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ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF A DECENTRALIZED TREATMENT FACILITY FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

GPS: 3º 42' 5.28''N, 34º 45'36.75''E

Prepared by:	Submitted to:
Ecowest (K) General Supply Consultancy & Construction Services Ltd (EGSC^{2}S) Po. Box 380-00517, Nairobi, Mobile: 0723-145-079 0718-295-662 ecowestk@gmail.com	National Environment Management Authority-NEMA P.O Box 67839-00200 Nairobi
Proponent Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Riverside Drive, Riverside Mews Building, opp. Prime Bank Headquarters P O Box 41607-00100 Nairobi, Kenya	

AUGUST 2020

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PROJECT DETAILS

Title:	Environmental Impact Assessment Study Report For The Proposed Construction Of A Decentralized Treatment Facility For Refugee And Host Communities In Kakuma, Turkana West Sub-County, Kenya
Prepared for:	In accordance with the EIA Regulations, the purpose of the EIA study is to: ➢ Ensure neighborhood participation in the project development ➢ Assess the environmental risks posed by the development ➢ Recommend the mitigation measures necessary to safeguard the environment and the development ➢ Determine the existing level of environmental management on the site ➢ Determine the level of environmental compliance
Prepared for:	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Riverside Drive, Riverside Mews Building, opp. Prime Bank Headquarters P.O. Box 41607-00100 Nairobi, Kenya
Prepared by:	Ecowest (K) General Supply Consultancy & Construction Services Ltd ($EGSC^2S$) P.O. Box 380-00517, Nairobi, Opposite Bomas of Kenya along Muiri Lane, Nairobi. Mobile: 0723-145-079 ecowestk@gmail.com
Author:	Nelson Walunywa Wanyonyi and Geoffrey Wanyama Kololi
Date:	August, 2020
To be cited as:	$EGSC^2S$, 2020. Environmental Impact Assessment Study Report For The Proposed Construction Of A Decentralized Treatment Facility For Refugee And Host Communities In Kakuma, Turkana West Sub County, Kenya: Final EIA Report

CERTIFICATION

Certification by Experts

We hereby certify that this Environmental Impact Assessment (EIA) study Report has been done under our supervision and that the assessment criteria, methodology and content reporting conform to the requirements of the Environmental Management and Co-ordination (Amendment) Act, 2015 and Legal Notice No. 31 & 32 of 2019 (Environmental Management and Co-ordination (Amendment) Act and The Environmental (Impact Assessment and Audit) (Amendment) Regulations).

Names: **Ecowest (K) General Supply Consultancy & Construction Services Ltd**

Sign:…… Date:……..

Certification by Proponent

We, **GIZ** confirm that this Environmental Impact Assessment Study Report For The Proposed Construction Of A Decentralized Treatment Facility For Refugee And Host Communities In Kakuma, Turkana West Sub County, Kenya has been submitted to NEMA with our authority as the proponent.
Signed by: **CHRISTOPH BRUMMEL**

Signature: _____Date: _____

Proponent Contact Details

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Riverside Drive, Riverside Mews Building, opp. Prime Bank Headquarters
P.O. Box 41607-00100
Nairobi, Kenya

ACKNOWLEDGEMENT

We would like to register our sincere appreciations to all those who made the entire Environmental Impact Assessment (EIA) study a success. In this regard, we would first extend our thanks to the entire GIZ project team for the support they gave us during the study period.

Secondly we would like to thank all the field officers for the assessment they undertook on behalf of the team, Chiefs, and Assistant Chiefs whom we worked closely in the field in the course of the study.

Third, we would like to appreciate the contribution of all the government officers from all the relevant departments that we interacted with in the course of the EIA study for proposed project.

Fourth, the tireless efforts of the community representative committee members in the process went a long way in making this process a success.

Fifth is the appreciation of the commitment and tolerance exhibited by all the community members within and outside the project area. Our sincere appreciations finally go to GIZ, the project proponent for having offered us the chance to carry out this Environmental Impact Assessment study report.

