning the project; the following will have to be considered:

a) ***Demolition works***

Upon decommissioning, the project components including buildings, pavements, drainage systems, parking areas and perimeter fence will be demolished. This will produce a lot of solid waste, which will be reused for other construction works or not reusable, disposed of appropriately by a licensed waste disposal company.

b) ***Dismantling of equipment and fixtures***

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

c) Site restoration

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

2.6 Project Cost for phase one as incineration plant

The proposed project is estimated to cost the sum of Forty Million Kenya Shillings only (Ksh40,000,000.00). This budget will meet the cost of site preparation, waste management, and all the helipad construction works.

Note: Boredo Supplies Limited intend to put integrated waste management plant in 3 phases starting with Incineration plant, waste recycling plant and Briquette processing plant see attached master plan for the whole project which will be subjected to independent Environment Social Impact as stipulated in EMC Act Cap 387 at every stage of implementation per phrase.

CHAPTER THREE

3.0 REVIEW OF THE APPLICABLE ENVIRONMENTAL LEGISLATION IN KENYA

3.1 Introduction

The desire for continued improvement on our ways of life comes with associated impacts on the environment. Environmental and social impacts can either be positive, negative, small scale, large scale, temporary, permanent, reversible or irreversible depending on the nature of the activities/ operations being undertaken. In the face of continued development and the resultant impacts, a lot of legislative tools have been developed to guide development, safeguard environmental and social concerns and offer probable mitigation interventions. Kenya has a policy, legal and administrative framework for environmental and social management. Under the framework, NEMA is responsible for ensuring ESIA's on proposed facilities as per the provisions of EMCA and other International regulations.

ESIA's are carried out in order to identify positive and negative (actual and potential) impacts associated with proposed projects such as the proposed incinerator, with a view to taking advantage of the positive impacts and developing mitigation measures for the negative ones. The guidelines on ESIA's are contained in sections 58 to 67 of EMCA. Hence, ESIA is a tool for environmental conservation and has been identified as a key requirement for proposed projects to ensure sustainable operations with respect to environmental resources and socio-economic activities in the neighborhood of such project sites. The government has established guidelines to facilitate the process on ESIA's that are contained in the Kenya Gazette Supplement No. 56, legislative supplement No. 31, Legal Notice No. 101 of 13th June 2003 and which was revised in 2016 not forgetting the Legal Notice Number 31 of 2019. In order to ensure that the incinerator implementation and operations conform to existing policies and laws, a number of key statutes were reviewed.

These included the following

1. Environmental Management Principles and Guidelines

- i. The Principle of Waste Management
- ii. The Principle of Environmental and Social Assessment
- iii. Sustainability
- iv. Principle of Intergenerational Equity
- v. Principle of Prevention
- vi. Precautionary Principle
- vii. Polluter Pays Principle
- viii. Principle of Public Participation

2. Policy Framework

- a. Environmental Policy Framework
- b. National Injection Safety and Medical Waste Management Policy 2007
- c. Infection Prevention and Control Policy and Guidelines 2011
- d. The National Poverty Eradication Plan (NPEP), 1999-2015
- e. The Kenya National Environmental Action Plan (NEAP, 2009-2013)

3. Legal Framework

- a. Environment Management Coordination Act (Amendment) 2015.
- b. Physical Planning Act, (Revised Edition, 2012).
- c. The Environmental (Impact Assessment and Audit) Regulations, 2003 (revised in 2019).
- d. County Government Act, 2012 (Amended in 2014)
- e. EMCA (Waste Management) Regulations, 2006 Legal Notice No.12.
- f. Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations, 2006
- g. Environmental Management and Co-ordination (Air Quality) Regulations, 2014
- h. The Public Health Act, Cap 242.
- i. Occupational Safety and Health Act (OSHA) 2007.
- j. Noise and Excessive Vibrations Pollution Control Regulations 2009.

- k. Way leave Act, 2010.
- l. Water Act of 2016
- m. The Constitution of Kenya, 2010

4. International Conventions and Treaties

- a) Sustainable Development Goals (SDG's)
- b) United Nations Framework Convention on Climate Change (UNFCCC)
- c) Kyoto Protocol

5. Safeguard Policies for World Bank

- a) Environmental Assessment Operational Policy OP/BP 4.01
- b) Indigenous people OP/BP 4.10
- c) World Bank Group Environmental, Health and safety guidelines

3.2 Environmental Management Principles and Guidelines

The project proponent is expected under law and best practice to consider and exercise all the principles and tenets of sustainable environmental and socio-economic management. Some of these principles are as discussed below:

3.2.1 The Principle of Health Care Waste Management/Waste Management

Provision of health care services is core at the mandate of every government in the world; a healthy population is a productive nation/ state. Whereas provision of affordable and quality healthcare is the desire of every government; there are challenges in management of wastes generated by health care providing facilities both private and public. It is against this background the MoH in Kenya has formulated policies to guide in management of HCW. The ministry has gone further and formulated strategic plans to implement HCW management over a specific period of time; currently the "Health Care Waste Management Plan 2016–2021" is being implemented. HCW entails all the waste generated within health-care facilities, research centres and laboratories related to medical procedures (WHO, 2014). In addition, it includes the same types of waste originating from minor and scattered sources, including waste produced in the course of health care undertaken in the home (e.g. home dialysis, self-administration of insulin, recuperative care) (WHO, 2014). For purposes of HCWM in Kenya, the wastes are classified into categories such as Infectious; Highly

Infectious; Non-Infectious/ non-hazardous (non-clinical); Chemical and Pharmaceutical; Sharps; and Radioactive waste. The waste categories should be segregated at source and packed in colour coded packaging materials as indicated in the table below.

Table 2: Colour Codes system used in Kenya

Type of Waste	Colour of container and markings	Type of Container.
Sharps	Yellow (Marked 'Sharps')	Puncture proof
Infectious	Yellow	Strong leak proof plastic bag with biohazard symbol
Non-Infectious/ non-hazardous(non-clinical)	Black	Plastic Bag or container.
Chemical and Pharmaceutical	Brown	Plastic bag or Container
Radioactive waste	Yellow with black radioactive symbol	Lead Box

Such wastes should be disposed based on the type of wastes and the likely impact on the environment. Given that the proposed will be managing HCW, it is upon the project proponent to adhere to the said HCWM policies without fail.

3.2.2 The Principle of Environmental and Social Assessment

Environmental Assessment /ESIA just like financial audit strive to assess practices and operations in the use of resources and are defined as “systematic, documented, periodic and objective process in assessing an organization’s activities and services”. ESIA’s are undertaken for various reasons and the major objectives of undertaking ESIA’s are:

- 1) Promoting good environmental management;
- 2) Facilitating management control of environmental practices;
- 3) Assessing compliance with relevant statutory and internal requirements;
- 4) Maintaining credibility with the public (local communities and relevant stakeholders);

- 5) Raising staff awareness and enforcing commitment to departmental environmental policy as stipulated in Standard Operations Procedures (SOP) or guidelines;
- 6) Establishing the performance baseline for developing an Environmental Management.
- 7) Exploring improvement/mitigation opportunities

Conducting an ESIA is no longer an option but a sound precaution and a proactive measure in today's heavily regulated environment in the wake of acknowledged importance of sound environmental management. Indeed, evidence suggests that ESIA has a valuable role to play, encouraging systematic incorporation of environmental perspectives into many aspects of an organisation's overall operation, helping to trigger new awareness and new priorities in policies and practices. The proponent should take all practical measures to ensure the implementation of the Environmental and Social Management Plan (ESMP) of either the approved ESIA (such as the one carried out for the incinerator leading to the production of this report) by carrying out environmental auditing (EA) on a regular basis. It is worth noting at this juncture that this ESIA was undertaken prior to construction and commissioning of the incinerator; in view of this the ESIA exercise identified all the potential and actual environmental and social impacts thereby developing an ESMP that will ensure sustainability in the use of the facility. The ESMP will also serve as the baseline in the future management and auditing of the facility.

3.2.3 Sustainability

The principle of sustainability requires that natural resources should be utilized in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. It strives for equity in the allocation of the benefits of development and decries short-term resource exploitation which does not consider the long-term costs of such exploitation.

3.2.4 Principle of Intergenerational Equity

The principle of sustainability should be examined together with that of intergenerational equity, which focuses on future generations as a rightful beneficiary of environmental protection. Essentially, the principle of intergenerational equity advocates fairness, so that present generations do not leave future generations worse off by the choices they make today regarding development. Its implementation requires the utilization of natural resources in a sustainable manner while avoiding irreversible environmental damage.

3.2.5 Principle of Prevention

The principle of prevention states that protection of the environment is best achieved by preventing environmental harm in the first place rather than relying on remedies or compensation for such harm after it has occurred. The reasoning behind this principle is that prevention is less costly than allowing environmental damage to occur and then taking mitigation measures.

3.2.6 Precautionary Principle

The precautionary principle recognizes the limitations of science, as it is not always able to accurately predict the likely environmental impacts of resource utilization. It calls for precaution in the making of environmental decisions where there is scientific uncertainty. Accordingly, it is closely related to the principle of prevention and can be viewed as the application of the principle of prevention where the scientific understanding of a specific environmental threat is not complete. The precautionary principle thus requires that all reasonable measures must be taken to prevent the possible deleterious environmental consequences of development activities. Further, it demands that scientific uncertainty should not be used as a reason for not taking cost effective measures to prevent environmental harm.

3.2.7 Polluter Pays Principle

The polluter pays principle requires that polluters of natural resources should bear the full environmental and social costs of their activities. It seeks to internalize environmental externalities by ensuring that the full environmental and social costs of resource utilization are reflected in the ultimate market price for the products of such utilization. Since environmentally harmful products will tend to cost more, this principle promotes efficient and sustainable resource allocation as consumers are likely to prefer to the cheaper less polluting substitutes of such products.

3.2.8 Principle of Public Participation

The principle of public participation seeks to ensure environmental democracy and requires that the public, especially local communities should participate in the environment and development decisions that affect their lives. It requires that the public should have appropriate access to information concerning the environment that is held by public authorities and should be given an opportunity to participate in decision-making processes. Hence this was fulfilled via consultation of some of the people living around the proposed project site.

3.3 National Environmental Action Plan

The National Environment Action Plan (NEAP) was first published in 1994, and the most recent document was revisited in 2007 with a scope from 2009 - 2013. The NEAP provides a framework for the implementation of the Environment Policy and realization of the Standard Development Goals and Vision 2030. The plan outlines measures to combat climate change including mitigation and adaptation, improving inter-sectoral coordination, mainstreaming sustainable land management into national planning, policy and legal frameworks and undertake research on impact of climate change on environmental, social and economic sector. The plan also aims to increase the country's forest cover and adopt economic incentives for management of forest products. It is upon the project's proponent to ensure that the activities and components of the project are geared towards attaining the gist of the NEAP

3.4 Policy Framework

3.4.1 Environmental Policy Framework (2014)

The Kenya Government's Environmental Policy of 2014 is geared towards sound environmental management for sustainable development. This is envisaged in the principle of prudent use, which requires that the present day usage should not "compromise the needs of the future generations". Incinerator operations should be done within acceptable environmental management framework. The policy emphasis is on environmental protection such as avoiding air pollution in order to ensure sufficient supplies for the present and future generations. The policy envisages the use of the "polluter pays principle", where one is expected to make good any damage made to the environment. The Policy aims at integrating environmental aspects into development plans.

3.4.2 National Injection Safety and Medical Waste Management Policy 2007

This policy advocates for the importance of safeguarding patients, health workers and the community at large from risks associated with unnecessary and unsafe injections as well as improper disposal of health care wastes. The overall objective of the Policy is to ensure safe injection practices and proper management of medical waste, in order to safeguard the patient, health care provider, community and the environment. Given that the proposed project will be handling some medical wastes, it is upon the project proponent to ensure that they acquaint themselves with this policy.

3.4.3 Infection Prevention and Control Policy and Guidelines 2011

The guidelines are specifically designed for the healthcare workers to understand and practice evidence-based infection prevention and control (IPC) practices that will protect patients, clients, and health care workers from Healthcare-Associated Infections (HAIs). HAIs include urinary tract infections, surgical-site infections, bloodstream infections, and pneumonia.

3.4.4 Health Care Waste Management Plans

The GoK through the MOH has developed HCWM guidelines that are effected through management plans and are reviewed from time to time. This ensures that HCWM in Kenyan HCF is responsive to the dynamics of HCWM strategies, hence the HCWM Plan of 2016-2021. The national HCWM Plan of 2016-2021 is dedicated to management of HCW in the period stated (2016-2021). The Strategic planning for HCWM covers not only the technical aspects related to waste management such as waste handling, storage, transportation, treatment, and disposal, but also capacity-building and awareness creation. The plan provides viable technical and management options as well as a roadmap for the domestication of the National HCWM Strategic Plan 2015 - 2020 in Kenya for five years.

3.5 Legal Framework

3.5.1 Environment Management and Coordination Act (Amendment) 2015

EMCA is an Act of parliament to provide for the establishment of an appropriate legal and institutional framework for the management of the environment and for related matters. NEMA is a body established under the Act, and has the legal authority to exercise general supervision and co-ordination over all matters relating to the environment, and is the principal arm of the Government charged with the implementation of all policies relating to the environment. Part II of EMCA states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. It is worth noting that the entitlement to a clean and healthy environment carries a collective duty. Hence, there is not only the entitlement to a clean and healthy environment, but also the duty to ensure that the environment is not degraded in order to facilitate one's own as well as other persons' enjoyment of the environment. According to Section 58 of the Act, ESAs need to be carried out on all proposed projects. All ESIA reports are submitted to NEMA for review and necessary advice thereafter. The law is based upon the principle that everybody is entitled to a healthy and clean environment. Section 42, pertinent to the continued running of this project deals with *Discretionary approvals required*: The Act requires that projects acquire environmental approval before their commencement.

NEMA approves and issues an environmental license after an EIA report depending on whether the project assessment and report satisfies it. This is also in compliance with the requirements of EMCA Part VI section 58 (1) and (2) which states that:

“Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the authority in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee” The proponent of the project shall undertake or cause to be undertaken at his own expense an EIA/EA study and prepare a report thereof where the Authority, being satisfied, after studying the report submitted under Subsection (1), that the intended project may or is likely to or will have a significant impact on the environment, so directs”.

Carrying out this ESIA is part of complying with the provisions of EMCA.

3.5.2 ESIA and EIA/ EA Guidelines (2003, Revised in 2019)

The ESIA and EA/ ESA guidelines require that ESIA and EA/ ESAs be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures. Carrying out this ESIA is part of complying with the provisions of EMCA as well as complying with the provisions of EIA/EA Guidelines of 2003 (as revised in 2019).

3.5.3 The Water Act 2016

The 2016 Act repealed the water Act 2002. The enactment of this law aimed at aligning national water management and water services provision with the requirements of the Constitution of Kenya 2010 particularly on the clauses devolving water and sanitation services to the county governments. Consequently, the Act retained some and established other new institutional arrangements including, Ministry of Water and Irrigation as the sector coordinator, Water Services Regulatory Board (WASREB) for regulation of water

services' providers, Water Resources Regulatory Authority (WRA formerly WRMA) for water resource use regulation, National Water Harvesting and Storage Authority for major water infrastructural development, Water Tribunal for dispute resolution, Water Sector Trust Fund for water services development towards the un-served and poor segments of the society in peri-urban and rural areas, Water Works Development Agencies to replace the Water Service Boards, and Basin Water Resources Committees to replace Catchment Advisory Committees (CAACs).

The Act vests provision of water and sanitation services with the county governments through Water Services Providers (WSPs) whose operations must be in accordance with a Service Agreement entered between each WSP and WASREB. It provides for national monitoring and information systems on water resources and it allows the WRA to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by the project proponent and the information thereof furnished to the authority. This may include periodic water analysis records for borehole water or even for harvested rain water.

3.5.4 Public Health Act Cap 242 (2012)

The Public Health Act protects human health, prevents and guards against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases.

This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health and the project proponent must follow it to the latter by avoiding open burning of any wastes as well as exposing animals to the access of wastes.

3.5.5 Physical Planning Act Cap 286 (2010)

This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning. It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in a specific plan. The ostensible intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues. Thus, it is upon the project proponent to ensure that the proposed project conforms to the County's Physical Plans.

3.5.6 Laws Governing Environmental Health

The health of the environment is a broad issue that should apply to any activity occasioning environmental degradation. However, what we have in Kenya is construed rather narrowly to apply only to environmental problems, which affect the human body, but not including diseases.

3.5.6.1 Public Health

Under this section the review is confined to the provision of the Public Health Act (Cap 242 of 2012), the Traffic Act (Cap 403 of 2013), the Local Government Act (Cap 265 of 1998), the Penal Code (Cap 63 of 1948) and the Factories Act (Cap. 514 of 1977). Within the Public Health Act, the sections on housing and prevention of mosquitoes are directly pertinent. On sanitation, the Act borrows from the common law doctrine of nuisance, which makes it an offence for any landowner or occupier to allow nuisance or any other condition liable to be injurious or dangerous to health to prevail on his land. A medical health officer, once satisfied of the danger, may issue an order requiring the owner or occupier of the land to remove the nuisance. Fighting malaria is also a critical environmental task dealt under the Act. Part XII makes it an offence to leave on one's land or premises, any collection of water, sewage, rubbish, well, pool, gutter, channel cesspit, latrine, urinal or dump pit where mosquitoes may breed. Such a situation constitutes a nuisance. Any person who fails to clear such a nuisance is guilty of an offence under the Act.

The project proponent should not allow the collection of water, sewage, rubbish, well, pool, gutter, channel cesspit, latrine, urinal where mosquitoes may breed in relation to the operation of the incinerator that could trigger this law hence becoming a threat to public health. This is because not using it as intended could mean the burning of waste in the open as well as allowing the piling of waste in the open leading to its access by animals such as dogs, cats and birds.

3.5.6.2 The Working Environment

The two statutes relevant to this subject are the Factories Act (Cap 514 of 1977, replaced by the Occupational Safety and Health Act of 2007) and the Mining Act (Cap 306). The primary environmental requirements under the Factories Act are that each factory (working place) must observe as high standards of cleanliness as are possible for the respective operations; avoid overcrowding, construct and maintain adequate ventilation, provide and maintain suitable natural or artificial lighting, as appropriate, provide drainage of floors and construct and maintain clean sanitary conveniences. This should be provided for in the construction of the shelter for the incinerator.

3.5.6.3 The Factories and other Places of Work (Fire Risk Reduction) Rules, 2007

These Rules were published in the Kenya Gazette Supplement No. 46, Legislative Supplement No. 28, Legal Notice No. 59 of 4th May, 2007 being a supplementary legislation to the Factories and other places of work act, Cap 514 which was repealed. The Occupational Safety and Health Act (OSHA) 2007 (replacement of Cap 514) recommends the implementation of this subsidiary legislation. The rules provide for fire safety measures with specific focus on the following critical requirements:

- i. Safe handling and storage of flammable substances
- ii. Provision of fire escape exits
- iii. Formation of firefighting team
- iv. Functions of a firefighting team
- v. Fire safety training
- vi. Conducting fire drills

- vii. Installation, maintenance, inspection and testing of fire equipment
- viii. Documentation of a fire safety policy and
- ix. Annual fire safety audits

The operation of the proposed incinerator should comply with the provisions of this law.

Thus, in line with the

Fire Risk Reduction, rules 2007, the project proponent is required to:

- i. Provide and maintain suitable and adequate number of firefighting equipment
- ii. Establish a firefighting team
- iii. Organize training for firefighting team
- iv. Conduct annual fire drill
- v. Conduct annual fire audit

3.5.6.4 Management of Hazardous Waste

In the foregoing section, we saw that work environment protection focuses largely on protection of human beings against injury by such wastes or radiations. The Public Health Act is also concerned with the protection of human health. Section 75 of the Constitution whose purpose is protection from the deprivation of property, empowers the government to acquire property “in circumstances where it is necessary to do so because that property is in a dangerous state or injurious to the health of human beings or animals or plants.” This is the closest reference to the protection of the environment and its resources. In relation to the operation of the incinerator, the handling of diesel should be done with a lot of care to avoid any spillage because hydrocarbons are classified as being hazardous by NEMA in Kenya.

3.5.6.5 Environmental Management & Coordination Act (Waste Management) Regulations (2006)

These Regulations apply to all categories of waste as is provided for. According to the regulations, no person should dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Any person whose activities generate waste should collect, segregate and dispose or cause to

be disposed off of such waste in the manner provided for under these Regulations. Any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose of such waste in a designated waste disposal facility. Any person, whose activities generate waste, should segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority. Any person who owns or controls a facility or premises which generates waste should minimize the waste generated.

Every trade or industrial undertaking should install at its premises anti-pollution technology for the treatment of waste emanating from such trade or industrial undertaking. No owner or operator of a trade or industrial undertaking should discharge or dispose of any waste in any state into the environment, unless the waste has been treated in a treatment facility and in a manner prescribed by the Authority in consultation with the relevant lead agency. Third Schedule comprehensively deals with all requirements for operating such a facility (Incinerator) in Kenya. The schedule provides the following information:

- i. Standard for treatment and disposal of Wastes;
- ii. Standards, guidelines, criteria, procedure for installing/operating incinerators

Further to that the operator should comply with Part IV of the regulation that deals with hazardous wastes (Regulation 22 through to 32); Part VI that deals with Biomedical Wastes (Regulations 36 through 47). The facility management must observe this law strictly in the management of its waste water and sewage as well as in its operation of the incinerator by applying for the necessary licenses as provided for (*For more information, see attached EMCA (Waste Management) Regulations 2006*).

3.5.6.6 Environmental Management and Coordination Act (Noise) Regulations (2009)

The noise regulations in the country clearly state that any person who contravenes their provisions commits an offence. The provisions are as per the following table:

Table 3: First Schedule of the Regulation Provides for the Following Permissible Noise Levels

Zone		Sound Level Limits dB(A)	Noise Rating Level (NR)
		(Length-14hours)	(Length-14 hours)
		Day	Night
A.	Silent Zone	40	35
B	Places of worship	40	35
C.	Residential 1	Indoor	35
		Outdoor	35
D.	Mixed residential (with commercial some and Places of entertainment)	55	35
E.	Commercial	60	35
Time Frame			
Day	6.01 a.m. – 8.00 p.m. (Length-14 hours)		
Night:	8.01am. – 6.00 a.m. (Length-10hours)		

To avoid contravention of this law, all bottles should be opened before being put into the incinerator so as to avoid their explosions.

3.5.6.7 Fossil Fuel Emission Control Regulations 2006

These regulations are described in Legal Notice No. 131 of the Kenya Gazette Supplement no. 74, October 2006. The regulations include internal combustion engine emission standards, emission inspections, the power of emission inspectors, fuel catalysts, licensing to treat fuel, cost of clearing pollution and partnerships to control fossil fuel emissions. The fossil fuels considered are petrol, diesel, fuel oils and kerosene. To comply with this regulation, the proponent should make sure that the incinerator machine is functioning optimally as well as avoiding adulated diesel hence the need to source diesel

from reputable sources such as Shell, Total, National Oil, Delta and *Kenol Kobil* Petrol Stations to mention but a few.

3.5.6.8 Environmental Management and Co-ordination (Air Quality) Regulations, 2009

The objective of these Regulations (which were revised in 2014) is to provide for prevention, control and abatement of air pollution, to ensure clean and healthy ambient air. The general prohibitions state that; no person shall cause the emission of air pollutants listed under First Schedule (Priority air pollutants) to exceed the ambient air quality levels as required and stipulated under the provisions of the Seventh Schedule (Emission limits for controlled and non-controlled facilities) and Second Schedule (Ambient air quality tolerance limits). The project proponent should observe policy and regulatory requirements and implement the mitigation measures proposed in this document, in an effort to comply with the provisions of these Regulations, on the abatement of air pollution more so as a precautionary measure.

Under the general prohibitions (Part II), section 5 states that no person should act in a way that directly or indirectly causes immediate or subsequent air pollution. Among the prohibitions are priority air pollutants (as listed under schedule 2 of the regulations) that include general pollutants, mobile sources and greenhouse gases. Odours are also prohibited under section 9 of the regulations (offensive emissions). Emissions into controlled areas such as schools, hospitals, residential areas and populated urban centers are also prohibited. By practicing open air waste burning is leading to contravention of this law in that it is leading to production of foul odour as well as polluting the atmosphere. Hence, it is upon the project proponent to ensure that no open waste burning within the incinerator site at any time.

3.5.6.9 The Occupational Safety and Health Act, (2007)

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces. The key areas addressed by the Act include:

- i) General duties including duties of occupiers, self-employed persons and employees;

- ii) Enforcement of the Act including powers of an occupational safety and health officer
- iii) Registration of workplaces (hence the proponent needs to register the workplace of this project)
- iv) Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences;
- v) Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver
- vi) Safety General Provisions including safe storage and handling of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas
- vii) Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials

Under Section 6 of this Act, every occupier is obliged to ensure safety, health and welfare of all persons in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7). He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21). According to section 44, potential occupiers or users of any premises as work places are required to apply for registration

to the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47). In relation to fire safety, section 78 (3) requires spillage or leaks of any flammable liquid to be contained or immediately drained off to a suitable container or to a safe place, or otherwise treated to make it safe.

Furthermore, a clear and bold notice indicating that smoking is prohibited should be conspicuously displayed in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled or stored- section 78 (5). In addition, necessary precautions for dealing with fire incidents should be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom – section 81. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals. To promote health and safety of employees who are at risk of being exposed to chemical substances, section 84 (3) and 85 (4) requires every employer to maintain at the workplace Material Safety Data Sheets (MSDS) and Chemical Safety Data Sheets (CSDS) respectively for all chemicals and other hazardous substances in use and ensure that they are easily available to the employees. The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

Other precautionary measures include: issuance of a permit to work to any employee, likely to be exposed to hazardous work processes or hazardous working environment, including such work processes as the maintenance and repair of boilers, dock work, confined spaces, and the maintenance of machinery and equipment, electrical energy installations, indicating the necessary precautions to be taken – section 96 (1); provision and maintenance for the use of employees, adequate, effective and suitable P P E a n d clothing including suitable gloves, footwear goggle and head coverings in any workplace

where employees are likely to be exposed to wet, injurious or offensive substance – section 101 (1). In relation to this Act, the project proponent should provide appropriate PPE to the incinerator operators as well as provide first aid kits. It will be prudent for the project proponent to develop a fire management means or a health and safety committee be put in place. The project management should pay attention to the firefighting aspect and put in place the necessary measures needed in firefighting; this will entail but will not be limited to the following:

- i. Installing fire suppression system; and
- ii. Training incinerator personnel on firefighting;

3.5.7 Employment Act (2007)

a) General Principal

The Act constitutes minimum terms and conditions of employment of an employee and any agreement to relinquish vary or amend the terms set shall be null and void. The Act stipulates that no person shall use or assist any other person, in using forced labour. Clause 5 of the Act states that its shall be the duty of the Cabinet Secretary/ Minister, Labour officer, the National Labour Court and the subordinate labour courts to; Promote equality of opportunity in employment in order to eliminate discrimination in employment Promote and guarantee equality of opportunity for a person who, is a migrant worker or a member of the family of the migrant worker lawfully within Kenya. No employer shall discriminate directly or indirectly, against an employee or prospective employee or harass an employee or prospective employee on the following grounds; race, color, sex, language, religion, political or other opinion, nationality, ethnic or social origin, disability, pregnancy, mental status or HIV status. An employer should pay his employees equal remuneration for work of equal value.

b) Part IV Rights and Duties of Employment

The provisions of this part and part VI constitute basic minimum and conditions of contract of service. The employer shall regulate the hours of work of each employee in accordance with provisions of this Act and any other written law. Subsection (2) of section 27 states that an employee shall be entitled to at least one rest day in every period of seven days. An employee shall be entitled to not less than twenty-one working days of leave after every twelve consecutive months. The incinerator operators should be allowed to be off duty during the weekends where possible.

c) Maternity Leave

Section 29 of the Act stipulates that a female employee shall be entitled to two months maternity leave with full pay and an employer who has paid a female employee wages for two months during her maternity leave shall be reimbursed by the National Social Security Fund, the equivalent of wages paid by the employer during maternity leave or a lesser amount as may be determined by the minister in rules made by the minister for that purpose. Subsection 8 of section 29 further states that no female employee should forfeit her annual leave entitlement on account of having taken her maternity leave.

3.5.8 Work Injuries Benefits Act (2007)

i. Obligations of Employers

Section 7 of the Work Injuries Benefits Act (WIBA) stipulates that every employer shall obtain and maintain an insurance policy, in respect of any liability that the employer may incur under this Act to any of his employees. Hence the project proponent is advised that it obeys the provisions of WIBA in relation to the operation of the incinerator.

ii. Employer to Keep Records (Section 9)

Section 9 states that an employer shall keep a register or other record of the earnings and other prescribed particulars of all employees and produce the same on demand by the director for inspection. Such records should be retained for at least six years after the date of last entry. Thus all records in relation to the operation of the facility should be well kept and maintained.

iii. Reporting of Accidents

A written or verbal notice of any accident shall be given by or on behalf of the employee concerned to the employer and a copy to the Director of Occupational Health and Safety within twenty-four hours of its occurrence in case of fatal accident. In case of any accidents, the rules should be applied to the latter. And that is why the incinerator operators under the supervision of the incinerator manager should keep proper records including those of any incidents.

3.5.9 National Construction Authority Act, 2011

Section 5 of the Act stipulates the mandate of the National Construction Authority (NCA) which is to oversee the construction industry and coordinate its development. Section 5 subsection 2 part (f) states that the authority shall provide consultancy and advisory services with respect to the construction industry; part (g) promote and ensure quality assurance in the construction industry; part (k) accredit and register contractors and regulate their professional undertakings; (l) accredit and certify skilled construction workers and construction site supervisors; (m) develop and publish a code of conduct for the construction industry; and (n) do all other things that may be necessary for the better carrying out of its functions under the Act. Hence it is upon the project proponent to ensure that the construction of the incinerator shelter is registered with NCA and supervised by the NCA during its construction so as adhere to the provisions of the Act.

3.6 COVID-19 Regulations/ Guidelines and Frameworks

The proponent shall adhere to all regulations, guidelines and frameworks that have been formulated to prevent the spread of the infectious COVID-19. The Kenyan government through the relevant ministries has developed COVID-19 management regulations, guidelines and frameworks touching on the environment and social spheres. The proponents stand guided by all the guidelines and regulations issued by the government of Kenya through the line ministries as well as the guidelines developed by the World Bank Group. The key objective of these regulations and guidelines is to stop the spread of COVID-19 and contain the pandemic. The list below highlights the applicable regulations and frameworks that should be adhered to during project implementation so long as the

COVID-19 pandemic is ongoing and the government and the WBG have not advised otherwise.

- i. The Public Health (Covid-19 Restriction of Movement of Persons and Related Measures) Rules, 2020;
- ii. ESF/Safeguards Interim Note: Covid-19 Considerations in Construction/Civil Works Projects;
- iii. Labour Management Procedures by Ministry of Health of Kenya;
- iv. Infection Control and Waste Management Plan (ICWMP)

3.7 Treaties

A treaty is a binding agreement under International Law concluded by subjects of International Law, namely states and international organizations. Treaties can be called by many names including; International Agreements, Protocols, Covenants, Conventions, Exchanges of Letters, Exchanges of Notes, etc. However, all of these are equally treaties and the rules are the same regardless of what the treaty is called. Treaties can be loosely compared to contracts; both are means of willing parties assuming obligations among themselves, and a party to either that fails to live up to their obligations can be held legally liable for that breach. The central principle of treaty law is expressed in the maxim *pacta sunt servanda*, translated as "pacts must be respected." Kenya has ratified the following Project-relevant international conventions:

3.7.1 United Nations Framework Convention on Climate Change

The UNFCCC sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 191 countries having ratified. Under the Convention, governments:

- I. Gather and share information on greenhouse gas emissions, national policies and best practices;

- II. Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and
- III. Cooperate in preparing for adaptation to the impacts of climate change.

The Convention entered into force on 21 March 1994. Kenya signed the UNFCCC on 12th July 1992, ratified it on 30th August 1994 and started enforcing it on 28th November 1994. The project proponent should observe the above convention in all its operations throughout the project cycle and especially reducing the releasing of greenhouse gases by avoiding open burning of waste by fully operationalizing the incinerator.

3.7.2 Kyoto Protocol

According to a press release from the United Nations Environment Programme (UNEP):

"The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that were expected by 2010 without the Protocol, this target represents a 29% cut). The goal was to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008- 12."
(http://en.wikipedia.org/wiki/kyoto_protocol)

Compliance with this convention will largely inform the technical and environmental evaluation of the project if any additional funding may be required in future. There is thus a necessity that proper adherence to minimal emission levels of greenhouse gases be ensured during the operational phases of the project, which could be achieved if the project proponent fully operationalizes the incinerator, avoids operating the incinerator when its faulty and repairing it fast enough to avoid open burning of wastes.

3.8 World Bank Safeguard Policies Triggered by the Project

The WB's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies

provide guidelines for Bank and borrower staffs in the identification, preparation, and implementation of programs and projects. The Safeguard policies also provide a platform for the participation of stakeholders in project design and have been an important instrument for building a sense of ownership among local populations. In essence, the safeguards ensure that environmental and social issues are evaluated in decision making, help reduce and manage the risks associated with a project or program, and provide a mechanism for consultation and disclosure of information. The WB has 10 key operational policies although for the Kenya Health Sector Support project only 2 policies were triggered that is OP/BP 4.01 on Environmental assessments and OP/BP 4.10 on Indigenous People.

3.8.1 Environmental Assessment Operational Policy OP 4.01

Environmental Assessment (EA) is used in the WB to identify, avoid, and mitigate the potential and actual negative environmental impacts associated with Bank lending operations. In WB operations, the purpose of EA is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. It helps ensure the environmental and social soundness and sustainability of investment projects as well as support integration of environmental and social aspects of projects in the decision-making process. As indicated at the beginning of this report, the proposed incinerator project was assigned environmental category B hence implementation of the incinerator project triggered the Environmental Assessment Operational Policy OP 4.01. This means that before implementation, the incinerator project should be subjected to an ESIA as is the case with this report. The ESIA is meant to ensure that due diligence in the application of safeguards during installation and to plan for mitigating and/or addressing of any potential and actual adverse risks during the operational phase of the incinerator project. As per the ESIA, the incinerator has minimal negative impacts to the environment and people, which can be mitigated successfully as **it is categorized under category B under WB Categorization criteria**. But the incinerator project proponent is adhering to this OP by subjecting the incinerator project to ESIA, disclosure will be done in due course, that

review will be done as per the provisions of EMCA (Amendment) 2015 and that the proponent will implement the ESMP as contained in this ESIA report and as advised by NEMA.

3.8.2 OP/BP 4.10 (Indigenous Peoples)

This policy contributes to the Bank's mission of poverty and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies and cultures of indigenous peoples. For all projects that are proposed for Bank financing and affect indigenous peoples, the Bank requires the borrower to engage in a process of free, prior, and informed consultation. The broad support of the project by the affected Indigenous Peoples such as Bank-financed projects includes;

- (i) Preventive measures to adverse effects to the indigenous cultures and practices
- (ii) Avoiding potential and actual adverse effects on the Indigenous Peoples' communities
- (iii) When avoidance is not feasible, minimize, mitigate, or compensate for such effects.

Bank-financed projects are also designed to ensure that the Indigenous peoples receive social and economic benefits that are culturally appropriate and gender and inter-generationally inclusive. The objective of this policy is to design and implement projects in a way that fosters full respect for Indigenous Peoples' dignity human rights and cultural uniqueness and so that they receive culturally compatible social and economic benefits and do not suffer adverse effects during the development process. Via consultation of members of the public living around the incinerator site, it was established that the incinerator implementation is expected to create various job opportunities to the locals while it's expected that the project proponent will be involved in grading the roads leading the project site regularly.

3.8.3 World Bank's Environmental, Health and Safety Guidelines

Under its "General EHS Guidelines (April 30, 2007)", the WB has several guidelines that include the following:

- i) EHS Guidelines - Air Emissions and Ambient Air Quality
- ii) EHS Guidelines - Waste Management
- iii) EHS Guidelines - Health Care Facilities
- iv) EHS Guidelines - Hazardous Materials Management
- v) EHS Guidelines - Construction and Decommissioning

The WB EHS “Air Emissions and Ambient Air Quality” guidelines require projects with “significant” sources of air emissions, and potential for significant impacts to ambient air quality to prevent or minimize impacts by ensuring that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards (or in their absence, the current WHO Air Quality Guidelines, or other internationally recognized sources). Kenya currently has the 2014 national air quality regulations applicable to this incinerator project. The standards, however, make no mention of dioxins which are potent cancer-inducing, expected in incineration emissions. But to be noted is that, the proposed incineration unit is a “no significant” source since it is not expected to have the capacity to generate high levels of air pollutants if well maintained and properly managed as per the operation procedures given in this report. The WB EHS “Waste Management” guidelines apply to both non-hazardous and hazardous waste. They advocate for waste management planning where waste should be characterized according to: composition, source, types, and generation rates. This is essential for the project proponent in relation to operation of the incinerator project since there is a need to segregate the different categories of waste to be handled by the incinerator. These guidelines call for implementation of a waste management hierarchy that comprises prevention, recycling/reuse; treatment and disposal. The guidelines require segregation of conventional waste from hazardous waste streams and if generation of hazardous waste cannot be prevented (as is the case in hospitals); its management should focus on prevention of harm to health, safety and environment. The Guidelines recommend monitoring to include:

- i) Regular visual inspection of all waste storage, collection and storage areas for evidence of accidental releases and to verify that wastes are properly labelled and stored.
- ii) Regular audits of waste segregation and collection practices.
- iii) Tracking of waste generation trends by type & amounts, preferably by facility departments.
- iv) Keeping manifests or other records that document the amount of waste generated and its origin.
- v) Periodic auditing of third party treatment and disposal services including re-use and recycling facilities/processes when significant quantities of hazardous wastes are managed by third parties. Whenever possible, audits should include site visits to the treatment, storage and disposal location.

3.9 The Constitution of Kenya, 2010

The provision for legal and institutional mechanisms is one of the basic conceptual tools for environmental management. Further, considering that the environment supports life, it requires protection that is stable and can only be changed, if necessary, by a special and substantial majority. These Constitutional provisions for environmental management are not new, and already exist in other countries. Environmental provisions were outlined, albeit superficially, in the previous constitution of Kenya. The current constitution's innovation is the presentation, in greater detail, of obligations in respect of specific natural resources, as well as the human aspects of environmental management. Environmental provisions are included in Chapter Four, under 'Rights and Fundamental Freedoms', Chapter Five, under 'Environment and Natural Resources', and Chapter Ten, under 'Judicial Authority and Legal System'. The Fourth Schedule also includes environmental provisions under 'Distribution of functions between National and County Governments' and the Fifth Schedule titled 'Legislation to be enacted by Parliament'.

In relation to the incinerator project, it can be taken as the right step in constructing and operationalizing it because its operationalization is likely to lead to the conservation of our natural resources such as water bodies and land/soil as well as ensuring a clean

environment for all. This is because proper incineration of especially hazardous waste means that it doesn't find its way into water bodies or even agricultural land hence not polluting them. It should also be noted that proper incineration of waste leads to reduced atmospheric pollution that can arise from open burning of waste.

3.10 Compliance with Prudent Environmental Management

An analysis of the various environmental laws in Kenya shows that, at disposal to the project proponent are clear laws providing guidance on the best way to manage the environment and its resources. By not adhering to any cannot be an excuse of causing environmental degradation. It should be noted that, ignorance is no defense in a court of law. Hence, the project proponent is advised to acquaint itself with the provisions of all laws that may touch on its operations and specifically operation of the incinerator, one of them being the application for license from NEMA to operate the incinerator as per the provision so the Waste Management Regulations of 2006.

CHAPTER FOUR

4.0 BASELINE INFORMATION

4.1 Introduction

This section describes the major elements of the project area's environment, encompassing the physical, biological and social environment as well as the condition of the proposed project site. The information presented in this section is based on observation of the project area by the consultants as well as information from secondary literature.

4.2 General Location

The proposed project will be located in Mavoko sub-county which covers an area of 693 km sq. stretching from KAPA/ Airport area where it borders with Nairobi County, and covers Katani, Ruai, Kangundo Road through Muthwani-Lukenya, Makutano(Kyumbi) to the east where it boards Machakos Town. It covers Kapiti Plains to the south west towards Kitengela area where it borders with Kajiado County then to Embakasi in Nairobi County and it is located 1° 27' 0" S, 36° 59' 0" E.

4.3 Project Location

The proposed project site is located in Kinanie area ,Kinanie Ward,Mavoko Sub-County, in Machakos County. The proposed commercial incineration plant will be located on LR .NO.23961,Off Mombasa Road, Off Athi-River–Kinanie Joska Road.The proposed site is 14 km from Devki steel Mills Limited .The neighbours adjacent to the proposed site are a few residential dwellings some belonging to EPZA staff, EPZ Waste treatment works, Synergy waste processing facility ,leather city and a 40 acre piece of land.

4.4 Physiography:

The Kinanie area falls within the general dissected Kapiti Plateau at an altitude of 1400m asl. The site is gently undulating plateau with an east-facing slope of between 1 to 2 %.

4.5 Geology and Soils:

Geology for the Kinanie area has been described based on available documentation and reports [Sombroek; et al, 1982]. The Kapiti plateau is underlain by volcanic rocks of the

deriving from the Cenozoic era which, in geo-chronological order, consists of the following formations:

- ❖ Upper Athi Series
- ❖ Kapiti Phonolites
- ❖ Basement System

Upper Athi Series: The Upper Athi Series forms part of the extensive Athi tuffs and lake beds deriving from consolidation of fragmental volcanic material which was deposited shallowly into water after eruption. Geaverts, 1964, classify the series as all the sediments and tuffs lying between the Nairobi and the Kapiti phonolite and include beds of the Kerichwa Valley series where the phonolite and trachytes are absent. The extensive occurrence of the series in the area indicates the former presence of an extensive swampy country. The Upper Athi series consists mainly of sandy sediments, tuffs and welded tuffs, with clays being subordinate.

Kapiti Phonolite: Wherever the contacts of the Kapiti Phonolite are present, the unit underlies associated volcanic rocks and is consequently the oldest lava of the succession. The rock is distinctive in hand specimens by its large white crystals of feldspar and waxy-looking nephelines which are set in a fine grained dark green to black or dark bluish-grey groundmass. This is the oldest lava flow in the area and lies directly on the Basement. The Kapiti phonolite is exposed in the valleys of Athi River, Stony Athi, Mbagathi and along Kitengela River.

Rocks of Mozambique Belt: These are crystalline rocks of Precambrian age which are exposed in the south west of Kitengela where the volcanic cover has been removed by erosion. They are predominantly biotite gneises, frequently migmatitic and rich in hornblende. Soil data for the project site is based on a previous description of the Machakos

district based on Jaetzhold and Schmidt (1983). Local soils are mainly pellic Vertisols which are basically imperfectly drained, very deep, dark grey to black, friable soils but underlain by cracking clays at 50cm depth.

4.6 Climate

4.6.1 Rainfall

Annual rainfall follows a double maxima pattern with “long rains” falling from March to May and “short rains” from October to December. In terms of rainfall content, April, May and November are the wettest months accounting for over 54% of the annual rainfall inputs. The period October to January however promises some favourable moisture regime which is only separated from the long rains by a bare 2 month drought. The short rain season is thus the most viable for establishment of rain fed investment. On the contrary, the long rains are followed by a long dry season lasting June to September during which, moisture limitation poses a major constraint to ecological productivity. Overall, analysis of moisture indices indicates that the area generally suffers a moisture deficit.

4.6.2 Temperature

Mean monthly temperatures vary between 18^oc and 25^oc. The coldest month is July while October and March are the hottest.

4.7 Flora

The vegetation of the area is originally savannah bushland dominated by Acacia /Commiphora trees in association with Themeda triandra grass. Overtime, the original woodlands have been thinned out to create generally open savannah grassland devoid of trees. During the site visit the environmental experts noted that a few acacia trees were growing at the site which will be cleared to pave way for the proposed incineration plant.

Acacia trees growing within the site



4.8 Fauna

Generally, the area around the project site does not support diverse fauna species. It is open, dry with very low vegetation cover making it unsuitable for inhabitation. However, few species of birds and butterflies were observed in the wider area (within the site and outside of it).

4.9 Hydrology and Drainage

The Kinanie site proposed for development of the proposed incineration plant is situated within the drainage of the Mbagathi tributary of Athi River. Downstream of Kinanie, Mbagathi joins the Stony Athi to form the Athi River which is later on joined by the Nairobi river upstream of Donyo Sabuk and later receives the Kaiti/ Thwake System and the Tsavo River upon which it continues flow as the Galana and later enters the Indian Ocean North of Malindi as the Sabaki. Mbagathi tributary therefore, is among the major contributors of flow which sustains economic and ecological systems in downstream areas of Drainage Basin Three. Specifically, the Athi River downstream of Donyo Sabuk traverses semi-arid country in Machakos, Kitui, Makueni and Kilifi Counties where it provides a critical lifeline as a source of water for domestic and agricultural use in addition to supporting wildlife and tourism in the Tsavo National Park while the Baricho well field supplies the bulk of water consumed in Malindi, Kilifi and parts of North Coast Mombasa.

4.10 Land Use and Livelihoods:

The Kinanie area has all features of a newly settled area;- barbed wire fence around properties, immature exotic trees especially around hedges and many yet to be developed

land parcels. For those that are settled, agro-pastoralism entailing keeping of local livestock breeds supplemented both rained and irrigated agriculture are the main means to livelihood. Other economic drivers in the area include trade at Kinanie Market, irrigated commercial horticulture and employment in horticultural farms such as Waridi Ltd.

4.11 Population and Settlement Patterns

The entire Kinanie Division is formerly a Group Ranch owned by the Lukenya Ranching and Housing Cooperative Society that used to specialize in dairy, sisal and irrigated agriculture along the Mbagathi River. The Ranch was later subdivided into 5---40 acre plots and allocated to members some of whom have further sub divided and sold off their land. Going by the 2009 National Population Census, Kinanie location had a population of 7,069 people distributed in 214 households in a land area of 129.3 square kilometres.

4.12 Energy Resources

Different types of energy sources are in use in the project area and include electricity, firewood, charcoal, kerosene, gas and biogas. Electricity and gas are the most commonly utilized energy sources both for domestic and commercial purposes. The proposed project area is served by electricity and hence that will be the source of energy for the project..

4.13 Public Health and Safety

The project area is in a rural set up and therefore has little social amenity facilities. The area has no any health facilities. The residents rely on Kinanie health centre which is 6 kilometers from the proposed project site. The area is served by Athi River Police Station which is approximately 7 kilometers from the site. There is no fire station in the area. Residents in the area rely on borehole for potable water supply. Some residents downstream in Kangemi Village within Kwa Mboo sub-location use water from River Athi for domestic purposes. The river water is also used for livestock as well as for subsistence irrigation farming.

Toilets are mainly pit latrines with very few dwellings appearing to have inside flush toilets.

4.14 Physical Infrastructure

4.14.1 Road and Transport Network

The project area can be accessed using an earth road approximately 14 kilometers from Mombasa Road turn-off near Athi River Township. The earth road is in a poor state of repair and is not easily passable during rainy season. There are no public transport vehicles in the project area.

4.14.2 Power Supply

Kinanie area is served by several three-phase electricity which serve the neighbourhoods including, homes, market, schools, boreholes and other facilities.

4.14.3 Utilities: Water and Sewerage:

The dominant infrastructure at Kinanie is the sewerline and sewage treatment plant operated by the EPZA. Water supply to Kinanie is mainly from community and privately owned boreholes.

4.14.4 Public Amenities

Kinanie is currently served by 8 schools out of which, 2 (a primary and secondary school) are public sponsored and though the area does not have a single public college, the daystar University is situated within the Ward.

CHAPTER FIVE

5.0 PROJECT ALTERNATIVES

5.1 Overview

The team analyzed the project alternatives in terms of project site, technology and waste management options. The findings and recommendations are based on the proposed site materials and the proposed technologies to be used in implementation of the proposed project.

5.2 Site Alternatives

5.2.1 Current site

The team examined the current site on account of prevailing environmental parameters. It was established that the site is away from any sensitive or fragile ecosystem such as surface water sources, forest or nature conservatives.

Currently, the proposed project site is undeveloped. The proponent has an opportunity to establish the commercial incineration plant and manage environmental impacts as far as practicable.