ACRONYM

ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management Coordination Act
EMP	Environmental Management Plan
KM	Kilometres
NEC	National Environment Council
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organizations
NPEP	National Poverty Eradication Plan
NWASCO	North Victoria Water and Sanitation Company
PEC	Poverty Eradication Commission
PPE	Personal Protective Equipment
TOR	Terms of Reference
KPLC	Kenya Power and Lighting Company
ERP	Emergency Response Plan
LR	Land Reference
OHS	Occupational Health and Safety
SEM	Sustainable Environmental Management
SERC	Standard and Enforcement Review Committee
WCC	Waste Collection Centre
DOHSS	Directorate of Occupational Health and Safety Services
VOC	Volatile organic compounds
PPP	Principles of Public Participation

I &AP	Interested and Affected Party
IEM	Integrated Environmental Management
IDP	Integrated Development Plan
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
BA	Basic Assessment
DTF	Decentralized Treatment Facility
KNBS	Kenya National Bureau of Statistics
BT	Balancing Tank
NRC	Norwegian Refugee Council
LOKADO	Lotus Kenya Action for Development
IRC	International Rescue Committee
LWF	Lutheran World Federation
NCCK	National Council Churches of Kenya
DDG	Danish Demining Group
DRC	Danish Refugee Council
UNHCR	United Nations High Commission for Refugees

TOR APPROVAL LETTER FROM NEMA

nema

NEMA/TOR/5/2 /118 Date: 29/06/20

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ)
P. O. BOX 41607-00100
NAIROBI

RE: ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE (TOR) FOR ENVIROMENTAL IMPACT ASSESSMENT

We acknowledge the receipt of TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act CAP 387, the second schedule and the Environmental (Impact Assessment and Audit) Regulations 31 and 25, your terms of reference for the Environmental Impact Assessment (EIA) for the proposed Construction of Feacal Sludge Treatment Facility in Kakuma for Refugee and Host Communities in Kakuma, Turkana County has been approved.

You shall submit ten (10) copies and one electronic copy of your report prepared by a registered expert to the Authority

NK

MARRIAN KIOKO
EIA SECTION HEAD

EXECUTIVE SUMMARY

Project Overview

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is supporting the Government with the project *Support to Refugees and Host Communities in Kenya*. The project aims at improving the living conditions for refugees and host communities in Kenya. One specific objective is to improve access to water supply and sanitation for 2,000 refugees and 10,000 representatives of the host community in Turkana West Sub-County. As part of this work, GIZ supports the Turkana County Government in constructing a Decentralized Treatment Facility (DTF) in Kakuma.

The Turkana County Government is proposing to construct the DTF and associated infrastructure in Kakuma for refugee and host communities on a 20-acre piece of land sited at Nayanae-Ngitira village, in Lonyoduk sub-location, Kalobeyei location of Oropoi/Kalobeyei ward, Turkana West Sub-County, Turkana County. The proposed site is geographically located on a latitude of 3º 42' 5.28''N and a longitude of 34º 45'36.75''E lying on an altitude of 628.80m above sea level. This site is about 14km North-west of Kakuma refugee camp; about 15km North-west of Kakuma town and approx. 3km West of Kakuma-Lokichoggio A1-road. The site is that large to accommodate liquid and solid waste management infrastructure. The side that GIZ will support developing will be about 1 acre in size only.

The specific objectives of the EIA study are to: Ensure neighborhood participation in the project development, assess the environmental risks posed by the development, and recommend the mitigation measures necessary to safeguard the environment and the development, determine the existing level of environmental management on the site and also to determine the level of environmental compliance.

The environmental management in Kenya is coordinated by the National Environment Management Authority (NEMA). Pursuant to the prevailing legal requirements as envisaged in the Environmental Management and Co-ordination (Amendment) Act (EMCA), 2015 and to ensure sustainable environmental management, the project proponent commissioned the undertaking of the EIA study for the proposed project; and incorporated substantial environmental aspects as advised by NEMA. The proponent (GIZ) appointed Ecowest (K) General Supply Consultancy & Construction Services Ltd ($EGSC^2S$) to undertake the EIA study Processes in order to determine the biophysical, social and economic impacts associated with undertaking the proposed development. This study was undertaken in fulfillment of requirements of the EMCA and The Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019.

Project Description

The proposed project is a DTF which is a small-scale decentralized plant for treatment of faecal sludge from flush toilets and pit latrines through mechanical and biological processes. The objective of a DTF is to treat faecal sludge for safe release of the effluent into the environment.
The DTF therefore is mainly used for provision of sanitation solutions in:

- Areas not yet connected to a centralized wastewater treatment plant.
- Areas that do not allow a connection on technical, financial or institutional reasons.

- Areas where human excreta are collected for treatment at or near the point of generation and to complete the sanitation value chain.