5.2.2 Alternative site

At present, the proponent does not have an alternative site. Therefore, no alternative site was considered in this study. The EIA consultants however carried out an evaluation within the project area, taking records of observation. The evaluation was based on how the proposed project was likely to affect the neighbouring community and land uses. Other factors considered during the evaluation included topography and accessibility.

5.3 Alternative Building Designs

Various professionals (including the Architect, Construction Engineers, Land Surveyors and the Environmental Consultants) were involved during the planning stage of the project. After extensive discussions, the various options were assessed and the optimal design, materials and technology were selected that best fulfilled the project needs. The proposed project design was selected, because it was able to meet all the requirements.

5.4 Alternative Construction Materials and Technology

The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors.

Heavy use of timber during construction is discouraged because of massive destruction of forests. The exotic species would be preferred to indigenous species in the construction where need may arise. However, this will require very little timber. The proponent should consider installing solar panels so that solar energy is also used as an alternative.

5.5 Waste Management Alternatives

During construction waste from project construction activities will include, debris, human related wastes, worn out tires and plastic containers. The team recommends the construction of lavatories to manage human waste from the construction staff, stone waste and loose soil be heaped together and sold for footpath construction and a reserve for use in landscaping the site.

5.5.1 Liquid waste

a) Connection to the sewer system

The possibility of a connection to a sewer system was explored. The experts noted that the area is currently served by the EPZA sewer line.

b) Septic tank system

The study team examined the option of constructing septic tanks. This involves the construction of underground concrete-made tanks to store the sludge with soak pits.

This option requires regular monitoring and record keeping ensuring timely exhaustion in order to avoid leaks and spills.

c) Bio-digesters

The team examined this option and noted that it is an environmentally friendly alternative and can be used for wastewater recycling. Methane is also produced through this option, widening the energy options.

d) Constructed wetland

This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant species on the site will also be required to avoid weed biological behavioral problems. Hence it is not the best alternative for this kind of project.

e) Wastewater treatment plant

This refers to the use of a series of ponds/lagoons which allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly. No chemicals are used/heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds in case of failure of the system.

Lagoon systems is usually comprising open ponds. Selection of this alternative would require close monitoring to avoid air pollution (offensive odour), overflowing during rainy season and subsequent proliferation of vermins and rodents in the project area.

The team recommended that the proponent should seek a connection to the EPZA sewer line as this would solve the effluent management issue at a very minimal cost and in environmentally efficient manner.

5.5.2 Solid waste

The proposed project will generate considerable amounts of solid wastes both during construction and operational phases. An integrated solid waste management system is recommended. The proponent will give priority to reduction of the materials at source. This option will demand a solid waste management awareness programme in to be effected by the management and the entire workforce. In addition to that recycling, reuse and composting of waste will be an alternative in priority. This issue calls for a source separation programme to be put in place-the proponent/ building management should introduce separate and adequately marked skips/ dustbins for sorting the recyclable wastes, organic matter and the other waste.

The recyclable will be sold to waste buyers within the Machakos County and surrounding areas, organic matter could be sold to farmer for food or for use as compost while the rest can be taken to an approved dump-site/ sanitary landfill i.e. ash that will be generated by the incinerator. The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy. Finally, sanitary land filling will be the last option for the proponent to consider.

a) Contracting private waste handlers

The team surveyed the possibility of commissioning waste handlers from the private sector to dispose of the waste.

b) Recycling

The study team analyzed the practicability of implementing this option. Waste segregation is a requirement through providing labeled waste-specific litterbins. The study team recommended that the proponent contracts the services of NEMA-registered private waste handlers.

c) Landfill

Upon gauging this option for its viability, the team noted that the possibility of using this option requires adequate land to be used.

5.6 Alternative Schedule

The team examined the option of having an alternative schedule. This option entails carrying out the project proposal at a later time thus offsetting its impacts to that time. The only benefits that would be accrued by undertaking it at a later date would be depended on the improvements in baseline conditions and technologies that may be involved with the proposal. However these are not guaranteed and it may only lead to delays in development, therefore carrying out the proposed project with mitigation would be a preferred option due to this uncertainty. In addition carrying out the proposed project at later time may lead to more operational and logistic costs due to increasing inflation and standards of living.

5.7 The 'No Project Alternative'

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

- a) Discouragement for investors
- b) There will be no incinerator installation yet there is acute need for such facility within Machakos County.
- c) Land will still remain idle
- d) No employment opportunities will be created for Kenyans bearing in mind that the proposed project will have employment opportunities both directly or indirectly during construction and operations phases and thus improve lifestyles and livelihoods
- e) Local skills would remain under utilized

- f) Development of infrastructural facilities (energy facilities, roads, electrical etc. will not be undertaken
- g) Vision 2030 will be far from being achieved/ attained bearing in mind that this is one of sector which need infrastructural improvement to gear the nation towards realization of vision 2030.

From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, and the government of Kenya.

5.8 Comparison of alternatives

The proposed project is the best alternative since it will provide hazardous waste management facility within Machakos County. In addition to this the facility will lead to revenue for the proponent and the government, improvement in service (hazardous waste) delivery and will create employment opportunities for more people.

CHAPTER SIX

6.0 CONSULTATION AND PUBLIC PARTICIPATION

6.1 Overview

Introduction

Consultative Public participation (CPP) process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated in EMCA CAP 387 section 58, on Environmental and social Impact Assessment for the purpose of achieving the fundamental principles of sustainable development. CPP basically entails engaging members of the public to express their views about a certain project. Public participation tries to ensure that due consideration will be given to public values, concerns and preferences when decisions are made. If well conducted CPP is beneficial in various ways:

- a) Obtains local and traditional knowledge that may be useful for decision-making;
- b) Facilitates consideration of alternatives, mitigation measures and tradeoffs;
- c) Ensure that important impacts are not overlooked and benefits are maximized;
- d) Reduce conflict through the early identification of contentious issues;
- e) Provide opportunity for the public to influence project design in a positive manner;
- f) Improve transparency and accountability of decision-making; and
- g) Increase public confidence in the EIA process.

6.1 Objectives of the consultation and public participation

The specific objective of the consultation and public participation were to:

Inform the stakeholders about the project with Special reference to its key components and location.

- i. Incorporate the information collected in the ESIA report
- ii. Explain to the neighbors the nature of the proposed project, its objectives and scope;
- iii. Gather comments, suggestions and concerns of the interested and affected parties about the project.
- iv. Give neighbors an opportunity to present their views, concerns and issues regarding the Proposed incinerator Development
- v. Obtain suggestion from neighbors on possible ways that they fill potential negative impacts can be effectively mitigated.

6.2 Methodology used in Public Consultation

The exercise was conducted by a team of experienced registered environmental experts. Stakeholders' participation forms were distributed to the project neighbors as key stakeholders. Consultation meetings were held in order to gauge the attitudes of the local community towards the proposed incinerator. Consultative meetings were held including a courtesy call to Assistant Chiefs office. Detailed outcomes of each meeting are discussed in the next clauses.

6.3 Issues raised

The stakeholders consulted gave both positive and negative views. They also suggested the mitigation measures that the proponent and other relevant authorities could do to address such concerns.

6.3.1 Positive Issues

- a) The project contribute to improved health and at the same time promote economic growth to the company as well as the county and national governments through revenue and job creation.
- b) The project is a waste management facility hence will promote environmental conservation.
- c) The project will spur other similar projects which may come up in the County.
- d) The project will encourage other investors to consider investing in Machakos County.

6.3.2 Negative Issues

The public consulted also raised negative issues which they anticipate the project will create hence should be mitigated:

- a) Increased demand for available social amenities and other services
- b) Noise pollution during installation and operation
- c) Waste generation by the project.
- d) Air pollution may occur during the operation phase.
- e) Occupation safety and health concerns during operation Phase

6.3.3 Suggestions by respondents

- a) The Proponent should ensure proper environmental management practices are put in place.
- b) Noise pollution should be controlled during installation and operation phases.
- c) The incinerator installed should be installed properly to ensure minimal or no particulate matter is released to the atmosphere.

- d) The proponent should consider employing casual workers from the local areas during construction and operation phase of the project to promote the host community

CHAPTER SEVEN

7.0 PROJECT IMPACTS AND MITIGATION MEASURES

7.1 Introduction

The ESIA sought to find out the environmental compatibility and performance of the proposed incinerator. In assessing the facility in relation to the environment and socio-economic aspects, the ESIA delved into various parameters that define environmental performance of such a facility in the face of delicate environmental resources use. The parameters were divided into *hard* and *soft* issues based on the effect of implementing and operating such a facility to the environment.

Through the EIA, the experts endeavored to ensure that applying the aims and objectives incorporated in the following statements optimizes the development potential of the proposed project. These statements include: -

- 1) To maximize the social, economic and ecological benefits of the project,
- 2) To minimize the social economic and ecological costs of the project,
- 3) To ensure that the functioning of vital ecosystems or critical habitats is not irreversibly disrupted,
- 4) To ensure that where damages or costs occur, every reasonable measure is taken to ameliorate or compensate for such damages or costs.

To achieve the aims and objectives, the environmental experts applied the principles of integrated environmental management. The overall evaluation of the impacts associated with the project has been carried out using the principals of efficiency, equality, safety and sustainability.

7.2 Potential Construction Phase Impacts

The Construction phase is also associated with various positive and negative impacts. The potential negative impacts are as discussed below:

7.2.1 Potential Effect to Air Quality

Vehicular/equipment engine exhaust emissions are a potential source of impacts to air quality, though they will be minor and temporary during construction. Air quality impacts will be temporary during construction. The project will generate moderately significant vehicle trips to the area. Vehicular and equipment exhaust emissions during project operations will, thus, have a minor incremental/cumulative impact locally and regionally. Particulate matter (dust particles) would be generated by grading, excavation and the movement of construction vehicles. It is not possible to accurately estimate the particulate concentration that might occur at the site because it is dependent on meteorological conditions and soil moisture. But all the same, mitigation measures need to be put into place. Proposed mitigation measures include:

- a) Vehicle speeds in and around the construction area will be limited to minimize dust in the area.
- b) Discourage idling of vehicles i.e. vehicle and equipment engines will be turned off when not in direct use to reduce exhaust emissions.
- c) Regular maintenance of construction plant and equipment
- d) The management will sensitize the employees on sound environmental management.
- e) Provide Personal Protective Equipments (PPE) such as nose masks to the workers on site
- f) The construction contractor will water the site with exposed soil surfaces twice each day during dry weather.

7.2.2 Increased Water Demand

Water is a major concern especially in construction sites. The proposed development will most likely cause strain to the existing water supply in the area, which will have a direct impact to the main water supply especially if the supply remains constant. This calls for proper mitigation measures to be put into place.

Hence proposed mitigation measures include the following:

- a) Avoid wasting the water supplied to the site.
- b) Encourage water reuse/recycling during both construction and operational phases.
- c) In order to encourage water conservation during operational phase the proponent should install water conserving taps that turn off automatically when water is not in use.
- d) Encourage proper water management systems.

7.2.3 Potential Effects due to Increased Power Demand

It is expected that there will be high power consumption especially during occupation phase. The proposed development will be connected to the existing power line and this might strain this resource. However the contractor, construction workers and the eventual occupants will be encouraged to conserve energy and to use energy conserving appliances as much as possible. Energy conservation involves proper use of electrical appliances, lighting systems and other electrical gadgets utilized for different purposes. Thus, the proposed mitigation measures are as stated below:

- a) All electrical appliances should be switched off when not in use.
- b) Put off all lights when not in use.
- c) Use energy conserving electric lamps for general lighting.
- d) Utilize natural light inside buildings to avoid using electricity for lighting during the day.
- e) Explore the use of solar and wind energy especially for site security lighting during the night

- f) Create awareness among workers by use of stickers on the need to conserve energy

7.2.4 Potential Impacts due to Effluent Generation

Effluent generation and its management are another challenge related to implementation of the proposed project. It is common for developers to begin construction of projects without planning on how effluent will be disposed appropriately; hence waste water (raw sewage) is either channelled to a river, or disposed carelessly. Some are poorly constructed, are of inadequate capacity, make use of low quality structural materials which leads to leakage of sewage to the underground water hence posing a dangerous health risk to the living organism including man. However, the proposed project deviates from this norm and hence, has integrated effective waste water handling system in to its designs. It is also recommend that:

- a) All liquid wastes to be disposed of properly by connecting to the EPZ sewer line system to be constructed
- b) Construction of the drainage system to be under the supervision of the structural engineer
- c) Provide mobile toilets to construction workforce

7.2.5 Potential Impacts in Relation to Occupational Health and Safety

The immediate neighbours and workforce involved would be more subjected to these environmental hazards such as falling debris or materials, dust, vehicle accidents, falling from high areas, open pits etc. Food for the construction workforce is usually provided by mobile individuals who usually operate without licenses. This can compromise health of the workers especially if foodstuffs are prepared in unhygienic conditions. To ameliorate against the above, the proposed mitigation measures include:

- a) All workers should be provided with full protective gear. These include working boots, overalls, helmets, goggles, earmuffs, masks and gloves.
- b) Construction crew at the site to be sensitized on social issues such as drugs, alcohol and diseases.
- c) A first aid kit should be provided within the site. This should be fully equipped at all times and should be managed by qualified person.
- d) The contractor should have workmen's compensation cover. It should comply with workmen's compensation Act, as well as ordinances, Regulations and Union Agreements.
- e) Adequate sanitary facilities should be provided and standard cleanliness maintained.
- f) Food handlers preparing food for the workers at the site should be controlled and monitored to ensure that food is hygienically prepared.
- g) The construction site should be well scaffolded to take care of falling materials
- h) Control the speed of vehicles in and around the project site

7.2.6 Impacts in Relation to Surface Drainage

Good drainage system is used to prevent land near human settlement from becoming saturated with water which collects or accumulate/flood after a downpour or from other sources. Poor drainage causes dampness to building structures as well as water stagnation. Dampness is influenced by poor drainage, in the presence of warmth and darkness, breeding grounds for malaria and other diseases can be directly traced to it. Hence, proper drainage of the general property/premise comes in handy to enhance effective flow of the much-anticipated surface run-off emanating from the roof catchments and other newly pave areas within the site. To prevent bad effects of poor drainage, the following mitigation measures are proposed for this project:

- a) During construction, the design of the drainage system should ensure that surface flow is drained suitably into the public drains provided to control flooding within the site.
- b) Drainage channels should be installed in all areas that generate or receive surface water such as drive ways and along the building block-edges of the roofs.
- c) Channels should be covered by approved materials to prevent occurrence of accidents and entry of dirt that would compromise flow of run-off.
- d) Drainage channels should ensure safe disposal of run-off/surface water & should be self-cleaning.
- e) Paving of the side walkways, driveways and other open area should be done using pervious materials to encourage recharge and thus reducing water run-off volume.
- f) All rain water from the roofs should be harvested so as to reduce on amount of run-off

7.2.7 Potential Impacts due to Solid Waste Generations

Solid waste will be generated both during construction and operation phases of the project. This will include metal cuttings, rejected materials, excavated materials, paper bags, empty cartons, broken glass among other materials from a construction site. Solid wastes if not well managed have a potential of causing disease outbreaks due to the creation of suitable breeding conditions from various pathogens. To avoid occurrence of such effects, recommended mitigation measures include:

- a) The contractor or the proponent should be ready to facilitate proper waste management and disposal from the site. The resulting debris could be collected, transported and disposed off at suitably NEMA approved dumpsites.
- b) It is recommended that land excavation and construction waste be recycled or reused to ensure materials that should be disposed off as waste are diverted for

productive use. In this regard the proponent is committed to ensuring that construction materials left over at the end of construction should be recovered for refurbishing and use in other projects. Such measures should involve the sale or donation of such recyclable/reusable materials to construction companies, local community and residents.

- c) Any disposal should be by a NEMA licensed person/company at a NEMA approved site

7.2.8 Potential Noise Pollution

Activities related to the project implementation can lead to noise, which is the unwanted/undesirable sound that can affect job performance, safety and health, of especially those residing around the project site. This can lead to psychologically related effects of noise that include annoyance and disruption of concentration. Physical effects may include loss of hearing, pain, nausea and interference with communications if the exposure is severe. The proposed project is expected to generate noise during construction period. Since the proposed site is located within a residential area though sparsely populated, there should be a clear guideline on the working hours whereby construction work should be carried out strictly during the day. Other proposed mitigation measures include:

- a) Construction works should be carried out only during the specified time of 0800-1700hrs.
- b) Machineries should be maintained regularly to reduce noise resulting from friction.
- c) There should not be unnecessary honking of the involved machinery
- d) Provision of bill boards at the construction site notifying of the construction activity and timings
- e) Sensitize drivers of construction machinery on effects of noise.

- f) Billboards will be suitably erected on the start of the project to psychologically prepare the people in the vicinity.
- g) Workers in the vicinity of high-level noise to wear safety and protective gears.
- h) Provide barriers such as walls around site boundaries to provide some buffer against noise propagation.
- i) The proponent should comply with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.

7.2.9 Potential Increased Run Off

Construction works and paved roads could result in additional run off through creation of impervious areas and compaction of soils. Impervious areas and compacted soils generally have higher runoff coefficients than natural areas and increased flood peaks are a common occurrence in developed areas. Increased runoff from paved grounds and expansive roofs causing extreme flooding and overflows of drainage system shall be mitigated via the following:

- a) Surface runoff and roof water shall be harvested and stored in an underground reservoir for reuse or shall be directly channeled to storm water drains.
- b) A storm water management plan that minimizes impervious area infiltration by use of recharge area & use of detention and /or retention with graduated outlet control structures will be designed.
- c) All rain water from the roofs should be harvested so as to reduce on amount of run-off

Negative Social Impacts

- a) **Labor influx and related impacts:** The employees will be hired from within the locality hence limited movement or very short distances from their homes.

The skilled labour force from elsewhere will reside in the closest proximity to the project area

- b) Human rights and gender inclusivity:** During recruitment of workers there could be discrimination against one gender either by design or oversight. Lack of compensation for excess working hours. Contractors may overlook provision of sanitary, health and safety facilities such as Personal Protective Equipment (PPE).
- c) Child protection:** Exposing the children to strangers is likely to result in sexual violence and exploitation which involves unwanted sexual touching, attempted unwanted sex, physical forced sex, receiving money in exchange for sex among others. Children are likely to be subjected to labor during construction works such as fetching water and carrying building materials.
- d) Increased transmission of communicable diseases:** Construction activities could create opportunities for transmission of communicable diseases such as water borne and airborne diseases.
- e) Sexual exploitation and abuse:** Interaction between construction workers and other project stakeholders such as students, staff and community could lead to sexual exploitation.
- f) Occupational health and safety:** Sexual harassment may occur between workers during the construction phase. The possible mitigative measure should include but not limited to Ensuring clear human resources policy against sexual harassment that is aligned with national law; Integrate provisions related to sexual harassment in the employee Code of Conduct and ensuring appointed human resources personnel to manage reports of sexual harassment according to policy
- g) Drug and substance abuse:** The presence of construction workers is likely to increase the student's exposure and access to drugs and alcohol.
- h) Social Evils/crime –** influx of workers near the school, may introduce

criminal activities especially people with bad behaviors like stealing at the construction site or in the school.

7.2.10 Summary of Construction Phase Impacts and Mitigation

Potential construction impacts would include: stress on infrastructure as a result of increased population/vehicle traffic, possible soil erosion, possible surface & ground water hydrology changes and water quality degradation, solid waste generation, noise pollution, dust emissions, generation of exhaust emissions, increased water demand, increased energy consumption, increased use of building materials, likely accidents; and diseases. To ameliorate against the potential negative effects, measures such as the following should be taken:

- a) Awareness creation & education of the project area communities regarding HIV/AIDS & other diseases.
- b) The contractor will ensure that all machines are well tuned and maintained to reduce amount of exhaust emission
- c) All materials will be ordered as per need to avoid over piling on site which leads to destruction of materials and unnecessary obstruction.
- d) The construction will be done in design that will allow for natural ventilation and lighting as well as both vertical and horizontal ventilation. The incorporation of natural ventilation and lighting will contribute to the reduction of the amount of energy consumed in artificial ventilation and lighting. Landscaping and greening of the buildings will be a contribution to the ongoing beautification and greening of our urban centers, a factor that will subsequently be beneficial to carbon sequestration.
- e) To save on water, the construction could also incorporate water saving designs such as waterless urinals, self-timing taps and low volume water closets. Water harvesting from the roof will be implemented to provide water for cleaning, landscaping and use in the toilets. Roof water harvesting will also lead to the

reduction of the amount of runoff within the area hence controlling the flooding that afflicts itself during the rainy seasons.

- f) Emergency escape routes will also be incorporated during this stage
- g) Waste containment facilities will also be constructed during this stage.
- h) To protect the health of workers on the site, they should be provided with protective gears and the contractor ensures that they make full use of them. Workers should not be forced or allowed to lift heavy loads.
- i) All materials on site should not be piled to heights that are prone to accidental falls.
- j) First Aid kits and emergency numbers should be conspicuously displayed. This means that someone trained in administering first aid should be present at the construction site all the time of the work.
- k) An insurance cover by the contractor should be acquired to compensate for any unforeseen medical emergencies and injuries or destructions
- l) Provisions should be included during the construction period to allow for greening of public places.
- m) Provisions for disabled friendly toilets with support bars in them should be implemented during the construction period to avoid unnecessary modifications later during the life of the project.
- n) **Labor influx and related impacts**
 1. Labour influx will be insignificant due to few employees required in the project and the fact that the contractor intends to hire unskilled labour force from within the locality.
 2. The contractor shall hire mainly local persons for construction works to reduce the demand for accommodation in the area. This can be done in consultation with the school board of management.
 3. The contractor shall ensure hiring of workers is done outside the project site to avoid crowding. They should consider hiring from a central place

4. The contractor shall ensure the hiring process is done with fairness and gender sensitivity
5. The contractor will comply with provisions of Work Place Injuries and Benefits Act (WIBA) 2007.
6. Effective and elaborate community/stakeholder engagements to understand issues around labor influx.
7. Effective contractual obligations for the contractor to adhere to the mitigation of risks against labor influx, including sexual exploitation and abuse
8. The contractor to have a proper and updated records of the laborers on site while avoiding child and forced labor
9. Fair treatment, non-discrimination and equal opportunity of all laborers
10. The Contractor shall require the laborers, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct with specific provisions on protection from sexual exploitation and gender-based violence

(o) Human rights and Gender Inclusivity

1. The contractor shall ensure hiring is done without gender discrimination, but also put into consideration the cultural norms within the locality.
2. The contractor shall observe gender mainstreaming in hiring of workers as required by Gender Policy 2011 and 2/3 gender rule. Provide equal opportunities to all gender.
3. The contractor shall ensure provision of the necessary basic sanitary facilities in relation to gender – provide separate sanitary facilities for male and female
4. The contractor shall ensure protection of labor rights to the workers e.g. working hours should be as agreed between the contractor and the workers.

(p)Child Protection

1. The Contractor will ensure that each construction worker signs a legal binding code of conduct to ensure children are protected against any negative impact including sexual harassment from the construction works.
2. The contractor shall strictly hire people who are above 18yrs and ensure they provide their National Identity Card.
3. The contractor shall hoard the construction site especially where there are pits in the construction of pit latrine to avoid school children falling.
4. The contractor shall organize with the school management to ensure they alert the children not to play or go near the construction site or any machinery –vehicles transporting construction materials.
5. Provide safety warning signs informing the children and staff of ongoing construction works.

(q) Increased transmission of Communicable diseases – waterborne and airborne illnesses

1. The contractor should communicate to the construction supervisor/foreman to ensure there is no sharing of dust masks
2. The contractor should ensure there is provision of safe drinking water to the workers and workers should not share drinking containers (cups).

®Sexual Exploitation and Abuse

1. The contractor should develop a code of conduct which should encompass clear warning to workers on any kind of sexual exploitation and abuse. Grievance redress mechanism strategy developed

2. The contractor should provide a mechanism where workers are free to report any sexual exploitation and abuse to the senior management without fear of intimidation.
3. The contractor shall communicate to the workers that there should be no interaction with the school children.

(s)Occupational Safety & Health

1. The contractor shall hire a site safety officer
2. The contractor shall provide all the construction workers with the appropriate Personal Protective Equipment.
3. The site supervisor shall ensure all the construction workers wear the provided PPEs during the working hours. The contractor shall erect rules requiring all workers and visitors have the appropriate PPEs to prevent any injuries.
4. Provide WIBA insurance cover for every worker
5. The contractor shall purchase and provide a first aid kit at every construction site. Establish a first aid unit at the Project site office or make local arrangements with local health facilities for treatment purposes where need arises during construction period.
6. The contractor shall ensure any injuries, incidents or accidents are recorded and records kept for monitoring health and safety. This will be the responsibility of the appointed safety officer

(T)Drug and Substance Abuse

1. During workers' orientation, they shall be clearly informed of no drug or alcohol abuse within the construction site and during working hours.

2. The contractor shall communicate its “No Smoking” policy through large visible posters to the workers.
3. The supervisor shall not allow any worker entry to the construction site who is under the influence of drugs or alcohol.
4. Provide posters sensitizing workers on the dangers of drugs and substance abuse.

(u) Social Evils/Crimes

1. The contractor has a responsibility to provide security at the construction site and not to rely on the EPZs security.
2. The contractor shall consider hiring workers in collaboration with the local administration who may have more knowledge on the local people, and that will minimize bad characters in its workforce.

On the other hand the anticipated positive impacts include: creation of alternative employment opportunities, improving growth of the economy, improved living standards, provision of the much needed sustainable waste management facilities and provision of market for supply of construction materials and other services.

7.3 Operation Phase

The activities to be carried out during the operation phase of the proposed project include receiving waste, storage, incineration and disposal of the ashes. All activities will be done with high standards of operation observing all required standards of hygiene, safety and waste disposal.

7.3.1 Overall Environmental Management

It was realized that the construction and installation of the incinerator is likely to help much in overall management of the environment in Kinanie and the environs

assuming that the incinerator will be operated to the optimum. However, despite the place being a waste sorting site, what should not be allowed is heaping of waste materials in the open to the extent of rotting and producing foul odours neither should there be allowed open burning of waste regardless of their types/category within the project site.

7.3.2 Healthcare Waste Management

It should not be lost that Health Care Waste from hospitals will be finding its way into the facility for incineration. The Ministry of Health of Kenya has put in place guidelines that offer directions on management of HCW in Kenya. It is upon the project proponent to acquaint oneself with these guidelines for better implementation. It should be noted that mixing wastes (infectious and non-infectious) complicates waste management, since mixing sharps and other infectious waste with non-infectious waste increases the amount of waste that is considered infectious (WHO 2014). Studies have demonstrated that poorly disposed HCW can be sources of new infections to humans and pose a danger to animals scavenging such waste. It is imperative for the project proponent to note that with maximized use of the incinerator facility, such nuisances will not be experienced and should not be experienced anyway.

7.3.3 Noise Monitoring and Control

The project proponent should ensure that noise monitoring is carried out with regard to the incinerator operations. There are regulations that set the permissible levels of noise that should be observed when operating various machines. The levels are set out in *(Noise and Excessive Vibration Pollution) (Control) Regulations, 2009*. In section 5, the regulations provide permissible noise levels and states that:

No person shall make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

Table 4: First Schedule of the Regulation Provides for the Following Permissible Noise Levels

Zone		Sound Level Limits dB(A)		Noise Rating Level (NR)		
		(Length-14hours)		(Length-14 hours)		
		Day	Night	Day	Night	
A.	Silent Zone	40	35	30	25	
B	Places of worship	40	35	30	25	
C.	Residential	Indoor	45	35	35	25
		Outdoor	50	35	40	25
D.	Mixed residential (wcommercial son and Places of entertainment)	55	35	50	25	
E.	Commercial	60	35	55	25	
<i>Time Frame</i>						
Day		6.01 a.m. – 8.00 p.m. (Length-14 hour				
Night:		8.01 .m. – 6.00 a.m. (Length-10hours)				

It is expected that the incinerator will be designed in a manner that does not allow noise pollution even from the explosion of bottles during incineration. But, whenever possible, let bottles to be incinerator be open to avoid noise pollution from the explosion of bottles as well as avoiding open burning of the waste.

7.3.4 Air Quality Monitoring and Control

It is likely that the emissions from the incinerator impact on air quality within the influence of the incinerator. It is only fair and just to the environment that air quality monitoring around the incinerator (a radius of 1km) is undertaken on regular basis. The government in its wisdom has formulated air quality regulations that would ensure air quality is maintained at acceptable levels within the jurisdiction of Kenyan borders. To be noted is that air pollution will not be avoided if open burning of waste

is allowed. Non-optimal operationalization of the incinerator can also lead to atmospheric air pollution, something that can lead to conflicts with the surrounding community. It should be noted that open burning of waste produces toxic emissions such as carbon monoxide (CO), dioxins (polychlorinated dibenzo-para-dioxins or PCDDs), and furans (polychlorinated dibenzofurans or PCDFs). CO is produced by poor and incomplete combustion. These emissions could be reduced by good incinerator operating procedures. Dioxin and furan emissions occur through burning of chlorine-containing wastes, e.g., PVC and other plastics, hence it is advisable to avoid unnecessary plastics in the wastes to be incinerated.

In general, the emissions from incinerators should not be allowed to blow across cultivated land because exposure to dioxins and furans is mostly through food intake (WHO 2001). Such emissions would be minimized by good waste segregation practices to eliminate inclusion of unnecessary PVC waste, and appropriate practices for high-temperature incineration. It is also advisable to have the chimney not less than 10m high from the ground level. To reduce on emissions, it is advisable to stop open burning of waste as well as adhering to the following practices:

- a) Ensure that the incinerator is functioning properly, and the chimney is clear of excessive soot.
- b) Rigorously segregate waste so that no unnecessary PVC (IVs, etc.) waste is incinerated
- c) Ensure that the incinerator is preheated adequately and that supplementary fuel is added whenever necessary to maintain the burning temperature above 6000C.
- d) Load the incinerator according to the recommended “Best Practices”.
- e) Adopt rigid quality control measures.

7.3.5 Environmental Management System Set Up, Suitability and Performance

Management of environmental concerns at the project site will largely be guided by the national guidelines provided by the ministry with regard to public health and environment. The project proponent should be aware and informed about the expected standards with respect to environmental concerns. However, the impact of the guidelines can be defeated by poor management of environmental matters within the project site. A classic example is where the waste is well segregated at source, but lumped together when its being picked up for disposal, thus mixing up of hazardous materials such as medical wastes with none-hazardous wastes such as food remains. Therefore, the project proponent should fully be dedicated in environmental management and especially management of HCW.

7.3.6 Staff Awareness and Training

It is imperative that staff awareness and training with respect to environmental management is adequately done especially on management of HCW as stipulated in various guidelines offered by the MoH.

7.3.7 Compliance to Environmental Standards

Compliance of environmental standards is a must for the project proponent owing to the many facets of the project that affects the environment. Central to this is HCW that require stringent disposal measures. In line with EMCA, there are compliance levels that have been set for operations of an incinerator as indicated in the Environmental Management and Coordination Act, Waste Management Regulations (2006). Third Schedule of the said regulations comprehensively deals with all requirements for operating such a facility (Incinerator) in Kenya. The schedule has the following provisions:

- iii. Standard for treatment and disposal of Wastes;

- iv. Standards, guidelines, criteria, procedure for installing and operating incinerators

Further to that the project proponent should comply with Part IV of the regulation that deals with hazardous wastes (Regulation 22 through to 32); Part VI that deals with Biomedical Wastes (Regulations 36 through 47) by acquiring all the set environmental licenses and carrying out any required environmental assessments, and especially during the operation phase by carrying out annual ESA. The project management should strive to comply with all set environmental standards. Under the waste management regulations (regulation 12) all existing solid waste disposal sites are required to undergo environmental audits in order to ensure compliance with the set conditions thereof in terms of the provisions under Part V which states that the report compiled under the regulations shall include among others:

- a) The past and present impacts of the waste disposal site/apparatus;
- b) The responsibility and proficiency of the operators of the waste disposal site;
- c) Existing strategies to mitigate environmental impacts of solid waste disposal activities;
- d) Health and safety concerns of the waste disposal site;
- e) Legislative and policy frameworks relevant to the waste stream and disposal site management;
- f) Existing environmental awareness and sensitization measures including environmental standards and regulations, law and policy for the managerial personnel;
- g) Identification, documentation and analysis of all negative environmental impacts associated with the existing solid waste and disposal site management;
- h) An analysis of environmental performance of the disposal site in the light of environmental impacts;

- i) Development of an environmental management plan and action plan for the waste streams and sites;
- j) Public consultations on the impact of the continued existence of the disposal site within the area; and Preparation of an ESIA report

The existing waste disposal sites are subject to environmental monitoring and control audits by NEMA inspectors (Section 117 of EMCA, 2015) in conjunction with other government lead agencies such as the OSH Department and in the manner prescribed under regulation 35 (3a-f).

7.4 Community Health and Safety Issues

7.4.1 Operational Effectiveness of the Incinerator

It is our advice that the project proponent enters into a maintenance contract so as to ensure proper regular servicing and maintenance so as to have the incinerator in very good operating status all through.

7.4.2 Water Resources Management

It is expected that the project proponent will find an alternative water source so as not to strain the local source. It should not be forgotten that underground water resources are prone to pollution from hazardous materials seeping from the surface especially during the rainy season and thus poor handling and disposal of especially hazardous wastes, is a potential source of contamination of underground water resources. Hence, the project proponent should ensure at all times that the quality of underground water in the area is above board as stipulated in the Environmental Management and Co-ordination (Water Quality) Regulations, 2006 schedule 1. This can only be ascertained by carrying out regular water analysis from underground water sources in the area. This calls for the project proponent to fully operationalize the incinerator to ensure that all hazardous wastes are incinerated. They should also ensure a waste reduction system by exercising waste recycling for some wastes such as the organic materials

and re-using others such as paper/cartons, plastic packaging materials and glass bottles not contaminated with hazardous substances.

Table 5: Recommended Quality Standards for Sources of Domestic Water

Parameter	Guide Value (max allowable)
pH	6. – 8.5
Suspended solids	30 (mg/L)
Nitrate-NO ₃	10 (mg/L)
Ammonia-NH ₃	0. (mg/L)
Nitrite –NO ₂	3 (mg/L)
Total Dissolved Solids	1200 (mg/L)
Scientific name(<i>E.coli</i>)	Nil/100ml
Fluoride	1. (mg/L)
Phenols	Nil (mg/L)
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. (mg/L)
Alkyl benzyl sulphonates	0. (mg/L)
Permanganate value (PV)	1. (mg/L)

7.4.3 Structural Safety of Project Infrastructure

It should be noted that the smoke chimney is should not be exposed for easily vandalization not forgetting that kids could climb on it with danger of getting burnt. It is advisable that a secure fence is established around the incinerator area with a

lockable entrance. The chimney and any parts of the incinerator that can get hot should also be insulated.

Construction of the incinerator should include an ash pit as the standard for new incinerators so as to avoid disposal of the ashes from the waste incineration being disposed in the open. This is noting that the incineration process produces two types of ash. Bottom ash comes from the furnace (primary burning chamber) and is mixed with slag, while fly ash comes from the stack (secondary burning chamber) and contains components that are more hazardous. In most waste incinerators, bottom ash is approximately 10% by volume and approximately 20 to 35% by weight of the solid waste input. Fly ash quantities are much lower, generally only a few percent of input. Emissions from incinerators can include heavy metals, dioxins and furans, which may be present in the waste gases, water or ash. Plastic and metals are the major source of the calorific value of the waste. The combustion of plastics, like polyvinyl chloride (PVC) gives rise to these highly toxic pollutants.

Toxics are created at various stages of such thermal technologies, and not only at the end of the stack. These can be created during the process, in the stack pipes, as residues in ash, scrubber water and filters, and in fact even in air plumes which leave the stack. There are no safe ways of avoiding their production or destroying them, and at best they can be trapped at extreme cost in sophisticated filters or in the ash. The ultimate release is unavoidable, and if trapped in ash or filters, these become hazardous wastes themselves. The pollutants which are created, even if trapped, reside in filters and ash, which need proper disposal otherwise we disperse the incinerator ash throughout the environment which could subsequently enter our food chain. Thus, it is advisable that an ash pit is constructed during the incinerator installation.

The ash pit should be large enough to store incinerated residues for at least 10 years without being emptied. A pit of 3.25m³ stores ash from the burning of approximately 300 safety boxes per month, over a period of 12years. The ash pit would have access

trap doors to allow the pile of ash to be redistributed from time-to-time. For such a design and volume to be done accurately, the incinerator operations should be recorded on a daily basis, i.e. how much waste is received per day (in weight), how much waste is completely incinerated per day, how much ash is produced per day against waste incinerated. Therefore, accurate and proper records are vital in optimum operation of the incinerator.

7.5 Occupation Safety and Health Management

OSH is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment or operating/occupying a certain premises. As a secondary effect, it may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment.

Since 1950, the International Labour Organization (ILO) and the World Health Organization (WHO) have shared a common definition of occupational health. It was adopted by the Joint ILO/WHO Committee on Occupational Health at its first session in 1950 and revised at its twelfth session in 1995. The definition reads: "Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job." The reasons for establishing good OSH standards are frequently identified as:

- a) **Moral**-An employee should not have to risk injury at work, nor should others associated with the work environment.

- b) **Economic**-many governments realize that poor occupational safety and health performance results in cost to the State (e.g. through social security payments to the incapacitated, costs for medical treatment, and the loss of the "employability" of the worker). Employing organizations also sustain costs in the event of an incident at work (such as legal fees, fines, compensatory damages, investigation time, lost production, lost goodwill from the workforce, from customers and from the wider community).
- c) **Legal**-Occupational safety and health requirements may be reinforced in civil law and/or criminal law; it is accepted that without the extra "encouragement" of potential regulatory action or litigation, many organizations would not act upon their implied moral obligations.

With regard to operation of the proposed incinerator, the ESIA dwelt on the following parameters that may greatly define OHS during operation of the facility.

7.5.1 Adequacy of the Design of the Shelter

The design and construction of the shelter should include vital facilities such as the following and which should be provided for at the facility:

- i. **A defined Office space** - there should be provision for a fully equipped office with furniture and office accessories so as to assist in proper record keeping of the incinerator operations and activities;
- ii. **Washing rooms** - there should be bathrooms (separate for male and females) with functioning shower head and adequate supply of water
- iii. **A Toilet** -there should be a toilet for the incinerator operators to avoid their having to share one with other staff and clients;
- iv. **Supplies/ material Store**-the shelter should have a store where consumables like fuel, records, PPEs and other supplies can be stored.
- v. **Waste Store**- the shelter should have a dedicated waste store to avoid the wastes being stored outside promoting scavenging by animals such as dogs

and cats. The operators should be provided with waste boxes to store wastes awaiting incineration or a waste store that should have the capacity to stock at least 200 neatly-stacked safety boxes.

The incinerator shelter should be designed to enable the trained operators to safely process and dispose of infectious waste. Other than the above singled fundamentals, it should encompass other several elements, housed within the sheltered enclosure.

These elements are:

- i. A storage box to keep tools, protective clothing and records.
- ii. An enclosure with a lockable door to prevent access by children and unauthorized persons, as well as scavenging animals and birds.
- iii. An access hatch through a wire-mesh wall of the incinerator to allow waste to be deposited when the incinerator shelter is locked and the operator is not present. This hatch should open into a safety-box deposit which should provide a protected area where the waste boxes and containers can be deposited temporarily.

7.5.2 Operator's Tasks and Responsibilities

It is good that the incinerator operators have a regular routine to burn the waste as well as a formal way for reporting of achievements or problems associated with the operation of the incinerator. It is highly recommended that the incinerator operators in conjunction with the management establish a regular routine to burn the waste, work towards minimizing personal risk, as well as risk to other workers and the local community by not operating a faulty incinerator as well as initiate a way of reporting achievements and problems to the supervisor for necessary actions.

7.5.3 Receiving Health-Care Waste & Industrial hazardous waste at the Incinerator

There should be established a formal way of receiving wastes at the incinerator facility. The following procedures are recommended to be observed for a better operation of the incinerator once it is fully operationalized:

i. When Operator is Present at the Incinerator

- a) Receive the waste, record the required details in the Waste-Deposit Record.
- b) Verify that any waste received is appropriately packaged -that is: Sharps in safety boxes; other waste in plastic bags, and Needles in needle-cutter containers.

ii. When the Operator Is Not Present at the Incinerator

If the operator is not present at the incinerator site, the person delivering the waste should:

- a) Make sure that the safety boxes and plastic bags are properly closed.
- b) Deposit the safety boxes and plastic bags through the access hatch that is clearly labeled and designed for this purpose. The waste deposited here drops into the safety box deposit that is accessible only to authorized persons.

On returning to the incinerator site, the operator should arrange the safety boxes or plastic bags of waste which have been deposited through the waste store access hatch in the waste store. The operator should also complete the Waste-Deposit Record for the newly arrived waste.

7.5.4 Security of the Facility

The facility should not be highly exposed to avoid easy access for anyone with ill intention of vandalizing the facility. Such lack of proper securing of the incinerator area is also what can enable the access to waste by stray dogs and cats as well as enabling anybody to dispose their waste into the incinerator area indiscriminately.

7.5.5 Personal Protection Equipment

Lack of appropriate PPE for use during operation of the incinerator should not be allowed considering that there will be handling of potentially hazardous or infectious wastes all the time. This can expose the operators to infections from especially HCW waste. Waste incineration systems produce a wide variety of pollutants which are detrimental to human health. Such systems are expensive and do not eliminate or adequately control the toxic emissions from chemically complex solid waste such as the HCW. Even new incinerators release some toxic metals, dioxins, and acidic gases. Far from eliminating the need for a landfill, waste incinerator systems produce toxic ash and other residues. Dioxins are the most lethal Persistent Organic Pollutants (POPs) which have irreparable environmental health consequences. The affected populace includes those living near the incinerator as well as those living in the broader region. People are exposed to toxic compounds in several ways:

- a) By breathing the air which affects both workers in the plant and people who live nearby;
- b) By eating locally produced foods or water that have been contaminated by air pollutants from the incinerator; or
- c) By eating fish or wildlife that have been contaminated by the air emissions.

Dioxin is a highly toxic compound which may cause cancer and neurological damage, and disrupt reproductive systems, thyroid systems, respiratory systems etc. Considering this, it is worthwhile to ensure optimum functioning of the incinerator, attaining complete combustion and the scrubber functioning to its fullest so as to minimize the amount of gases finding their way onto the atmosphere. It is also imperative that the project proponent provides the incinerator attendants with the appropriate PPE at all times. Safety of the incinerator operators can be assured by following the instructions below:

- i. Wearing the proper PPE provided to all operators at all times when operating the incinerator.

- ii. Washing hands regularly, hence why a washroom and a hand wash basin is needed within the incinerator shelter.
- iii. Being vaccinated against Hepatitis B Virus (HBV).
- iv. Having regular medical checkups (every six months).

7.5.6 Fire Outbreak Preparedness

Given that the facility will be disposing wastes by combustion, it should have the right category of firefighting equipment such as carbon and powder fire extinguishers as well as buckets of dry sand inside the facility too to help fight electric fires. The management should also ensure that contacts for emergency service providers are well displayed in and around the facility as well as an emergency alarm system. The incinerator attendants should be trained by reputable firms such as St. Johns Ambulance on fire emergencies as well as be subjected to regular fire drills.

7.5.7 First Aid Kits

The project proponent should make the necessary arrangements to ensure the incinerator attendants are trained in first aid administration, emergency preparedness and response as well as making sure that the facility is provided with adequate easily accessible first aid kits.

7.5.8 Sanitation and Cleanliness of the Facility

Poor housekeeping within the incinerator shelter with waste bags and other boxes being left lying all over the floor is not an option. This is dangerous as it can lead to accidental slips and falls within the incinerator shelter. Hence, it is recommended that all what is not related to the operation of the incinerator be removed from the shelter, and that the project proponent acquires waste holding containers for proper containment of the waste within the shelter as it awaits incineration. Further, it is

imperative to have washrooms and disinfection supplies within the incinerator for the operators not to expose them to carrying infections to their homes because for lack of a place to change their clothes to PPE and vice-versa before and after operating the incinerator.

7.5.9 Emergency Response Procedures

The project proponent should have had a dedicated emergency response team. Operators of the incinerator should be well trained in emergency response procedures to ensure that they are ready to deal with any emergency cases at the incinerator facility.

7.5.10 The Project Management and the Incinerator Operations

Central to efficient operation of the incinerator is the project management. The incinerator can poorly be operated due to the following highlighted challenges:

a) Lack of Adequate Supply of Fuel (Diesel)

This can lead to the incinerator attendants resulting to open burning of waste. The inadequate supply of diesel also leads to incomplete combustion of waste by the incinerator leading to the production and release of noxious gases such as carbon monoxide into the atmosphere. Lack of complete combustion of the HCW means that its volume is not reduced as per the standards. This means that, with lack of reducing the waste volumes, if an ash pit is constructed, it will get filled up very fast, which is not economical.

b) The Incinerator Operators

The incinerator should have a dedicated operator so as to avoid a situation whereby the attendants are not able to organize and keep track of what goes around the incinerator. Some assessments of waste management practices and incinerator

performance carried out highlight incinerator project management and incinerator operator constraints as critical factors in good waste management and optimal performance of incinerators. Major constraints identified are inadequate operator training and motivation. The following operator-related measures should be adopted to ensure good incinerator performance:

- i. Only a trained, qualified and equipped operator should operate the incinerator.
- ii. The operator must be on-site while the incinerator is functioning.
- iii. The operator must be motivated to follow “Best Practices.”
- iv. The incinerator should be operated according to Best Practices to minimize emissions and other risks.
- v. The operator must have long-term contracts or be permanent hires.

Long-term or permanent operator contracts are often the most difficult of the above points to address. Incinerator operation is usually not a full-time job, and frequently incinerators are operated by casual labor responsible for grounds maintenance. This approach is strongly discouraged since training efficient operators is time-consuming and expensive; and operator knowledge and commitment are essential for good incineration practices. The incinerator operators should be contracted for long terms or be on permanent payrolls so as to be able to develop a technical profile, consistently maintain records and be able to recognize maintenance needs. It is therefore advisable that the project management dedicates at least two full time operators to the incinerator and who should possibly be permanently employed. This would ensure that tracking of the performance of the incinerator is done and efficiency is attained with regard to disposal of various categories of waste.

c) Supervision

Even if the incinerator operator would be well-trained, supervision is essential. Supervision would provide quality control and recourse to improve other aspects of waste management, in particular segregation and disposal practices. Most countries

have a collaborative mechanism for developing a regulatory framework for especially, such as the National Policy on Injection and Medical Waste Management and the National Health Care Waste Management Strategic Plan (2016 – 2021) that underpin national policies for handling, processing and destruction of infectious waste at all health facilities, including primary health facilities. As per the policy and the plan, this project proponent included, there should be a designated an HCWM supervisor, with operational linkages (directly or indirectly) to a Waste Management Committee. The responsibilities of the HCWM supervisor at the facility should include but not be limited to:

- i. Ensuring good waste segregation practices;
- ii. Coordination and supervision of waste transportation, packaging, storage and handling;
- iii. Monitoring of waste handling at the incinerator and other appropriate locations
- iv. Supervision of the incinerator operator; and Reporting.

7.5.11 Best Practices in Waste Incineration

1) Appropriate Conditions for Incinerating Waste

It is advisable to use the incinerator to burn waste only if:

- a) Twelve or more safety boxes of waste have been deposited at the site for disposal.
- b) No large groups of people are present in the immediate area.
- c) The safety precautions are adequate.
- d) The incinerator is in good working order.

2) For Safety Precautions to be Termed Adequate, the Following Conditions must be Met

- a) The appropriate PPE should be available and in good condition.
- b) A container full of sand is available at the incinerator site.

- c) The appropriate tools are available to operate the incinerator.

3) For the Incinerator to be considered in Good Working Condition, the Following Conditions must be met:

- a) The ash door and the loading door close correctly, i.e. they must not be broken.
- b) The strainer cables to the chimney should be tight, and there should be no risk that the chimney will fall down.
- c) The metal parts (front door, loading door, spigot, chimney, etc.) should not be badly corroded and/or likely to break.
- d) The masonry should not be badly cracked and/or likely to cause injury.

4) For the Incinerator to be considered in Good Working Condition, the Following Conditions must be met:

- a) The ash door and the loading door close correctly, i.e. they must not be broken.
- b) The strainer cables to the chimney should be tight, and there should be no risk that the chimney will fall down.
- c) The metal parts (front door, loading door, spigot, chimney, etc.) should not be badly corroded and/or likely to break.
- d) The masonry should not be badly cracked and/or likely to cause injury.

5) Preparation and Loading the HCW and industrial hazardous waste

- a) Make sure that the HCW is dry. If it is wet, place it in a well-ventilated spot inside the incinerator to dry.
- b) Ensure that all tools and equipment are in working order.
- c) Wear protective clothes (gloves, goggles, overalls and masks).
- d) Remove the ash from the incinerator and place it in the ash pit.
- e) Clean the area around the incinerator.
- f) Weigh the medical waste to be incinerated and count the boxes and/or packages. Record these quantities in the Waste-Disposal Record

- g) After starting the incinerator, observe the primary burning chamber temperature gauge until the temperature stabilizes (approximately 5 minutes) at around 600°C .
- h) Load only HCW that has been weighed and recorded in the operator's record for burning.
- i) Endeavor to load a mixture of safety boxes bags of waste so as to assist maintain the temperature at or above 600°C.
- j) If the temperature drops below 600°C, do not load waste till rises again.
- k) Do not load very wet HCW. Place them in a dry, well-ventilated, warm place to dry (e.g. next to the top of the incinerator).
- l) As a general rule: burn more of safety boxes in order to increase temperatures in the incinerator, and more bags of other waste in order to reduce temperatures in the incinerator.

6) Burn Down/Cool Down

When all the available HCW has been burned and the temperature indicated on the temperature gauge falls below 600°C, proceed to burn down/cool down. After the waste has burned down, leave sufficient time for the fire to die down and the embers to cool. This allows the "fixed carbon" in the waste bed to burn, reducing toxic emissions and ensuring that all the waste is totally destroyed.

- i. It is advisable the operator does not leave the incinerator site until the temperature on the gauge falls below 400°C (if there is no temperature gauge, wait until the fire is reduced to a bed of red embers) to avoid any possible accidents.
- ii. Allow the incinerator to cool down for at least three hours after use before removing the ash.

7) Cleaning – Including Ash Removal

When burning is complete a residue is left, the HCW and industrial waste incineration ash. It is important to dispose of this ash carefully since it is toxic and it may contain sharp objects. If the load of health-care waste has been burned in accordance with "best practices", the volume and weight of the ash should be minimal compared to the HCW incinerated. When carrying out the cleaning and ash removal, the operator should observe the instructions below:

- a) Always wear gloves and a face mask when removing the ash.
- b) Never handle the ash or other solids with bare hands. Always wear protective clothing, including gloves. Use a rake (should be provided as part of the incinerator tool kit) to rake the ash and other non-burnable waste directly into the ash transport trolley and take it directly into the ash pit without storing it first.
- c) If the incinerator is operated every day, remove the ashes and other non-burnable waste the following day, prior to operating the incinerator again.
- d) If the incinerator is not used every day, remove all the ash on the same day after several hours or remove it the following morning. Do not leave ash in the incinerator for long periods of time.
- e) Carefully sweep the area around the incinerator to ensure that all the needles and non-combustible waste are placed in the ash pit.
- f) Always close the trap door of the ash pit to avoid accidents.

8) Record-Keeping and Reporting

The incinerator activities should be recorded on a daily basis on different forms:

- i. The **Waste-Deposit Record** shows the source, amount and type of waste deposited at the incinerator when the operator is present, and provides a monthly record of the waste burnt.

The purpose of the Waste-Deposit Record is to trace the quantities and origins of waste deposited. This record may not provide complete information since the

waste deposited during the operator’s absence may not be recorded. However, to avoid this, the operator is advised to develop a timetable of waste delivery at the incinerator site so as to avoid cases of people delivering waste in his absentia.

The table below shows a sample Waste-Deposit Record that should be completed for every delivery of waste deposited at the incinerator and if possible getting the signature of the person who deposits the waste for the record.

Table 6: Example of waste deposit record

<i>Health facility:</i>		<i>Month/year:</i>
<hr/>		<hr/>
<i>Type of Incinerator:</i>	<i>Name of incinerator operator:</i>	
<hr/>	<hr/>	

<i>Waste deposited</i>						
<i>Date</i>	<i>Sharps (kg)</i>	<i>Other (kg)</i>	<i>Origin of waste</i>	<i>Means of transport to incinerator</i>	<i>Name of person depositing waste</i>	<i>Signature of person depositing waste</i>

- ii. The **Waste-Disposal Record** shows the amount of waste destroyed and the amount of incineration ash produced at each burn session

Table 7: Example of waste Disposal Record

<i>Health facility:</i>				<i>Month/year:</i>
<hr/>				<hr/>
<i>Type of Incinerator:</i>		<i>Name of incinerator operator:</i>		
<hr/>		<hr/>		
<i>Waste disposed/Incinerated</i>				
<i>Date</i>	<i>Amount of HCW Incinerated (Sharps & Other types of HCW) in kg</i>	<i>Amount of Incineration Ash realized</i>	<i>Amount of Fuel (Diesel) Consumed</i>	<i>Number of Electricity Units consumed</i>
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

- iii. The **fuel and energy record** should show amount of fuel (diesel) and number of electricity units consumed each burn session
- iv. The **Tools and Equipment Record** lists the equipment available and its condition, as well as problems and defects encountered with any of the elements of the incinerator.

Table 8: Sample Tools and Equipment Record for use by the incinerator operator

Health facility:		Month:			
Type of incinerator:		Name of incinerator operator:			
Tools and equipment					
Category	Item		Available	Condition	
	Hand brush/dustpan				
	Hard broom				
	Ash rake				
	Shovel				
	Chimney cleaning brush and cord				
Safety	Sand bucket				
	Fire retardant gloves				
	Eye protection/face mask				
	Overalls or suitable clothing to cover the upper body, including the Lower arms				
	Lock for incinerator door				
	Safety first aid kit				
Records & measurement	Weighing scale				
	Incinerator records for recording incineration activities				
Problems:					
Packaging or segregation of deposited waste					
Fuel and consumables for operating incinerator					
Other					
Incinerator defects					
Date			Description	Present status	

The operator should be responsible for maintaining these records in accordance with the steps below:

- i. Submitting each record monthly to the waste-management supervisor.
- ii. Keeping a carbon copy of all records at the incinerator site. These records must always be available for inspection at the site.
- iii. Preparation of monthly/quarterly reports of the waste-management activity on the basis of the information in the daily records.

h. Operator's Maintenance Responsibilities

The operator should observe maintenance of the incinerator by carrying out the following activities:

- a) Keeping the area around the incinerator clean; not allowing it to become littered.
- b) Storing safety boxes & other medical waste in an orderly manner in the incinerator waste boxes and store.
- c) Storing fuel stocks in the incinerator fuel store or tank.
- d) Keeping the concrete slabs on either side of the incinerator clean; not using them as permanent storage zones. However, there could be temporarily storage of the HCW that is being dried prior to burning.
- e) Keeping tools, records and protective clothing in the storage box/office provided in the incinerator shelter.
- f) Handling tools and protective clothing carefully and keeping them clean.
- g) Immediately reporting to the waste-management supervisor any damage to the incinerator that affects operation or performance.
- h) Performing simple repairs but avoiding makeshift solutions.
- i) Systematically completing and submitting monthly reports for all records.
- j) Keeping the incinerator site locked at all times.

k) Not allowing unauthorized persons to enter the incinerator area during periods of incineration.

l) Ensuring that the waste-management supervisor has a key to the incinerator

m) Immediately reporting any vandalism, theft or unauthorized entry to the waste management supervisor.

7.5.12 Staff (Operators) Welfare

The welfare of the operators and other staff directly involved in waste management in the facility should be well taken care of to avoid incidences of low morale and go slows that would affect waste management with harmful ramifications on the surrounding environment as well as the social welfare of the local community.

CHAPTER EIGHT

8.0 ENVIRONMENTAL MANAGEMENT PLAN

This section describes the proposed measures to be implemented by the project management to mitigate the negative impacts identified. It forms the Environmental Management Plan document for use in Monitoring and Evaluation as well.

After identifying environmental effects, mitigation measures to lessen or compensate for potential adverse impacts are identified. An EMP for development projects provide a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, the EMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. EIA is an environmental management tool and EMP is its vital output providing a checklist for project monitoring and evaluation.

The EMP outlined herein addresses the identified potential negative impacts and mitigation measures of the proposed project and serves as a guide for enforcement and compliance to environmental management. The Environment Management Plan therefore endeavors to achieve the following:

- Compliance with legal requirements and voluntary commitments.
- Minimizing or preventing pollution.
- Continual improvement in environmental performance, including areas not subject to regulations.

It is recommended that the Project Proponent incorporates these measures gradually; prioritizing mitigation of impacts considered most significant (adverse impacts) and progress to the less severe ones in the project planning phases for the proposed project.

8.1 EMP- Construction Phase

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

Environmental Monitoring/Management plans for the construction phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Estimated Cost (Kshs.)
<p>High Demand of Raw materials</p>	<p>i. Source building materials from local suppliers who use environmentally friendly processes in their operations.</p>	<p>Civil Engineer, Architect, Project Manager & Contractor</p>	<p>Throughout construction period</p>	<p>Part of the main budget</p>
	<p>ii. Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.</p>			
	<p>ii. Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.</p>		<p>1 month</p>	
	<p>v. Use of some recycled/refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills.</p>		<p>1 month</p>	
	<p>v. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.</p>		<p>Monthly to Annually</p>	
	<p>vi. Designate access routes and parking within the site. 1 month</p>		<p>Architect, Project Manager</p>	

	ii. Introduction of more vegetation (trees, shrubs and grass) on open spaces and their maintenance.	& Landscape specialist	Monthly to Annually	
Increased storm water, runoff and soil erosion	i. Roof water to be harvested and stored in underground reservoirs for use in general cleaning and in the toilets. The tanks should have a capacity of at least 100, 000litres.	Civil Engineer, Mechanical Engineer, Project Manager & Contractor	During the beginning phase of the project	500, 000.00
	ii. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure should be designed.		One month	100, 000.00
	ii. Apply soil erosion control measures such as leveling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.			50,000.00
	v. Ensure that construction vehicles are restricted to existing roads to avoid soil compaction within and around the project site.		Construction period	200, 000.00
	v. Ensure that any compacted areas are ripped to reduce run-off.		2 months	
	vi. Site excavation works to be planned such that a section is completed and rehabilitated before another section begins.	Project Manager	Throughout construction period	
	ii. Construction of soil-galleys on sloppy sections.	Project Manager	period	

	ii. Open drains all interconnected will be provided on site.	Civil Engineer		
	x. Roof catchments will be used to collect the storm water for some uses e.g. washing of floors and cars	Civil Engineer		
Increased solid waste generation	i. Use of an integrated solid waste management system i.e. through a hierarchy of options: reduction,	Project Manager & Contractor	Throughout construction period	200, 000.00
	ii. sorting, re-use, recycling and proper disposal			
	ii. Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual		One-off	
	v. Ensure that construction materials left over at the end of construction will be used in other projects rather			
	v. than being disposed of.			
	vi. Ensure that damaged or wasted construction materials including cabinets, doors, plumbing and lighting			
	ii. fixtures, marbles and glass will be recovered for refurbishing and use in other projects			
ii. Donate recyclable/reusable or residual materials to local community groups, institutions and individual				
x. local residents or home owners.				

	<p>x. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the</p> <p>xi. amount of construction waste generated over time</p>			
	<p>ii. Provide facilities for proper handling and storage of construction materials to reduce the amount of waste</p> <p>ii. caused by damage or exposure.</p>			
	<p>v. Purchase of perishable construction materials such as paints should be done incrementally to ensure</p> <p>v. reduced spoilage of unused materials</p>			
	<p>vi. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging</p> <p>ii. waste</p>			
	<p>ii. Use construction materials containing recycled content when possible and in accordance with accepted</p> <p>x. standards.</p>			
	<p>x. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce</p> <p>xi. waste at the site</p>		<p>One-off</p>	
	<p>ii. Dispose waste more responsibly by dumping at designated dumping sites or landfills only.</p>	<p>Project Manager,</p>		

	<ul style="list-style-type: none"> ii. Waste collection bins to be provided at designated points v. Running educational campaigns amongst workers, e.g. through use of posters, to encourage reuse or recycling of the solid waste 	Mechanical Engineer & Contractor	Throughout Construction period	
Dust emission	i. Ensure strict enforcement of on-site speed limit regulations	Project Manager & Contractor	Throughout Construction period	100,000.00
	ii. Avoid excavation works in extremely dry weathers if/and when possible			
	iii. Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles			
	iv. Personal Protective equipment to be worn			
Exhaust emission	i. Vehicle idling time shall be minimized	Project Manager & Contractor	Throughout Construction period	50,000.00
	ii. Alternatively fueled construction equipment shall be used where feasible; equipment shall be properly			
	ii. Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off engines at these points			

Noise and vibration	i. Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles machinery not being used.	Resident Project Manager & Contractor	Throughout Construction period	50,000.00
	ii. Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals			
	ii. Ensure that construction machinery are kept in good condition to reduce noise generation			
	v. Ensure that all generators & heavy duty equipment are insulated / placed in enclosures to minimize ambient noise levels.			
	v. Trees around the site will provide some buffer against noise propagation			
	vi. The noisy construction works will entirely be planned to be during day time when most of the neighbors			
Increased energy consumption	i. Ensure electrical equipment, appliances and lights are switched off when not being used	Project Manager & Contractor	Throughout Construction period	Part of the main budget
	ii. Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy			

	<ul style="list-style-type: none"> iii. Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed iv. in excessive amounts 			
	<ul style="list-style-type: none"> v. Monitor energy use during construction and set targets for reduction of energy use. 			
	<ul style="list-style-type: none"> vi. Have provision for the installation of solar panels as per the provisions of the 2012 and the Energy (Solar Photovoltaic Systems) Regulations 			
High Water Demand	<ul style="list-style-type: none"> i. Harness rainwater for some domestic uses such as general cleaning, in the toilets & gardening (roof catchment), hence the need for a dual water distribution system within the building 	Mechanical Eng., proponent &Project Manager	Throughout construction period	
	<ul style="list-style-type: none"> ii. Install water conserving taps that turn-off automatically when water is not in use as well as low flush toilets iii. & waterless urinals 	Manager, proponent & Contractor	One-off	50,000.00
	<ul style="list-style-type: none"> iv. Promote recycling and reuse of water as much as possible (need for a dual water distribution system within the building) 		Construction period	
	<ul style="list-style-type: none"> v. Install a discharge meter at water outlets to determine and monitor total water usage 		One-off	

	vi. Promptly detect and repair water pipe and tank leaks		Throughout construction period	
	vii. Sensitize tenants to conserve water by avoiding unnecessary toilet flushing etc.			
	iii. Ensuring taps are not running when not in use			
Generation of wastewater	i. Provision of means for handling sewage generated by construction workers such as mobile toilets	Mechanical Engineer & Project Manager	One-off	Part of the main budget
	ii. Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies		Throughout construction period	
	iii. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated			
Incidents, accidents and dangerous occurrences.	i. Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction	Project Manager, Developer, Contractor and Site Safety Officer	Continuous	100,000.00
	ii. using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.			
	iii.			
	iv. Enforcing adherence to safety procedures and preparing contingency plan for accident response in		Continuous	
	v. addition to safety education and training shall be emphasized.			

	vi.	Ensure that the premises are insured as per statutory requirements (third party and workman’s compensation)		Annually	
	vii.	Develop, document and display prominently an appropriate SHE policy for construction works		One Off	
	viii.	Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer			
	ix.	and the workers are represented			
	x.	Ensure that Suitable, efficient, clean, well-lit and adequate sanitary conveniences have been provided for			
	xi.	construction workers		Continuous	
	xii.	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse			
	xiii.	Ensure that items are not stored/stacked against weak walls and partitions			
	xiv.	All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained			
xv.	Securely fence or cover all openings in floors	One Off			

	xvi. Ensure that construction workers are not locked up such that they would not escape in case of an emergency		Continuous	
	xvii. All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained		One-off for the design/Regularly for documentation	
	xviii. Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency. Such procedures must be tested at regular intervals			
	xix. Ensure that adequate provisions are in place to immediately stop any operations where there is an imminent and serious danger to health and safety and to evacuate workers		One off	
	xx. Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site		One off	
	xxi. Provide measures to deal with emergencies and accidents including adequate first aid arrangements		Continuous	

Machinery/ equipment safety	i. Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment	Project Manager, Developer, Contractor and Site Safety Officer	Continuous	50,000.00
	ii. Ensure that machinery, equipment, PPP, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded		One-off	
	iii. Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain		Continuous	
	iv. All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury		One-off	
	v. Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations		Continuous	
	vi. Equipment such as fire extinguishers must be examined by a government authorized person. The		Continuous	

	equipment may only be used if a certificate of examination has been issued			
	vii. Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register		Continuous	
Occupational health and safety risks during construction period and occupational phase	i. Well stocked first aid box which is easily available and accessible should be provided within the premises	Project Manager, Developer & Contractor	One-off	
	ii. Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.		One-off	
	iii. Firefighting equipment such as fire extinguishers and hydrant systems should be provided at strategic locations such as stores and construction areas.		One-off	
	iv. Regular inspection and servicing of the equipment must be undertaken by a reputable service provider and records of such inspections maintained		Every 3 months	
	v. Signs such as “NO SMOKING” must be prominently displayed within the flat, especially in parts where inflammable materials are stored		One-off	

	vi. Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air			
	vii. There must be adequate provision for artificial or natural lighting in all parts the premises in which person are working or passing			
	viii. Develop a suitable system for the safe collection, recycling and disposal of chemical wastes, obsolete chemicals and empty chemical containers to avoid their reuse for other purposes and to eliminate or minimize the risks to safety, health and environment			
a.Electrical safety	I. Circuits must not be overloaded			
	II. Distribution board switches must be clearly marked to indicate respective circuits and pumps			
	III. There should be no live exposed connections			
	IV. Electrical fittings near all potential sources of ignition should be flame proof			
	V. All electrical equipment must be earthed			
	I. Ensure that all chemicals used in construction are appropriately labeled or marked and that material safety	Project Manager,		10,000.00

b. Chemical safety and storage	data sheets containing essential information regarding their identity, suppliers classification of hazards, safety precautions and emergency procedures are provided and are made available to employees and their representatives	Developer & Contractor	Continuous	
	II. Keep a record of all hazardous chemicals used at the premises, cross-referenced to the appropriate chemical safety data sheets			
	I. There should be no eating or drinking in areas where chemicals are stored or used			
c. Employees Safety	I. Provide workers in areas with elevated noise and vibration levels, with suitable ear protection equipment such as ear muffs			
	II. Ensure that construction workers are provided with an adequate supply of wholesome drinking water which should be maintained at suitable and accessible points.			
	III. Ensure that conveniently accessible, clean, orderly, adequate and suitable washing facilities are provided and maintained in within the site			
Safety and security	1. Ensure general safety and security at all times by providing day and night security guards and adequate	Project Manager & Contractor	Continuous	10,000.00 per month

	lighting within and around the construction site.			
Oil Spills	1. A designated garage section of the site fitted with oil trapping equipments to be planned for changes. Such an area will be well protected from contaminating the soil			5, 000.00n per month
Increased Food Supply/demand	Construction workers will be given breaks to go for lunch	Project Manager & Contractor	Continuous	50, 000.00
	Onsite canteen to supply food if possible			
Hydrology and Water Quality Degradation	1. Hazardous substance control and emergency response plan that will include preparations for quick and safe cleanup of accidental spills.	Mechanical Engineer, Project Manager, Contractor & the D	Continuous	Part of erosion control
	Hazardous-materials handling procedures to reduce the potential for a spill during construction	Mechanical Engineer, Project Manager, Contractor & the Developer		
	3. Identify areas where vehicle maintenance activities and storage of hazardous materials, if any, will be permitted			
Vector / Water Borne Diseases	1. Complete refuse collection and handling service to be provided	Mechanical Engineer	Continuous	50, 000.00
Exposure to Diseases	Shall be mitigated by occupational health and safety standards enforcement	Contractor & all foremen	Continuous	

Increased Pressure on Infrastructure	I. Coordinate with other planning goals and objectives for region	Architect, Project Manager, Contactor and the Developer	Continuous	
	II. Upgrade existing infrastructure and services, if and where feasible.		Continuous	
Insecurity	1. Appoint security personnel operating 24 hours	Security Officer,	Continuous	Part of general
	2. Body-search the workers on entry, to avoid getting weapons on site, and leaving site to ensure nothing is safety stolen.	Resident Project Manager & Police		
	3. Ensure only authorized personnel get to the site			
Air Pollution	1. Suitable wet suppression techniques need to be utilized in all exposed areas	The Contractor & Site Safety Officer	Continuous	Part of dust control
	2. All unnecessary traffic must be strictly limited on site; speed controls are to be enforced			
Emergence of new environmental concerns	1. Due to the magnitude of the project, the Firm of experts should carry out monitoring and evaluation. More so an initial environmental audit should also be carried within a period of 12 months after commencement of the operations	Firm of Experts.	Continuous	200,000.00

Table 10: General Operational Environmental and Social Management Plan

Facility/ Environment Concern	Observations Made	Proposed Intervention Actions	Responsibility	Monitoring Means	Duration	Approximate cost (Ksh)
<p>Overall Environmental Management</p>	<p>I. The incinerator installation and operationalization should be geared to help much in overall management of the environment in Kinanie and the environs in terms of especially hazardous waste management</p> <p>II. There should not be allowed any open burning of waste or piling of it in the open, hence making it accessible by animals such as dogs, cats and birds and probably children. Thus this has been a</p>	<p>I. Ensure full operationalization of the incinerator</p> <p>II. Avoid piling waste where it can be accessed by animals</p> <p>III. Avoid open burning of waste</p>	<p>Project management/ Project Proponent</p>	<p>I. Full & efficient operation of the incinerator</p> <p>II. Lack of waste piled outside the incinerator</p> <p>III. Lack of open burning of waste</p> <p>IV. No animals accessing the waste</p>	<p>Through out</p>	<p>500, 000</p>

	<p>nuisance and an eyesore to the neighboring community</p>					
	<p>iii. Have in place well documented environmental management strategies that would inform organized environmental management system. iv. Develop an Institutional Environmental Policy Statement thus procedures and schedules for reviewing the Environmental Policy; records of overall environmental performance review meetings and departmental environmental management structure.</p>	<p>I. The project proponent is advised to put in place structural mechanisms that will ensure efficient environmental management strategies are adopted and reviewed from time to time to promote sustainable management of the environment 2. In consultation with environmental experts and relevant lead agencies, the proponent to develop its own environmental policy, if none exists</p>	<p>Project Proponent & Environmental Experts</p>	<p>I. Initial EA II. Team dedicated To Environmental management</p>	<p>Can be initiated immediately but endeavor to complete the process in 12 months</p>	<p>150,000</p>

Healthcare Waste Management						
	<p>I. Segregation of waste all the way from point of generation through to the final disposal of the segregated wastes.</p> <p>II. Acquire the HCW in force (2016- 2021)</p> <p>II. No heaping together all wastes for open burning thereby increasing the risk of infection from HCW</p> <p>V. HCW should not be left outside at the incinerator area for a long period hence being accessed by animals.</p> <p>V. Acquire a waste /incinerator operating license</p> <p>VI. Construct pits for disposing ashes and another pit for compositing organic wastes.</p>	<p>I. Ensure full operationalization of the Incinerator</p> <p>II. Avoid piling HCW where it can be accessed by animals</p> <p>II. The project proponent should know that the incinerator works best on well sorted waste</p> <p>IV. The project proponent should ensure that all guidelines provided by the MOH on HCWM are followed to eliminate incidences of poor HCW management like the evident mix-ups.</p> <p>V. It is important for the project proponent to train and retrain</p>	<p>Project management/ Project Proponent</p>	<p>1. Full and efficient operation of the incinerator</p> <p>2. Lack of waste piled outside the incinerator</p> <p>3. Lack of open burning of waste</p> <p>4. No animals accessing the waste</p> <p>5. Proper following of all guidelines provided by the MOH on HCWM</p> <p>6. Training and retraining reports</p> <p>7. Tight fence around the incinerator</p>	<p>In the next three months</p>	

	<p>These pits should be well attended and fenced off to reduce risk to the general population.</p>	<p>the staff involved in HCWM urgently</p> <p>VI. Apply from NEMA for a waste disposal/ incinerator operating license</p> <p>VII. Develop a schedule that will ensure that HCW brought to the incinerator for disposal is never left outside the incinerator shelter</p> <p>VIII. Fence the incinerator area tightly so as to keep off some stray animals such as dogs</p> <p>IX. Empty the organic waste composting pit and fence it off</p>		<p>8. Regularly emptied and fenced off organic waste pit</p>		
<p>Noise Monitoring and Control</p>						

	<p>I. There must be noise monitoring carried out with regard to the incinerator operations</p> <p>II. Check that bottles are opened being incinerated to avoid noise pollution from explosions</p>	<p>I. Initiate full operationalization of the incinerator immediately by providing adequate diesel</p> <p>II. Avoid open burning of to reduce on noise pollution from explosions</p>	<p>Project management/ Project Proponent</p>	<p>I. Reduced or lack of complaints from the public</p> <p>II. Full and efficient operation of the incinerator</p> <p>III. Lack of open burning of waste</p>	<p>Keep the incinerat or operating</p>	
	<p>Air Quality Monitoring and Control</p>					
	<p>The proponent should avoid air pollution around the area, either from the incinerator operations or from open burning of waste</p>	<p>To reduce on emissions, it is advisable adhering to the following practices:</p> <p>i. Firstly, initiate full operationalization of the incinerator always by providing adequate diesel and avoid open burning of waste</p>	<p>Project management/ Project Proponent</p>	<p>1. Air monitoring data</p> <p>2.Reduced or lack of complaints from the public</p> <p>3.Full and efficient operation of the incinerator</p> <p>4.Lack of open burning of waste</p>	<p>Every six months</p> <p>Keep the incinerat or operating</p>	<p>100, 000 purchase the necessary equipment or 50,000/yr</p>

		<ul style="list-style-type: none"> ii. Secondly, ensure that the incinerator is functioning properly, and the chimney is clear of excessive soot. iii. Rigorously segregate waste so that no unnecessary PVC (IVs, etc.) waste is incinerated iv. Ensure that the incinerator is preheated adequately and that supplementary fuel is added whenever necessary to maintain the burning temperature above 600C. v. Load the incinerator according to the recommended "Best Practices". vi. Adopt rigid quality control measures 				
<p>Staff Awareness and Training</p>						

	Staff awareness and training with respect to environmental management as stipulated in various guidelines offered by the MOH and NEMA	There should be training and frequent retraining of all the project staff with respect to environmental management	Project management/ Project Proponent	Training reports	Should be done every six months there after	50, 000 per training
Environmental Management System Set Up, Suitability and Performance						
	The project proponent should have in place a documented environmental management policy	Formulate an environmental policy for the incinerator	Management/ Project Proponent	Environmental policy in place	Up to 12 months	Ksh.50, 000
Compliance to Environmental Standards						
	It is upon the project proponent to ensure that the project is compliant to the set environmental standards.	1. Comply with all set environmental standards such as applying for an ETP license and an Incinerator operation license as well. 2.They should carry out an environmental	Project management/ Project Proponent	ETP and an Incinerator operation licenses	Every to 12 months	100, 000 per annum

		audit for the project annually				
Community Health and Safety Issues	Operational Effectiveness of the Incinerator					
	The incinerator should be undergoing regular servicing and maintenance	1.Ensure thorough sorting of waste to avoid organic wastes finding their way into the incinerator once full operationalization is done 2.Ensure regular servicing once full operationalization has been initiated 3.Evidence of a servicing contract	Project management/ Project Proponent	1.Lack of organic wastes at the incinerator site 2.Lack of complaints from the public	Through out the operation of the incinerator	Part of full operational iza tion of the incinerator
Structural Safety of Project Infrastructure						
	The chimney should not be highly exposed to avoid easy be vandalization not forgetting that kids could climb on it with danger of getting burnt.	Install guards around the chimney to ensure that nothing can reach it	Project management / Project Proponent	Insulated/ well- guarded chimney	Should be done during the construction phase	20, 000
	Ash Pit					

	<p>The incinerator should have a functional ash pit as should be the standard for incinerators to avoid the dispose of the ash from the incinerator in the open</p>	<p>There is need to construct a standard ash pit with a lockable cover. The ash pit should be large enough to store incinerated residues for at least 10 years without being emptied. A pit of 3.25m³ stores ash from the burning of approximately 300 safety boxes per month, over a period of 12years.</p>	<p>Project management / Project Proponent</p>	<p>A standard ash pit complete with lockable cover</p>	<p>Its construction should be done together with the incinerator shelter</p>	<p>60,000</p>
<p>Occupation Safety and Health Management</p>	<p>Adequacy of the Design of the Shelter</p>					
	<p>The design of the shelter should be up to standard to include: I. A defined Office space II. A Supplies/ material Store III. A Toilet</p>	<p>1. There should be provision for a fully equipped office with furniture and office</p>	<p>Project management/ Project Proponent</p>	<p>Fully equipped office with furniture and</p>	<p>These installations and modifications</p>	<p>1,000,000</p>

	<p>IV. Washing rooms</p> <p>V. The shelter to have a store where consumables like fuel, records, PPEs and other supplies can be stored</p>	<p>accessories so as to assist in proper record keeping of the incinerator operations and activities</p> <p>2. There should be a bathroom with functioning shower head and adequate supply of water</p> <p>3. There should be a toilet for the incinerator operators to avoid their having to share the mortuary pit latrine with mortuary attendants and clients;</p> <p>4. A store should be provided for within the incinerator</p> <p>Other than the above singled fundamentals, it should</p>		<p>office accessories</p> <p>A bathroom with functioning shower head and adequate supply of water</p> <p>1. A toilet for the incinerator operators</p> <p>2. A store within the incinerator</p> <p>3. A storage box to keep tools,</p>	<p>should be done during the project design phase</p>	
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		<p>encompass other several elements, housed within the sheltered enclosure.</p> <p>These elements are:</p> <p>i. A storage box to keep tools, protective clothing and records.</p> <p>ii. An enclosure with a lockable door to prevent access by children and unauthorized persons, as well as scavenging animals and birds.</p> <p>iii. An access hatch through a wire-mesh wall of the incinerator to allow waste to be deposited when the incinerator shelter is locked and the operator is not present.</p> <p>This hatch should open into a safety-box deposit which should provide a protected area where</p>		<p>protective clothing & records</p> <p>4. An enclosure with a lockable door to prevent access by children and unauthorized persons, as well as scavenging animals & birds.</p> <p>5. An access hatch</p> <p>Through a wiremesh</p>		
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		the safety boxes (and containers from needle-cutters) can be deposited temporarily.		wall of the incinerator		
Operator's Tasks and Responsibilities						
	<p>1.The incinerator operators should have a regular routine to burn the waste</p> <p>2.Prompt reporting of achievements or problems associated with the operation of the incinerator</p>	<p>1.Initiate full operationalization of the incinerator by always providing adequate diesel</p> <p>2.Avoid open burning of waste</p> <p>3.The incinerator operators in conjunction with the management should establish a regular routine to burn the waste</p> <p>4.Work towards minimizing personal risk, as well as risk to other workers and the local community by not operating a faulty incinerator</p> <p>5.Initiate a way of reporting achievements and problems to</p>	<p>Project management/ Project Proponent</p>	<p>1.A regular routine to burn the HCW in place</p> <p>2.Reports on achievements and problems associated with the operation of the incinerator and solutions taken</p>	<p>In the first month of full operation alization of the incinerat or</p>	

		the supervisor for necessary actions				
Receiving Health-Care Waste at the Incinerator						
	There should be a well-developed formal way of receiving wastes at the incinerator facility	In the event of full operationalization of the incinerator and in the presence of the operator at the incinerator and waste is deposited at the incinerator, the operator should: 1.Receive the waste, record the required details in the Waste-Deposit Record. 2.Verify that any waste received is appropriately packaged -that is: Sharps in safety boxes; other waste in plastic bags, and needles in needle-cutter	Project management/ Project Proponent Incinerator operator	Incinerator operating reports	A continuous activity	

		<p>containers. And that there are no organic wastes brought to the incinerator</p>				
		<p>When the operator is not present at the incinerator, the person delivering the waste should:</p> <ol style="list-style-type: none"> 1. Make sure that the safety boxes and plastic bags are properly closed. 2. Deposit the safety boxes and plastic bags through the access hatch that is clearly labeled and designed for this purpose. The waste deposited here drops into the safety box deposit that is accessible only to authorized persons. At locations where a needle-cutter is used, deposit the 				

		<p>needle containers through the access hatch that is used for the safety boxes and plastic bags. Thus this calls for the modification of the door to allow deposit of waste into the shelter even when the operator is not within the incinerator shelter.</p> <p>3.On returning to the incinerator site, the operator should arrange the safety boxes or plastic bags of waste which have been deposited through the waste hatch in the waste store.</p> <p>4.The operator should also complete the Waste-Deposit Record for the newly arrived waste once he returns to the facility</p>				
<p>Security of the Facility</p>						

	<p>Lack of proper securing of the incinerator area is what can enable the access to waste by stray dogs and cats as well as enabling anybody to dispose their waste into the incinerator area indiscriminately</p>	<p>1.Security of the facility should be enhanced by ensuring that it is well fenced off to make sure that strangers do not access the incinerator area nor do dogs access waste 2.Dispatch a 24hour watchman to the incinerator area</p>	<p>Project management/ Project Proponent</p>	<p>1.Proper fence around the incinerator facility 2.A 24hour watchman at the incinerator area</p>	<p>Fencing can be done during construction while a watchman can be deployed immediately</p>	<p>50, 000 for fencing</p>
<p>Personal Protection Equipment and Safety of the Incinerator Operator</p>						
	<p>The incinerator attendants should have appropriate PPE for use during operation of the incinerator</p>	<p>Supply of at least two sets of PPE of the right quality is recommended. The set of the right PPE should include at minimum the following: 1.Eye Goggles (medical grade); 2.Dust Mask-appropriate grade;</p>	<p>Project management/ Project Proponent</p>	<p>Availability of adequate PPE of the right quality</p>	<p>within a month</p>	<p>20, 000 to purchase adequate PPE</p>

		<p>3.Gumboots-appropriate grade;</p> <p>4.Hand glove-appropriate grade;</p> <p>5.Face Mask-appropriate grade; and</p> <p>6.Overall- covering the body and the head.</p>				
		<p>Exercising the following measures will ensure that the operator is safe:</p> <ul style="list-style-type: none"> i. Wearing the proper PPE at all times when operating the incinerator; ii. Washing hands regularly, hence why a hand wash basin with running water is needed within the incinerator shelter; 				

		<ul style="list-style-type: none"> iii. Being vaccinated against Hepatitis B Virus (HBV); and iv. Having regular medical checkups (every six months). 					
Fire Extinguishers							
	<p>Installed adequate fire suppression equipment/system at the incinerator shelter</p>	<p>1.The management should install fire suppression system before operationalization of the incinerator which should be serviced regularly to keep it effective at all times</p> <p>2. The incinerator operators should be trained on how to operate the fire extinguishing system to be installed and fire drills should be undertaken from time to time</p>	<p>1.Project management/ Proponent</p> <p>2.Incinerator operators</p>	<p>1. Availability of fire extinguishing equipment</p> <p>2.Training reports of the incinerator operator on fire emergencies</p>	<p>Should be achieved within the next three months</p>	<p>100, 000</p>	

First Aid Kits						
	The incinerator should have adequate well equipped first aid related equipment.	It is important that the facility is equipped with well-stocked first aid kits as well as training the incinerator operators on first aid administering from reputable first aid trainers such as St. Johns Ambulance.	Project management/ Project Proponent	1.Availability of adequate first aid kits 2.Training reports of the operator on first	Should be achieved within the next three months	Can be part of the fire emergency cost
Sanitation and Cleanliness						
	As earlier noted, the incinerator should have adequate sanitation facilities; 1.There should be piped water of good pressure 2.The shelter should be well arranged and clean at all times. 3.The sanitation and cleanliness of the facility should not be compromised by waste being	1.The operators are encouraged to observe and maintain the highest levels of cleanliness possible. 2.Measures should be put in place to ensure that wastes delivered when the operator is not in are not deposited outside the	Project management/ Project Proponent	1.No waste kept outside the incinerator shelter 2.Availability of safe waste disposal boxes 3.Piped water connected to the facility	Should be achieved within the next three months	200, 000

	deposited outside the shelter. This exposes the wastes to access by scavenging animals such as dogs.	incinerator shelter. This should be done by creating safe boxes that would allow safe depositing of HCW when the operator is not within the incinerator area. 3.Make a point of providing a sanitation facility to serve the incinerator alone		4.Toilet & bathroom constructed to serve the facility		
Emergency Response Procedures						
	1.Have a well-documented emergency plan for the incinerator facility. 2. Have a well-functioning Emergency alarm at the incinerator 3.Have the operator trained on emergency response. 4. Have an emergency committee in	It is recommended that the project proponent develops an emergency plan as well as constitute an Emergency Response Committee (ERC) that will entail staff from all departments. The members of the committee should be trained on emergency preparedness and response;	1.Project management/ Project Proponent 2.Department of Public Health and Department Of Occupational	1.Emergency alarms in place 2.Training reports on emergency management 3. Emergency management committee in place	Can be done together with the training on fire/first aid management	Can be part of the fire emergency cost

	place	the trained staff should in return be trainers of trainees to ensure that eventually all staff in all departments will be equipped with the necessary skills in emergency preparedness and response.	Safety and Health			
Work Injuries Benefit Cover						
	A Work Injuries Benefit Cover insurance cover should be in place	The management to have the Work Injuries Benefit (WIBA) Cover insurance cover put in place	1.Proponent 2.Department of Occupational Safety and Health	Work Injuries Benefit Cover insurance cover put in place	Can be achieved with the next six months	50, 000
The Management in Relation to the Incinerator Facility						
	The Incinerator Operators 1.The facility should always be supplied with adequate fuel so as to remain operational always so as to avoid open burning of wastes	1.The operators should always be subjected to retraining to improve their skills and know how especially the basics like	1.Department of Public Health and	1.Re-training report of the operators	Can be achieved by commercializing	Can be part of full operationalization of the incinerator

	<p>not forgetting that inadequate supply of diesel also leads to incomplete combustion of the waste by the incinerator leading to the production and release of noxious gases</p>	<p>loading of wastes, minor maintenance procedures that go a long way in defining the health of the facility in the long run</p> <p>2.The management should ensure there are at least two dedicated operators with long term contracts to inspire their morale. The operators should be subjected to regular retraining until they are well equipped with skills to navigate challenges likely to occur in the operations of the incinerator</p> <p>3.Ensure adequate supply of fuel to the incinerator as well as ensuring full</p>	<p>Department of Occupational Safety and Health</p> <p>2.Project management/ Project Proponent</p>	<p>2.Two motivated incinerator operators in place</p> <p>3.Adequate supply of diesel to enable optimum operation of the incinerator</p>	<p>the incinerator activities</p>	
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		<p>operationalization of the incinerator</p> <p>Further to the above, the following operator related measures should be adopted to ensure good incinerator performance once full operationalization is initiated:</p> <ol style="list-style-type: none">1. Only a trained, qualified and equipped operator should operate the incinerator.2. The operator must be on-site while the incinerator is functioning.3. The operator must be motivated to follow "Best Practices."				
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		<p>4. The incinerator should be operated according to Best Practices to minimize emissions and other risks.</p> <p>5.The operator must have long-term</p>				
	<p>Supervision Supervision is another area that needs to be addressed seriously so as to a mix up of waste delivered at the incinerator</p>	<p>Mixed up waste delivered at the incinerator could be identified with better supervision at the point of waste generation and at the incinerator site.</p> <p>The responsibilities of the supervisor at the facility could include but not be limited to:</p> <p>1.Ensuring good waste segregation practices;</p>	<p>Project management/ Project Proponent</p>	<p>1.Supervision reports 2.Strict sorting of HCW at source</p>	<p>Throughout</p>	

		<p>2.Coordination and supervision of waste transportation, packaging, storage and handling;</p> <p>3.Monitoring of waste handling at the incinerator and other appropriate locations</p> <p>4.Supervision of the incinerator operator; and Reporting.</p>				
	<p>Motivation</p> <p>One of the key barriers to good waste management is the absence of motivated operators and waste management supervisors and the lack of effort to motivate them</p>	<p>1.One way of motivating the personnel is through schemes offering financial incentives for good performance.</p> <p>2.Good training and creating awareness among all project staff on the importance of good waste management</p>	<p>Project management/ Project Proponent</p>	<p>1. Motivational schemes of the incinerators such as permanent or long term employment terms</p> <p>2.Training reports</p>		

		<p>(thorough sorting at source) can also improve motivation levels.</p> <p>3.As well, confirming permanent employment to the trained incinerator, giving them the appropriate PPE as well as providing for their own office and washroom would highly motivate to delivering the best in waste management and incinerator operation.</p>		<p>3.Provision of appropriate PPE to the operators</p> <p>4.Provision for office space, washroom and toilet to the incinerator operators</p>		
	<p>Incinerator Records</p> <p>There should be proper records at the incinerator indicating the type and quantity of wastes disposed.</p>	<p>In the event of full operationalization of the incinerator, records should be kept and they would help in evaluating the performance of the incinerator</p>	<p>Project management/ Project Proponent</p>	<p>Copy of proper records</p>	<p>Throughout</p>	

Best Practices in Waste Incineration once the incinerator is fully operationalized						
	<p>Appropriate Conditions for Incinerating Waste would include the following</p> <p>1.Observing appropriate conditions for incinerating the waste</p> <p>2.In relation to Safety Precautions, there should be provision of appropriate PPE</p>	<p>It is advisable to use the incinerator to burn HCW only if:</p> <p>1.Twelve or more safety boxes of waste have been deposited at the site for disposal.</p> <p>2.No large groups of people are present in the immediate area.</p> <p>3.The safety precautions are adequate.</p> <p>4.The incinerator is in good working order.</p> <p>For Safety Precautions to be Termed adequate, the Following Conditions must be Met;</p>	<p>Project management/ Project Proponent</p>	<p>1.Efficient incineration process</p> <p>2.Monitoring reports</p> <p>3.PPE available all the time and being used appropriately</p> <p>4.Availability of sand buckets</p>	<p>This is immediate and then maintained throughout maintained throughout</p>	

		<p>1.The appropriate PPE should be available and in good condition.</p> <p>2.Buckets full of sand are available at the incinerator site.</p> <p>3.The appropriate tools are available to operate the incinerator.</p>				
	<p>Making sure that the incinerator is in Good Working Condition due to the presence of a correctly closing loading door; the metal parts (front door, loading door, and chimney) not badly corroded and/or likely to break</p>	<p>For the Incinerator to be considered in Good Working Condition, the Following Conditions must be met:</p> <p>1.The ash door and the loading door close correctly, i.e. they must not be broken.</p> <p>2.The strainer cables to the chimney should be tight, and</p>	<p>Project management/ Project Proponent</p>	<p>Well maintained incinerator in optimal operating status</p>	<p>Can be achieved throughout</p>	<p>Running cost of the incinerator</p>

		<p>there should be no risk that the chimney will fall down.</p> <p>3.The metal parts (front door, loading door, spigot, chimney, etc.) should not be badly corroded and/or likely to break.</p> <p>4.The masonry should not be badly cracked and/or likely to cause injury.</p> <p>5.The incinerator should never be operated if faulty</p>				
	<p>Preparation and Loading the waste before start-up should follow the procedure below:</p> <p>1.Making sure that the waste is dry</p> <p>2. Ensuring that all tools and equipment are in working order.</p>	<p>In the preparation and loading of the HCW and before starting-up the incinerator, one should:</p> <p>1.Make sure that the HCW is dry. If it is wet, place it in a</p>	<p>1.Project management/ Project Proponent</p> <p>2.Incinerator Operators</p>	<p>a. Incinerator operating records</p> <p>b. Efficient operation of the incinerator</p>	<p>This is immediate and then maintained throughout</p>	

	<p>3.Wearing of complete and of best quality PPE.</p> <p>4. Consistence in removing the ash from the incinerator and placing it in the ash pit immediately.</p> <p>5.Weighing of the waste to be incinerated and counting of the boxes and/or packages hence a record of these quantities Burn Down/Cool Down- for at least 3hours following a waste incineration session.</p>	<p>well ventilated spot inside the incinerator to dry.</p> <p>2.Ensure that all tools and equipment are in working order.</p> <p>3.Wear proper PPE (gloves, goggles, overalls and masks).</p> <p>4.Remove the ash from the incinerator and place it in the ash pit immediately.</p> <p>5.Clean the area around the incinerator.</p> <p>6.Weigh the medical waste to be incinerated and count the boxes and/or packages. Record these quantities in a Waste-Disposal Record (WDR)</p> <p>7.After starting the incinerator, observe the</p>			<p>This is immediate and then maintained throughout</p>	
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		<p>primary burning chamber temperature gauge until the temperature stabilizes (approximately 5 minutes) at around 600°C.</p> <p>8.Load only HCW that has been weighed and recorded in the operator’s record for burning.</p> <p>9.Endeavor to load a mixture of safety boxes bags of waste so as to assist maintain the temperature at or above 600°C.</p> <p>10.If the temperature drops below 600°C, do not load waste till it rises again.</p> <p>11.Do not load very wet HCW. Place them in a dry, well-ventilated, warm place to dry</p>				
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		<p>(e.g. next to the top of the incinerator).</p> <p>12.As a general rule: burn more of safety boxes in order to increase temperatures in the incinerator, and more bags of other waste in order to reduce temperatures in</p> <p>13.When all the available waste has been burned and the temperature indicated on the temperature gauge falls below 600°C, proceed to burn down/cool down.</p> <p>14.After the waste has burned down, leave sufficient time for the fire to die down and the embers to cool.</p>				
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		<p>15. It is advisable that the operator does not leave the incinerator site until the temperature on the gauge falls below 400°C.</p>				
	<p>Proper Record-Keeping and Reporting</p>	<p>It is advisable that once the incinerator is fully operationalized, its activities are recorded on a daily basis on different forms such as the following: 1. The Waste Deposit Record to show the source, amount and type of waste deposited at the incinerator when the operator is present, and provide a monthly record of the waste burnt.</p>	<p>Project management/ Project Proponent Incinerator Operators Supervisor</p>	<p>Incinerator operating records</p>	<p>This is immediate and then maintained throughout</p>	

		<p>2. The Waste-Disposal Record to show the amount of waste destroyed and the amount of incineration ash produced at each burn session while the fuel and energy record should show amount of fuel (diesel) and number of electricity units consumed each burn session</p> <p>3.The Tools and Equipment Record lists the equipment available and its condition, as well as problems and defects encountered with any of the elements of the incinerator.</p> <p>The operator should be responsible for</p>				
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		<p>maintaining these records in accordance with the steps below:</p> <ol style="list-style-type: none">1.Submitting each record monthly to the waste-management supervisor.2.Keeping a carbon copy of all records at the incinerator site. These records must always be available for inspection at the site.3. Preparation of monthly/quarterly reports of the waste-management activity on the basis of the information in the daily records.				
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		4. Initiate proper records to indicate the fuel consumption versus waste incinerated				
	<p>Operator’s Maintenance Responsibilities-It is advisable that servicing of the incinerator is being carried out adequately by the contractor through a service contract/ after sale</p>	<p>The operators should be able to observe maintenance of the incinerator by carrying out the following activities:</p> <p>1.Keeping the area around the incinerator clean; not allowing it to become littered.</p> <p>2.Storing safety boxes and other medical waste in an orderly manner in the incinerator waste boxes and store.</p> <p>3.Storing fuel stocks in the incinerator fuel store or tank.</p>	<p>Project management/ Project Proponent Incinerator Operators</p>	<p>1.Incinerator operating records 2.Supervision records 3.Clean incineration area and shelter</p>	<p>©©This is immediate and then maintained throughout</p>	

		<p>4.Keeping the concrete slabs on either side of the incinerator clean; not using them as permanent storage zones. However, they could be temporarily storage of the HCW that is being dried prior to burning.</p> <p>5.Keeping tools, records and PPE in the storage box/office provided in the incinerator shelter.</p> <p>6.Handling tools and PPE carefully and keeping them clean.</p> <p>7.Immediately reporting to the supervisor any damage to the incinerator that affects operation or performance.</p>		<p>Availability of the right tools and equipment</p> <p>Reports</p>		
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		<p>8.Performing simple repairs but avoiding makeshift solutions.</p> <p>9.Systematically completing and submitting monthly reports for all records.</p> <p>10.Keeping the incinerator site locked at all times.</p> <p>11.Not allowing unauthorized persons to enter the incinerator area during periods of incineration.</p> <p>12.Ensuring that the waste-management supervisor has a key to the incinerator.</p> <p>13.Immediately reporting any vandalism, theft or unauthorized entry to the supervisor.</p>	<p>@@Supervisor</p>			
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Incinerator and ancillary facilities	Incinerator chimney can get very hot although it is not insulated	There is need to insulate the chimney during the construction phase	Project management/ Project Proponent	Insulated chimney	During construction phase	Part of the construction Budget
	Adequate provision of fuel for the incinerator	Provide adequate fuel for the incinerator to enable full operationalization	Department of Procurement and Supplies	Continuous availability of adequate fuel	To be maintained always	3000
	Energy use and conservation-The Incinerator to have an independent electricity meter	Install an independent electricity meter for the incinerator to enable monitor its energy use	Project management/ Project Proponent	Electricity meter installed	Can be achieved within one month	
Public Consultation, Participation and Socio-Economic Issues	Support for the Incinerator					

	<p>Members of the public are in full support of the incinerator project with the believe that if fully operationalized it would lead to reduced cases of foul emissions and explosions</p>	<p>The project proponent should not allow open burning of waste at the site</p>	<p>Project management/ Project Proponent</p>	<p>1.Fully operating incinerator 2.Lack of open burning of waste 3.Lack of complaints from the surrounding members of the public</p>	<p>Can be initiated immediately</p>	
<p>Emissions and the Surrounding Community</p>						
	<p>Emission from the open burning of waste should not be witnessed at all nor toxic emissions from the incinerator.</p>	<p>The management should fully operationalize the incinerator and avoid open burning of waste at the site</p>	<p>Project management/ Project Proponent</p>	<p>1.Fully operating incinerator 2.Lack of open burning of waste 3.Lack of complaints from the surrounding members of the public</p>	<p>Throughout</p>	
<p>Scavenging Animals and Public Health</p>						

	<p>Due to the potential lack of good securing of the facility and open dumping of waste, animals such as dogs and cats could access and rummage through the waste carrying some to the surrounding homesteads</p>	<p>1.Fence off the incinerator site properly 2.No open dumping of waste at the site 3.Develop a schedule of delivering waste from the surrounding health care facilities 4. Avoid open burning of waste</p>	<p>Project management/ Project Proponent</p>	<p>1.Proper fence around the incinerator area 2.Waste delivery schedule in place 3.Fully operating incinerator</p>	<p>Can be initiated immediately</p>	
	Livelihood Value of the Facility					
	<p>The local community feared that the incinerator would go down after commissioning owing to lack of funds for maintaining the project sustainably</p>	<p>The project proponent should ensure that adequate resources are put forward for proper maintenance of the incinerator so as to ensure that there is no likely of open burning of waste in the area</p>	<p>Project management/ Project Proponent</p>	<p>Continuous operation of the incinerator</p>	<p>Throughout the operation of the incinerator</p>	<p>At least 10000 per week to purchase fuel</p>
	Public Health and Sanitation					

	<p>1.The local community felt that waste management in the locality would continue improving with proper utilization of the incinerator.</p> <p>2.Some public members are aware that use of an incinerator in waste management is way better than open burning</p>	<p>1.The project proponent should be ready to address the issue of any emission</p> <p>2.Never allow open burning of waste</p>	<p>Project management/ Project Proponent</p>	<p>Never allowing open burning of waste; Reduced emissions via high notch management of incinerator and especially the thermocouple</p>	<p>Throughout the operation of the incinerator</p>	<p>At least 10000 per week to purchase fuel</p>
	<p>Staff Awareness and Training</p>					
	<p>The incinerator attendants should be trained by the incinerator supplier on its operation as well as handling of especially hazardous/infectious waste management.</p>	<p>1.Owing to the dynamics associated with HCWM, regular refresher trainings should be done to make sure that the operators are equipped with the best knowhow with regard to handling HCW</p>	<p>Project management/ Project Proponent</p>	<p>Refresher training Reports Report of retraining of the operators on operation of the incinerator</p>	<p>Immediate</p>	<p>20,000</p>

		<p>2.It is also advisable that the management organizes for a training of the operators on operation of the incinerator to ensure that they are efficient in their tasks</p> <p>3.Such retraining can be organized to be carried out by the incinerator installer</p>				
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Table 1: Social Management Plan for Construction of an incinerator plant

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost	Approx. cost	Impact Rating	Occurrence Likelihood
<i>Pre-construction Stage</i>									

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
<p>Labor influx and related impacts</p>	<ol style="list-style-type: none"> 1. The contractor should develop an internal labor management plan before hiring of workers. 2. The contractor should hire mainly local people for construction works to reduce the demand for accommodation in the area. This can be done in consultation with the local administration 3. The contractor should ensure the hiring process is done with fairness and gender sensitivity 4. The contractor will ensure compliance to provisions of Work Place Injuries and Benefits Act (WIBA) 2007 	<p>Before the commencement of construction</p>	<p>Contractor</p>	<p>Social team PMC</p>	<p>Once</p>	<p>Low</p>	<p>Low</p>	

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
<p>Violation of Human rights and Gender Inclusivity</p>	<ol style="list-style-type: none"> 1. The contractor should ensure hiring is done without gender discrimination, but also put into consideration the cultural norms within the locality. 2. The contractor should observe gender mainstreaming in hiring of workers as required by Gender Policy 2011 and 2/3 gender rule. Provide equal opportunities to all gender. 3. The contractor should ensure provision of the necessary basic sanitary facilities in relation to gender – provide separate sanitary facilities for male and 	<p>Before commencement of construction</p>	<p>Contractor</p>	<p>Social team PMC</p>	<p>Once</p>		<p>Low</p>	<p>Low</p>

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	female and cover the pits after project completion. 4. The contractor should ensure protection of labor rights to the workers in accordance with labor laws.							
Construction Stage								
Increased strain on available resources	1. The contractor should source their own water to be used during construction. By no means should the local neighbourhood resources used during construction unless prior arrangements are made and	Throughout construction period	Contractor	Health and Safety (EHS) team PMC	Bi-weekly		Moderate	High

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<p>necessary compensations accorded.</p> <p>2. Where possible use more infinite material to replace resources that have more demand that is competitive.</p> <p>3. Tracking of material sourcing to prevent or avoid degradation of associated source points by contractors or sub-contractors</p>							
<p>Child endangerment. Endangering the lives of children</p>	<p>1. The contractor should develop a Child Protection Strategy to ensure children are protected from any negative impact from the construction works.</p> <p>2. The contractor should strictly hire people who are above 18yrs</p>	<p>Throughout construction period</p>	<p>Contractor</p>	<p>Social team. PMC</p>	<p>Weekly</p>		<p>Moderate</p>	<p>Moderate</p>

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<p>and ensure they provide their Identity Card.</p> <p>3. The contractor should hoard the construction site</p> <p>4. The contractor shall ensure every worker under their jurisdiction signs a document committing themselves to the protection of the children.</p> <p>5. The contractor should organize with the local administration to ensure they alert the children not to play or go near the construction site or any machinery –vehicles transporting construction materials.</p>							

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	6. Provide safety warning signs informing the children and staff of ongoing construction works.							
Increased transmission of Communicable diseases – waterborne and airborne illnesses	<ol style="list-style-type: none"> The contractor should sensitize workers on proper use of Personal Protective Equipment (PPEs) The contractor should ensure there is provision of safe drinking water to the workers and workers should not share drinking containers (cups). 	Throughout construction period	Contractor	Social team. PMC	weekly		Low	Low
Sexual Exploitation and Abuse	1. The contractor should develop a code of conduct which should encompass clear warning to workers on any kind of sexual exploitation and abuse.	Throughout construction period	Contractor	Social team PMC	Weekly		Moderate	Moderate

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<ol style="list-style-type: none"> 2. The contractor should provide a mechanism where workers are free to report any sexual advances and abuse to the senior management without fear of intimidation. 3. The contractor should communicate to the workers that there should be no or minimal interaction with the students. 							
Occupational Safety & Health	<ol style="list-style-type: none"> 1. The contractor shall hire a competent occupational health and safety officer 2. The contractor should provide all the construction workers 	Throughout the construction period	Contractor	Social) team PMC	Bi-weekly		Moderate	Moderate

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<p>with the appropriate Personal Protective Equipment.</p> <ol style="list-style-type: none"> 3. The site supervisor should ensure all the construction workers wear the provided PPEs during the working hours. 4. The contractor shall erect rules requiring all workers and visitors have the appropriate PPEs to prevent any injuries. 5. Provide WIBA insurance cover for every worker 6. The contractor should purchase and provide a first aid kit at every construction site. Establish a first aid unit at the County/Lot Project site office or 							

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<p>make local arrangements with local health facilities for treatment purposes where need arises during construction period.</p> <p>7. The contractor should ensure any injuries, incidents or accidents are recorded and records kept for monitoring health and safety. This will be the responsibility of the appointed safety officer</p>							
Drug and Substance Abuse	<p>1. During worker’s orientation, they should be clearly informed of no drug or alcohol abuse within the construction site and during working hours</p>	Throughout construction period	Contractor	Social team	Weekly		Moderate	Moderate

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<ol style="list-style-type: none"> 2. The contractor shall communicate its “No Smoking” policy through large visible posters to the workers. 3. The site supervisor should not allow any worker entry to the construction site who is under the influence of drugs or alcohol. 4. Provide posters prohibiting workers from smoking or engaging in drug use within the polytechnic. 							
Social Evils/Crimes	<ol style="list-style-type: none"> 1. The contractor has a responsibility to provide security at the construction site 	Throughout construction period	Contractor	Social team D&CSC	Bi-weekly		Low	Low

Environmental / Social Impact	Mitigation Measures	Timing	Responsibility	Supervision	Monitoring Frequency	Unit Cost Approx. cost	Impact Rating	Occurrence Likelihood
	<p>and not to rely on the local security</p> <p>2. The contractor should consider hiring workers in collaboration with the local administration – who may have more knowledge on the local people, and that will minimize bad characters in its workforce.</p>							

7.1 Operational of the Incinerator EMP

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

Summary Environmental Management/Monitoring Plan for Operation of the incinerator

Expected Negative Impacts	Recommended Mitigation Measures	Responsible	Monitoring	Monitoring	Monitoring	Cost (Ksh)
		Party	Frequency	Means	Entity (ies)	
Emissions	To reduce emissions, adhere to the following Best Practices: i. Provide adequate incineration diesel ii. Rigorously segregate waste so that no unnecessary plastic/PVC (IVs, etc.) waste is incinerated. iii. Ensure that the incinerator chimney is clear of excessive soot. iv. Ensure that the incinerator is preheated adequately and that supplementary fuel is added whenever necessary to maintain the	Project management/ PHO/ Project Engineering Department and the CDE	Throughout the operating period of the incinerator	Observation of the incinerator operating temperatures, volume and weight of incineration ash against incinerated HCW,	Project management/ PHO/ Project Engineering Department and the CDE	Part of the incinerator operating costs

	<p>burning temperature above 600°C.</p> <p>v. Minimize poor burning in the chimney through correct loading practices and regulation of the self-adjusting draft control in the chimney. This increases the gas residency period.</p> <p>vi. Load the incinerator according to the recommended “Best Practices”.</p> <p>Ensure proper functioning of the scrubber at all times; Ensure timely servicing of the incineration machine</p> <p>vii. Adopt rigid quality control measures</p>			<p>colour of smoke from the incinerator chimney Project</p>		
Need for close supervision	<p>i. Training all the staff in best HCWM and industrial waste handling practices; Ensuring good waste segregation practices from source through to final disposal point;</p>			<p>Level of waste segregation, records form the incineration</p>		100,000

	<p>ii. Coordination and supervision of waste transportation, packaging, storage and handling; Monitoring of waste handling at the incinerator and other appropriate locations</p> <p>iii. Proper Supervision of the incinerator operators; and Reporting</p>			<p>operation</p>		
<p>Proper operation</p>	<p>i. The incinerator operators should be subjected to training on the best practices of operating it, maybe by the Incinerator Installer; Only welltrained, qualified and equipped operators should operate the incinerator.</p> <p>ii. The operators must always be on-site while the incinerator is functioning;</p> <p>iii. The operators must be motivated to follow “Best Practices.”</p>			<p>Observation of the incinerator operating temperatures, volume and weight of incineration ash against incinerated waste, colour of smoke</p>		

	<p>iv. The incinerator should be operated according to Best Practices to minimize emissions and other risks.</p> <p>v. The incinerator operators should have long-term contracts or be permanent hires</p>			from the incinerator chimney and records related to proper operation		
OSH concerns	<p>a) Implement all necessary measures to ensure health and safety of the facility to workers and the general public during operation of the facility as stipulated in the Occupational Safety and Health Act of 2007</p> <p>b) Subject the incinerator operators to First Aid Administration as well as fire emergency responses</p>	Project management/ PHO/ Project Engineering Department and the CDE	Throughout the operating period of the incinerator	General awareness of OSH related matters by the incinerator operators of the incinerator	Project management/ PHO/ Project Engineering Department and the CDE	0
General safety and security concerns	i. Ensure the general safety and security at all times by providing day and	Project Proponent and the	Continuous	Observation for	Project Proponent and	50, 000

	<p>night security guards and adequate lighting within and around the incinerator</p> <p>ii. Ensure only authorized personnel get to the site</p> <p>iii. Fire extinguishers should be placed strategically and operators of the incinerator trained on how to use them in case of a fire outbreak and</p> <p>Fence off the incinerator site</p>	Security Officer		the adequacy of security measures	the Security Officer	
Emergence of new environmental concerns	Undertake an EA within 12 months following the commissioning date of incinerator as required by law	Project management/ and the CDE	Once per annum		Project management/ and the CDE	As per the prevailing conditions

HEALTH CARE & INDUSTRIAL HAZARDOUS WASTE MANAGEMNET PLAN

NB-All Health care wastes should be disposed in accordance to the guidelines offered by the ministry of health. The proposed incinerator management should not hesitate to consult other relevant government agencies like NEMA with regard to disposal of industrial hazardous /HCW. Special reference should be made to the Environmental Management and Coordination Act, Waste Management Regulations (2006)

Waste Category	Recommended Treatment and Disposal Method	Responsibility	Monitoring Means	Monitoring Frequency	Monitoring Entity (ies)	
1. Human Anatomical Waste (human tissues, organs, body parts)	-Deep burial	The generating party-mostly a Hospital	Lack of such waste at the proposed project site	When picking the waste from a hospital	Hospitals and project proponent	
2. Microbiology & Biotechnology Waste (wastes from laboratory cultures, stocks or	- Local autoclaving / microwaving / incineration	Hospital Management	Observation	Before picking the waste from a hospital	Hospital Management NEMA, PHO and project proponent	Part of the incinerator operating cost

<p>specimens of micro-organisms live or attenuated vaccines, human cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)</p>						
<p>3. Waste sharps (needles, syringes, scalpels, blades, glass, etc. This includes both used and unused sharps)</p>	<p>-Disinfection (chemical treatment/ autoclaving /microwaving and mutilation/ shredding) / incineration</p>					

4. Discarded Medicines and Cytotoxic drugs (wastes comprising of outdated, contaminated, contaminated and expired medicines)	-Incineration, destruction and proper disposal in authorized secure landfills	Hospital Management and project proponent	Observation	Before picking the waste	Hospital Management and project proponent	Part of the incineration cost
5. Some types of Solid Waste (Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, beddings, other material contaminated with blood)	- Incineration / autoclaving / microwaving			Before picking the waste		Part of the incineration cost
6. Other types of Solid Waste (wastes	-Disinfection by chemical treatment /					

generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc.).	autoclaving / microwaving and mutilation shredding/incineration					
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8.3 Project Decommissioning

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It is anticipated that however long it takes, a time will come when the project lifespan will come to an end, the projects facilities removed and the site restored.

The main purpose of decommissioning is to restore /rehabilitate the site to acceptable standards. In this study, the decommissioning process is aptly dealt with under the chapter on EMP. During this stage, the proponent should ensure that all waste materials resulting from the decommissioning activities is cleared from the site.

Basically, the following should be undertaken as part of efforts to restore the environment:

- a) Fence and install sign posts with clear warnings on unsafe areas until natural stabilization occurs;
- b) Backfill surface openings, where possible;
- c) All re-usable waste materials should be used in other applications; and,
- d) Waste materials which cannot be reused should be collected by a licensed waste transporter for appropriate disposal.

CHAPTER NINE

9.0 CONCLUSION AND RECOMMENDATIONS

9.1 Conclusions

The ESIA found out that if the incinerator is put into optimal use as per the manufacturers user guide, the benefits are immeasurable in terms of efficiency in disposing especially hazardous and infectious waste. However, there are several challenges that can bedevil the operations of the incinerator hence not achieving optimal results; central to this is lack of adequate fuel to support the operations of the machine. Other challenges are related to Occupation Health and Safety of the operators. Noted is that there were no adverse environmental and social impacts associated with incinerator identified if operated as to per the manufacturer's guidelines and as per the recommendations given in this report. Therefore, addressing the identified management challenges would result in numerous environmental and social benefits as far as the local environment is concerned with regard to disposal of mostly HCW and industrial hazardous waste. Potential identifiable and noted impacts are of Low Significance and through proper mitigation measures they can be addressed satisfactorily as stipulated on the environmental management plan.

9.2 Recommendations

The project management is commended for embracing such technology in waste disposal and it is incumbent upon it to sort out the management challenges that can bedevil full operationalization of the incinerator in order to realize its intended benefits. Based on the ESIA findings, the experts recommend the following to enhance sustainability in utilization of the incinerator:

- i. **Supplies**- the project management should ensure that there are adequate supplies that can support the optimal running of the incinerator such as diesel at all times.

Consumption rates should be established to enable proper planning. This can only be attained via proper record keeping.

ii. Sustainability- the project management should map out a partnership with local private health care facilities that lack functional incinerators by assisting in disposing the HCW from such facilities at a fee. By so doing the project management will raise the required finances required to fuel and maintain the incinerator. In this regard the following should be formulated:

- a) Map out the catchment to be served by the incinerator;
- b) Establish an affordable fee preferably per kilogram of HCW delivered at the incinerator for disposal;
- c) Initiate a clean HCWM and incinerator operations record keeping at the facility
- d) Establish a mutually agreed timetable on delivery of HCW from private and other health care facilities within the vicinity of Kinanie;
- e) Retrain the incinerator operators and if possible give them permanent employment terms or long term contracts
- f) Ensure close supervision of the incinerator operators

iii. OHS and Emergency Services: In order to ensure optimum OSH status at the incinerator site, there should be put in place a ash pit; a washroom; a fully equipped office; a toilet; waste store fitted with waste boxes; a supplies store; a fire suppression system and an emergency alert alarm system. There should be provision of proper and adequate PPEs to the incinerator operators who should be properly trained on emergency preparedness and response, first aid administration and provided with adequate first aid kits and other requisite materials.

iv. Environmental Management Strategies – the facility should endeavour to comply to set standards with regard to environmental and public health/social management.

Reference should be made to the Environmental Management and Coordination Act-

2015 (Waste Management) Regulations of 2006 for compliance purposes. The project proponent should apply from NEMA for a waste disposal license

v. Security and access by non-authorized persons and animals-the facility should be secured adequately to fend away delinquent persons as well as deny scavenging animals the access to waste.

vi. Never allow open burning of waste-With the above in place, the project proponent should never allow open burning of waste as a matter of principle

This ESIA determined that if the proposed works are implemented with due attention to the mitigation and management measures outlined, it will not pose any serious adverse and negative environmental impacts. It is therefore recommended that NEMA gives consent and the necessary licenses to the project development with conditions it deems fit to include.

GALLERY



The chief addressing the locals



The lead expert explaining about the project





Stakeholders raising of their concerns



Stakeholders raising their hands as sign of embracing the proposed project

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Annexes

1. Stakeholder Engagement Methodology
2. Code of conduct
3. Labour management Plan
4. Grievance Redress mechanism Framework
5. Land Ownership documents
6. Approved architectural and structural designs
7. Minutes of Public Participation
8. List of Attendance
9. NEMA Licences of Lead Experts
10. NEMA licences of Associate Experts

Annex 1

STAKEHOLDER ENGAGEMENT METHODOLOGY

1.0 Introduction

This brief contains the framework for undertaking stakeholder's engagement for the BOREDO incineration Project. It highlights the following:

1. Rationale for stakeholder's engagement
2. Process to be followed in stakeholder engagement and information disclosure processes
3. Communication plan

1.1 Rationale

Stakeholders consultations and disclosure forms is one of the core chapters under the Environmental and Social Management Framework. The World Bank Safeguards Operational Policy /Bank Procedures (OP/BP 4.01 Environmental Assessment) requires stakeholders' consultation about the project environmental/social impacts and consider their view. The Constitution of Kenya, EMCA - 2015 and other statutes also require public consultations in the development process and implementation of any project.

Objectives of the stakeholder engagement was: -

1. To share information on the progress of the project
2. Develop recommendations/mitigation measures on how best to address the actual environmental and social implications

3. Develop a monitoring mechanism, to ensure Environmental, Health and Social safety
4. To clarify roles and responsibilities for engagement and consultations

1.2 Stakeholder Engagement Plan

The stakeholder engagement plan was formulated with the main purpose to;

- i. To engage the stakeholders through consultative forums to verify their interests, concerns and recommendations regarding the project implementation so as to monitor Environmental and Social safeguards
- ii. Secure and sustain support for the project among key stakeholders.
- iii. Creating awareness and minimize hostility towards the project implementation.
- iv. Tap into the local values and include them in the social and environmental safeguards.
- v. Verify that the needs of the stakeholders were met in the proposed project.

The stakeholder engagements were carried out through the following channels:

- Face-to-face
- Round-table discussions,
- Consultative workshops/ Focused group discussions
- Telephone interviews to ensure wide coverage of the relevant stakeholders.
- Public Meetings/ Baraza

The key Outputs from Stakeholder consultation process will be: -

1. List of actual environmental and social implications of the proposed project
2. List of recommendations on alternative mitigation measures and areas of improvement
3. Recorded minutes of the meetings and list of attendees.

1.3 Communication Strategy

Communications Plan will be used as a tool to involve stakeholders on different levels as the project implementation goes on. Communications plan objectives are: -

1. To build a monitoring and evaluation program in the project implementation.
2. To capture the feedbacks of the stakeholders on the need's implementation.

The communication channels to be used include -

1. The BOREDO project Management unit
2. Memorandums/ Written comments from the stakeholders

Invitations to the forums/ meetings was done through multiple means using official letters sent at least two days in advance, emails, physical deliveries and telephone calls to targeted stakeholders. Reminders were also sent out to ensure full participation in the process.

Given the resource constraint (time and finances), it was prudent to choose a venue on the basis of centrality and ease of access by the participants. The venue of preference was at Kwamboni Primary school

Some of the key stakeholders to be consulted include the following:

1. BOREDO management
2. BOREDO project implementation representative
3. Local leadership e.g. Area MP, Area MCA, Area Chief
4. Nearby village representative e.g. Kwamboni residents
5. Kwamboni Primary school representative
6. Kwamboni secondary school representative
7. County officer representative from Environment and water
8. Established Women Group representatives

9. Community based organization representatives
10. Youth group representative

Table 2: Stakeholders engagement methods

STAKEHOLDERS	METHOD OF ENGAGEMENT	FREQUENCY
Boredo Supplies Ltd management project implementation representative Local leadership e.g. Area MP, Area MCA, Area Chief	Official Memo Letters Telephone interviews Written comments Email	Monthly
County officer representative from Environment	Official memorandum Letters Email	Weekly
Supervising consultant	Official Memo Letters Telephone interviews Written comments Email	Weekly
Established Women Group representatives Community based organization representatives Youth group representative	Face to face meeting Written reports	Monthly
Community leaders Established Women Group representatives Community based organization representatives	Public meeting "baraza"	Need basis
Employees/Workers	One on one Discussion "Toolbox talks"	Daily

Annex 2:

CODE OF CONDUCT

ENVIRONMENTAL, SOCIAL, HEALTH AND

SAFETY (ESHS) BACKGROUND

The BOREDO Code of Conduct on Environmental, Social, Health and Safety (ESHS) is enshrined in the World Bank Environmental and Social Framework. It spells out commitment of all members of the contractor's team and ownership to improving environmental performance in all its operations and protect and promote the health and safety of all its stakeholders. This code of conduct comprises of Environmental and Social Policy, Safety and Health Policy and, other relevant guidelines.

The main purpose of this Code of Conduct is to help in preventing occurrence of any cases of Sexual Exploitation and Abuse (SEA) and other forms of Gender Based Violence (GBV) and Violence against Children (VAC) resulting from the anticipated influx of laborers to the project area.

The project proponent (BOREDO) is committed to creating a conducive environment during construction and operation which will prevent gender-based violence (GBV), Sexual Exploitation and Abuse (SEA) and Violence issues. GBV, SEA and VAC are unacceptable and this shall be clearly communicated to all those engaged on the project

SOCIAL POLICY

We are committed to protect and promote all stakeholders against any social risk bound to arise as a result of the proposed project. On the other hand, during construction and operation stages, BOREDO commits to create and maintain an environment which

discourages SEA, other forms of GBV and VAC, and where the unacceptability of any involvement in such actions are clearly communicated to all those engaged on the project including subcontractors, suppliers and other service providers. In order to prevent GBV and VAC, the following core principles and minimum standards of behaviors will apply to all employees without exception:

1. SEA and other forms of GBV and/or VAC constitutes acts of gross misconduct and are therefore grounds for sanctions, penalties and/or termination of employment. Contracts of people caught, reported or suspected to be engaged in such acts shall be suspended and if proven guilty summarily terminated.
2. All forms of GBV, SE and VAC including grooming are unacceptable be it on the work site, the Project Area of Influences, or at workers' camps and/or communities along the road corridor. Investigation and prosecution of those who commit SEA and other forms of GBV or VAC will be pursued and actively supported by the contractor and TKNP.
3. Women and children (persons under the age of 18) shall be treated with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
4. Language or behavior towards women and/or girls that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate shall not be used.
5. Sexual activity with children under 18—including through digital media—is prohibited and any incidents or suspension need to be reported immediately to the police and/or through BOREDO Grievance Redress Mechanism. Mistaken belief regarding the age of a child and consent from the child is not a defense. Delayed reporting or concealing incidents are not tolerated and may trigger the

termination of the involved employees and consequences against the contractor, as further stipulated in the Contract.

6. Exchange of money, employment, goods, or services for sex, including sexual favors or other forms of humiliating, degrading or exploitative behavior is prohibited.
7. Sexual interactions between employees at any level and member of the communities surrounding the work place that are not agreed to with full consent by all parties involved in the sexual act are prohibited (see definition of consent above). This includes relationships involving the withholding, promise of actual provision of benefit (monetary or non- monetary) to community members in exchange for sex – such sexual activity is considered “non-consensual” within the scope of this Code.
8. Where an employee develops concerns or suspicions regarding acts of SEA, other forms of GBV and VAC by a fellow worker, whether in the same contracting firm or not, he or she must report such concerns in accordance with the GRM.
9. All employees shall attend an induction training course/workshop prior to commencing work on site to ensure they are familiar with the Company’s Code of Business Conduct, Anti-corruption policy including this Code of Conduct to prevent GBV and VAC.
10. All employees shall attend other trainings internally organized by the project management unit including regular updates to reinforce the understanding of the Code of Conduct.
11. All employees will be required to sign an individual Code of Conduct confirming their agreement with the Code of Conduct and all its provisions.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent SEA and

other forms of GBV and VAC and report any incidents or suspicions immediately. I understand that any action inconsistent with this Code of Conduct or failure to take action mandated by this Code of Conduct may result in disciplinary action.

Signed by _____

Title: _____ Date: _____

SAFETY AND HEALTH POLICY

BOREDO project is committed to protect and promote the health and safety of all our stakeholders. We endeavor to develop a positive safety and health culture in accordance with all occupational health and safety legislation, regulations and appropriate codes of practice relating to our operations.

We are committed to:

1. Having a high-quality occupational health and safety management system (OHSAS), with an aim to lessening the risk to employees and members of the public from processes and activities associated with our activities.
2. Comply with all applicable safety & health standards
3. Effectively communicate the policy to staff and other interested parties
4. Review our safety & health objectives regularly for continual improvement
5. Provide information and assistance to public on occupational health and safety issues arising from our operations.

OTHER RELEVANT GUIDELINES

1. Confidentiality

- a. The contractor's/sub-contractor's employees and agents will treat the client information as confidential and will neither take personal advantage of privileged information gathered during the given assignment nor enable others to do so.
- b. The contractor's/sub-contractor's employees and agents shall share non-public information only on a need to know basis, and only with pre-approval.
- c. Follow procedures if disclosing confidential information to any third party.
- d. Never use non-public information to advance personal interests or the interests of any other party.

2. Assignments

- a. The contractor's/sub-contractor's employees and agents will only accept work that the member is qualified to perform and in which the client can be served effectively.
- b. The contractor's/sub-contractor's employees and agents will not make any misleading claims and will provide references from other clients if requested.

3. Commissions / financial interests

- a. The contractor's/sub-contractor's employees and agents will neither accept commissions, remuneration nor other benefits from a third party in connection with recommendations to the client without the client's consent nor fail to disclose any financial interest in goods or services which form part of such recommendations.

4. Unrealistic expectations

- a. The contractor's/sub-contractor's employees and agents will refrain from encouraging unrealistic expectations or promising clients that benefits are certain from specific management consulting and advisory services.
- b. The contractor's/sub-contractor's employees and agents will ensure that before accepting any engagements has been established with the client.
- c. The contractor's/sub-contractor's employees and agents will advise the client of any significant reservations the members may have about the client's expectation of benefits from the engagement.

5. Disclosure and conflict of interest

- a. The contractor's/sub-contractor's employees and agents will disclose at the earliest opportunity any special relationships, circumstances or business interests which might influence or impair the member's judgement or objectivity on a particular assignment. This required prior disclosure of all relevant personal, financial or other business interests that could not be inferred from the description of the services offered.
- b. The contractor's/sub-contractor's employees and agents will not serve the client under circumstances which are inconsistent with the contractor's professional obligations or which in any way might be seen to impair the contractor's integrity, wherever a conflict of interest arises, the contractor will, as the circumstances require, either withdraw from the assignment, remove the source of conflict or disclose and obtain the agreement of the parties concerned to the performance or continuance of the engagement.

6. Recruiting

- a. The contractor will not make offers of employment to or engage any member of the client's staff nor use the services of any such person either

independently or via a third party unless they have first obtained the client's written consent.

- b. The contractor will prevent the use of all forms of forced labor and child labor and promote the fair treatment, nondiscrimination and equal opportunity of project workers.

7. Standards of Service

- a. The contractor's/sub-contractor's employees and agents will carry out the duties which has been assigned for the clients diligently, conscientiously and with due regard to the client's interest. The contractor will maintain a fully professional approach in all dealings with clients, the general public and fellow members.

8. Maintaining integrity in financial transactions

- a. The contractor's/sub-contractor's employees and agents will ensure all payments and transfers are properly documented, check for compliance with applicable World Bank/GoK rules, policies, and procedures, seek guidance if s/he has any concerns about the legality, destination, or rationale for payments or other transfer of property or information.

9. Ethics

The contractor's/sub-contractor's employees and agents shall:

- (a) Comply with all laws and regulations in the country of Assignment.
- (b) Fully subscribe the Occupational Health and Safety Act 2007, World Bank Environmental and Social Safeguards and observe those rights in our daily work. S/he shall have a commitment to actively promote the respect for human rights in all their assignments.
- (c) Respect ILO conventions on employment and prohibit employment or outright employ persons below the age of 18.

- (d) Not allow any form of discrimination or harassment, be it with regard to race, age, gender, nationality, ethnicity, religion or political belonging or other affiliation.
- (e) Not allow or get involved in sexual harassment, defined as: behaviour based on gender differences or un-welcome behaviour of sexual nature that offends the integrity of other persons.
- (f) Never give any undue payment or other consideration to any person or entity for the purpose of inducing that person or entity to act in favour of the contractor's/sub-contractor's employees and agents. Never accepts any undue payment or other consideration from any person or entity for the purpose of acting in favour of that person or any entity or other person s/he may represent. Avoids all types of activities that may lead to a conflict of interest in the professional behaviour.
- (g) Abide to any type of anti-corruption policy in the country of work. Pro-actively works to prevent corrupt practices, even when it is not part of the duties or assignment of the individual. Reports suspicion of corrupt practices to relevant Authority.
- (h) Respect and always follows available National policies on corruption in Kenya. On his/her own initiative interprets the intention of the policies into practical personal rules.
- (i) Plan ahead to analyze what effect his/her work will have on the environment, and takes action to minimize environmental and social risks.
- (j) Not exploit business relationships for his/her own personal gain.
- (k) Respect, and act respectful of cultural practices in the community in the region of assignment, even when these do not exist in any written form.

10. Pro-active Statement

The contractor's/sub-contractor's employees and agents shall:

- a) Actively search for information on all issues in the Ethics section and realizes that it is his/her responsibility to act according to those Ethics.
- b) Be aware that any deliberate breach of the above – or serious breach out of negligence- will lead to corrective actions from the client and may lead to immediate termination of contract.
- c) Actively promote the issues in the ethics section above
- d) Conduct their private or other external activities in a manner that does not conflict or appear to conflict with the Ethics.

RELEVANT REFERENCE DOCUMENTS

We will refer and apply relevant technical documents in executing the project in accordance with for instance:

1. Requirements of the World Bank Group Environmental, Health and Safety Guidelines (EHSGs).
2. World Bank Group Strategy 2013 on corporate goals of ending extreme poverty and promoting shared prosperity in all its partner countries.
3. The Kenya Constitution 2010.
4. The Kenya Vision 2030 Blue Print.
5. Other relevant Environmental Health and Safety subsidiary legislation

REVIEW

The policy shall be reviewed as and when necessary for its relevance and appropriateness to the BOREDO project

Signed:

.....

.....**Main Contractor**

Annex 3: LABOR MANAGEMENT PLAN

The contractor/sub-contractor shall provide his/her labor management procedures in the form provide here below.

1. OVERVIEW OF LABOR USE ON THE PROJECT

1.1 Provide number of project workers.

- i. The total number of workers to be employed on the sub-project site:
.....
- ii. Number of direct workers:
- iii. Number of contracted workers:

1.2 State the characteristics of project workers.

- i. Number of local workers:
- ii. Number of national workers:
- iii. Number of international migrants:
- iv. Number of female workers:
- v. No of male workers:
- vi. No of PLWD workers:

1.3 Provide information on timing of labor requirements.

- i. Site preparation stage/Mobilization (site holding, erection of site temporary structures):

Number of skilled workers:
- Number of unskilled workers:
- ii. Excavation stage

Number of skilled workers:
- Number of unskilled workers:

iii. Sub-structure stages:

Number of skilled workers:

Number of unskilled workers:

iv. Super structure walling and concreting stage:

Number of skilled workers:

Number of unskilled workers:

v. Roofing stage:

Number of skilled workers:

Number of unskilled workers:

vi. Finishing stage (window/door installations, plaster/screed, painting, etc.):

Number of skilled workers:

Number of unskilled workers:

vii. Project close-up/demobilization:

Number of skilled workers:

Number of unskilled workers:

1.4 State number of workers hired by:

i. Main contractor. No.

ii. Sub- contractors. No.

iii. Contracted services (e.g. suppliers of materials). No.

1.5 Do you have migrant workers? Yes [] No []

If Yes

- How many are? DomesticNo, International..... No.
- In a separate paper provide details of the migrant works including their region/country origin/ working permits the case of international workers

2. ASSESSMENT OF KEY POTENTIAL LABOR RISKS

The key labor risks which may be associated with the project include the following:

- i) **Labor influx and related impacts:** The employees will be hired from within the locality hence limited movement or very short distances from their homes. The skilled labour force from elsewhere will reside in hotels in the closest proximity to the project area
- j) **Human rights and gender inclusivity:** During recruitment of workers there could be discrimination against one gender either by design or oversight. Lack of compensation for excess working hours. Contractors may overlook provision of sanitary, health and safety facilities such as Personal Protective Equipment (PPE).
- k) **Child protection:** Exposing the students to strangers is likely to result in sexual violence and exploitation which involves unwanted sexual touching, attempted unwanted sex, physical forced sex, receiving money in exchange for sex among others. Children are likely to be subjected to labor during construction works such as fetching water and carrying building materials.
- l) **Increased transmission of communicable diseases:** Construction activities could create opportunities for transmission of communicable diseases such as water borne and airborne diseases.
- m) **Sexual exploitation and abuse:** Interaction between construction workers and other project stakeholders such as students, staff and community could lead to sexual exploitation.
- n) **Occupational health and safety:** Sexual harassment may occur between workers during the construction phase. The possible mitigative measure should include but not limited to Ensuring clear human resources policy against sexual

harassment that is aligned with national law; Integrate provisions related to sexual harassment in the employee Code of Conduct and ensuring appointed human resources personnel to manage reports of sexual harassment according to policy

- o) Drug and substance abuse:** The presence of construction workers is likely to increase the student's exposure and access to drugs and alcohol.
- p) Social Evils/crime** – influx of workers near the school, may introduce criminal activities especially people with bad behaviors like stealing at the construction site or in the school.

3. BRIEF OVERVIEW OF LABOR LEGISLATION, POLICIES AND PROCEDURES

The contractor to refer to the following key aspects of Government of Kenya national labor legislation with regards to term and conditions of work, and how national legislation applies to different categories of workers identified in Section 1.

- a) The Constitution of Kenya, 2010
- b) EMCA Act, 2015
- c) Employment Act, 2007
- d) Labor Relations Act, 2012
- e) National Gender and Equality Commission Act, 2011
- f) Child Rights Act (Amendment Bill), 2014
- g) Occupational Safety and Health Act, 2007
- h) Work Injury Benefits Act, 2007
- i) Sexual Offenses Act, 2006
- j) Public Participation Bill, 2016
- k) HIV & AIDS Prevention and Control Act, 2011
- l) Public Health Act (Cap 242)

4. RESPONSIBLE STAFF

Provide information of individuals within the project responsible for the following:

i. Engagement and management of project workers

Name

Title

Answerable to: Main contractor [] OR Sub-contractor []

ii. Engagement and management of subcontractors

Name

Title

iii. Occupational health and safety (OHS)

Name

Title

Answerable to: Main contractor [] OR Sub-contractor []

iv. Training of workers

Name

Title

Answerable to: Main contractor [] OR Sub-contractor []

v. Addressing worker grievances

Name

Title

Answerable to: Main contractor [] OR Sub-contractor []

5. AGE OF EMPLOYMENT

The contractor, his sub-contractors and agents shall comply with **Employment Act, 2007** which provides the age limits and mechanism of labour management to ensure underage persons are not engaged in the project.

6. TERMS AND CONDITIONS

State specific wages of the workers in operation.

i. Skilled workers (pp/day) Ksh.

0-200	
201-400	
401-600	
601-800	
801-1000	

ii. Unskilled workers (pp/day) Ksh.

0-200	
201-400	
401-600	
601-800	
801-1000	

- iii. State working hours
 - Monday Friday: From to
 - Saturday: From to
 - Sunday: From to
 - Public Holiday: From to
- iv. Is there any collective agreements signed between contractor and workers?
- v. Yes [] No []. If YES in separate paper, provide a list of agreements and describe its key features and provisions
- vi. Provide any other specific terms and conditions of the labor engagement.

7. GRIEVANCE MECHANISM

The contractor, his sub-contractors and agents shall comply with the procedures laid out in the Grievance Redress Mechanism (GRM) Plan.

8. SOURCE OF WORKERS

The contractor will strive to ensure that the employees are from close proximity to the project site. The contractor will make necessary movement arrangement for workers to and from site on daily basis using designated public roads. The employees will be hired from within the locality hence limited movement or very short distances from their homes. Non skilled and semi-skilled labor can be sourced locally, skilled labor on the other hand can be sourced nationally this is if local labor cannot meet these demands. Considering that the project areas are schools, there will be no labour camps, the skilled labour force from elsewhere will reside far away from the project area.

Annex 4: GRIEVANCE REDRESS MECHANISM FRAMEWORK

INTRODUCTION

Grievance Redress Mechanism (GRM) – is a management system through which grievances will be resolved following a standard operating procedure (SOP) aligned to other management systems (communication, resourcing, reporting). A grievance is concern or complaint raised by an individual or a group of stakeholders affected by real or perceived impacts of a company's / project's operations". *This GRM not for the entire project but for the contractor workers.*

A grievance mechanism provides a way to reduce social and environmental risk for the proposed projects, offers stakeholders an effective avenue for expressing concerns and achieving remedies, and promotes a mutually constructive relationship.

A grievance mechanism will be provided for all direct workers and contracted workers (and, where relevant, their organizations) to raise workplace concerns. Such workers will be informed of the grievance mechanism at the time of recruitment and the measures put in place to protect them against reprisal for its use. Measure will be put in place to make the grievance mechanism easily accessible to all such project workers

A well-functioning grievance mechanism does the following,

- Provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting;
- Builds trust as an integral component of broader stakeholder's relations activities; and
- Enables more systematic identification of emerging issues and trends, facilitating corrective action and positive engagement.

GRIEVANCE REDRESS MECHANISM PRINCIPLES

Within the project the following principles need to be established to ensure the effectiveness of the GRM:

- Commitment to fairness in both process and outcomes.
- Freedom from retaliation for all involved parties within the project area.
- Dedication to building broad internal support across project lines.
- Mainstreaming responsibility for addressing grievances throughout the project, rather than isolating it within a single department.
- Willingness by Client, Contractor and Consultant to visibly and sincerely champion the grievance system.

In addition to this; The contractor informs direct and contracted workers, respectively, about the available grievance mechanisms, and how they work. The relevant information should be made available throughout project duration in a manner that is clear, understandable, and accessible to workers, for example, by including it in workers' handbooks, on notice boards, or through similar communication mechanisms

The design of this Grievance Mechanism framework is aligned to international best practices and guidelines and has taken the following factors into consideration:

- Proportionality: Scaled to reduce risks and adverse impacts on affected communities, stakeholders and beneficiaries.
- Cultural appropriateness: Taking into account culturally appropriate ways of handling community, stakeholders and project beneficiary concerns.
- Accessibility: Clear and understandable mechanism that is accessible to all segments of the affected stakeholders at no cost.
- Transparency and accountability to affected stakeholders at every project implementation level.

- Appropriate protection; Prevent retribution and not impede access to other remedies.

Grievance Categories

A grievance or complaint includes any communication that expresses dissatisfaction, in respect of the conduct or any act of omission or commission or deficiency of service and in the nature of seeking a remedial action but do not include the following:

- Complaints that are incomplete or not specific in nature
- Communications in the nature of offering suggestions
- Communications seeking guidance or explanation.

Based on the understanding of the project areas and the stakeholders, an indicative list of the types of grievances have been identified for the project, as can be seen below;

Internal Grievances: Grievances from Employees (including both direct and indirect employees, including local workers and migrant workers through contractors)

- ✓ Complaints pertaining to amount of wage, salary, other remuneration or benefits as per Contract Policy and legal framework
- ✓ Timely disbursement of remuneration
- ✓ Gender discrimination
- ✓ Issues related to workers organization
- ✓ Labour Accommodation, transportation
- ✓ Health and Safety issues
- ✓ Extended working hours

Guiding principles in preparation of a Grievance REDRESS CHECKLIST

The guiding principles to be considered while developing a checklist will entail the following:

- An inventory of any reliable conflict mediation organizations or procedures in the project area and an assessment to determine if any can be used instead of having to create new ones.
- Communication Mechanisms such as use of oral means and in the local and national languages should be prioritized and proposals on ways to impose clear time limits for addressing grievances.
- Specific appeal procedure, suggestion and recommendation mechanism shall be provided and suggestions made on how information needs to be shared with the stakeholders or beneficiaries.
- GRM committee (to be site specific) to be created to address grievances and authority to resolve complaints. This GRM proposes that such a committee to include stakeholder's representatives and the project beneficiaries.
- A Grievance Acknowledgement Form and Grievance Resolution Form should be introduced dully filled by the involved parties.

This GRM mainly focusses on;

- Measures relating to OHS and are aimed at protecting project workers from injury, illness, or impacts associated with exposure to hazards encountered in the workplace or while working. Such measures take into account the requirements of the WB OHS and national law requirements on OHS
- Labour related issues-terms of employment, wages, working hours, allowances, overtime etc

Receiving Grievances

There shall be two levels of handling the grievances. These should be fully utilized before one goes to the courts. These levels are:

- ✓ The Contractor/BOREDO management
- ✓ Project Management Unit

The channels of receiving grievances are summarized in the following table:

Table 3: Procedures for Addressing Complaints

Process	Description	Time frame	Other Information
grievance Identification	Face to face; phone; letter, e-mail; recorded during public/community interaction; others to the Principal	1 day	The contractor to provide an Email address; and a hotline number for reporting purpose
Grievance assessment and recording	Significance assessed and grievance recorded (i.e. in a log book) by the EHS officer hired by the contractor	1-2 days	Significance criteria: Level 1 –one off event; Level 2 – complaint is widespread or repeated; Level 3- any complaint (one off or repeated) that indicates breach of law or policy or this ESMF provisions
Grievance acknowledgment	Acknowledgement of grievance through appropriate medium	1 day	

Development of response	Grievance assigned to appropriate party for resolution. Response development with input from institutional management/ relevant stakeholders	1-7 days	
Response signed off	Redress action approved at appropriate levels	1-2 days	Project staff to sign off
Implementation and communication of response	Redress action implemented and update of progress on resolution communicated to complainant	1-4 days	
Complaints Response	Redress action recorded in grievance log book Confirm with complainant that grievance can be closed or determine what follow up is necessary	1-2 days	
Close grievance	Record final sign off of grievance If grievance cannot be closed, return to step 2 or refer to EHS officer in consultation with the consultant or recommend third-party arbitration or resort to court of law/ National Environment Tribunal.	1-4 days	Final sign off on by the Project Coordination

General Steps in Dealing with Grievances

- (i) Formal complaint received in writing (letter/email) or at the grievance desk within the site office.
- (ii) Recording of complaint in standard form or grievance register (as shown on Table below) and log. This grievance register shall be updated at each stage of the grievance redress. Once the grievance is recorded in the register, a preliminary analysis shall be undertaken by the EHS officer to ensure that the grievance is within the scope of the GRM.

Table 4: Sample of Grievance Register

Case No.	Name of Complainant	Phone & ID No. of the	Gender	Brief Description of	Date of Receipt	Grievance Status and Description of	Date of Response	Remarks
1.								
2.								
3.								

- (iii) EHS officer receives the complaint, upon the completion of the recording of the grievance, the stakeholder /complainant will be provided with an acknowledgment of the receipt, along with a summary of the grievance and later assigned to respective grievance committee if the grievance cannot be addressed at the Registration stage.

Sample of Acknowledgement Receipt for Claimant

<p>This receipt is acknowledgement of grievance registration by _____</p> <p>_____ resident of _____</p> <p>_____ on date _____. His/her case number is _____ and the date for response is _____</p> <p>Full name & signature of recording person -----</p>

In case the grievance is assessed to be out of the scope of the GRC, a communication towards the same shall be made to the complainant, and an alternative mode of redressal shall be suggested.

- (iv) Grievance committee reviews the complaint, verifies, investigates and takes action (if complaint is valid, resolves or passes it on to the Project Implementation Committee).
- (v) Project Implementation Committee/ GRC resolves and closes the complaint.
- (vi) Feedback to complainant within the stipulated timeframe.

Grievance Redress Committee and its Procedures

The main role of the committee will be arbitration through mediation and negotiation when complaints arise to ensure that cases are resolved quickly and fairly. The committee shall meet on need basis.

The project committee will constitute the following:

- ✓ Client BOREDO Representative
- ✓ BOREDO project coordinator
- ✓ Contractor EHS officer
- ✓ Design and Construction and Supervision consultants who will include the Environmental and Social Experts, Senior Resident Engineer or Site Engineer
- ✓ Local Leadership representative

A sub-committee Grievance Redress Committee (GRC) will be established from project stakeholders involved in the implementation of various activities. The subproject GRC will constitute the

- ✓ EHS officer,
- ✓ The foreman,
- ✓ BOREDO rep,
- ✓ The chief (ex-officio)

The BOREDO shall facilitate the operations of the above committees by providing venue for meetings, secretarial services and any expenses or allowances directly related to the proposed project where the GRM meetings cannot be conducted within the vicinity of the site.

If at any stage, if the complaint is not satisfied with the solution, s/he may choose to ask for an escalation of the grievance to the next level.

Updating of GRM Records

The records of the grievance register, book, forms shall be updated every working week with the current status of the grievance. Once the grievance is resolved, and the same has been communicated to the complainant, the grievance shall be closed in the grievance register. The grievance register shall also provide an understanding of the manner in which the grievance was resolved. These instances shall then serve as references for any future grievances of similar nature.