The wastes will mainly be transported to the DTF by use of exhausters for wastes from pit latrines and septic tanks as well dry waste generated from Urine Diverting Dry Toilets (UDDTs).
The generic stages of treatment in the proposed DTF will be as follows:

i. Operator store

ii. Receiving bay / Balancing tank

iii. Anaerobic reactor

iv. Vertical flow constructed wetlands (2)

v. Sludge drying bed

vi. Waste disposal unit (Incinerator)

From the Environmental Assessment carried out, the following mitigation measures are recommended to make the project environmentally sustainable and reduce negative impacts:

Table 1: ***Mitigation measures for the expected impacts***

Potential adverse impact	Mitigation measure
Excavation and earthworks resulting into stock piles, soil erosion:	• Excavation should be carried out such that drainage is controlled and water is not allowed to accumulate at the project site. Any water that collects has to be drained and disposed of sensibly, so as not to cause erosion • Establish controls for surface runoff during excavation e.g. digging trenches around excavated areas and earthworks to control erosive potential of surface runoff • Control excavation activities to limit excavation to land which is required for construction • Securing of the site using iron sheets or other appropriate materials to protect passersby and control noise. • Use the excavated soil as back fill • Excavated and piled soils should be covered when there is rainfall to prevent it causing sedimentation in the nearby water bodies

Potential adverse impact	Mitigation measure
Noise and dust during Construction	• Construction work shall be done during day time hours only i.e. from 8:00 AM to 5:00 PM • Control working hours to limit noise, dust and traffic nuisance. Noisy construction activities should be scheduled to hours with minimal interruption for residents. • Sprinkle water on areas where dust is likely to be generated • When excessive noise is anticipated, acquire a license from the County Government and follow NEMA regulations and orders.
Wastewater discharge to sewers	• The contractor shall erect a functioning sewer waste disposal system to cater for anticipated increase in waste generation • Portable toilet facilities should be provided for workers and visitors to the site
Occupational health and safety	• Develop a site safety action plan detailing safety equipment, emergency procedures, restrictions on site, safety inspections and controls; • Reporting and recording of health, safety and environmental incidences as per Legal Notice No 40, The Factories (Building Operations and Works of Engineering Construction) Rules 1984. • Erect warning signs on site warning residents and visitors of inherent danger posed in the construction site and restricting access at all times
Project maintenance / impacts on the local river and the neighbourhood	• Timely maintenance of sewer conveyance, distribution system; • Maintenance of access routes and the drainage system; • Manage solid wastes and dispose it appropriately; • Monitor water quality, upstream and downstream and at the point of discharge
Drainage Management	• Proper project site drainage management to Control erosion • Avoid ponding water; • Proper waste and material handling, and storage to avoid flushing of wastes in to the neighbouring river • Follow designs made for the system
Loss of Water Quality and interference with riparian reserve	• Runoff channels to be constructed to drain storm waters • Water quality tests at the river to be conducted quarterly • Maintain the riparian reserve as per WRMA requirements • Replant the riparian zone with suitable trees • Leave the riparian area without any development • Maintain the required buffer zone to the nearby river
Waste handling and Disposal	• Develop a solid waste management plan prior to project commencing, identifying optimal waste re-use options and disposal in licensed sites • Comply with NEMA guidelines on solid and liquid waste disposal. • Acquire requisite licenses from NEMA offices
Foul Odours	• Monitor and ensure that influent sulphate levels are below 240 mg/l if any. • Ensure that the pond have adequate water flow to reduce the potential of odour formation.
Decommissioning Phase	• Inform NEMA of intentions • Perform a close down Environmental Audit • Restore the area as per NEMA recommendations

Construction at the site will be immediate after a go ahead is issued by NEMA. The estimated cost of the project is about Ksh. 21,667,981.44. Through a careful assessment, it has been noted that there are no adverse environmental impacts likely to arise that cannot be mitigated as per available information. An annual Environmental Audit should be undertaken upon completion of the Project to gauge the level of implementation of Environmental Management Plan (EMP). It is therefore recommended that NEMA approval can be issued on the basis of this report.

Table of Contents

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1.0 INTRODUCTION

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is supporting the Government with the project *Support to Refugees and Host Communities in Kenya*. The project aims at improving the living conditions for refugees and host communities in Kenya. One specific objective is to improve access to water supply and sanitation for 2,000 refugees and 10,000 representatives of the host community. As part of this work, GIZ supports the Turkana County Government in constructing a Decentralized Treatment Facility (DTF) in Kakuma.

The Turkana County Government proposes to construct and operate the DTF in Kakuma, Turkana West Sub-County, Kenya and other associated infrastructure.

Guiding Acts and regulations that the proponent will observe include the following: Environmental Management and Coordination (Amendment) Act, 2015, Legal Notice No. 31 & 32 of 2019 (Environmental Management and Co-ordination (Amendment) Act and The Environmental (Impact Assessment and Audit) (Amendment) Regulations), the Penal Code, CAP 63, the Water Act 2016, the Public Health Act, Cap 242, Kenya Bureau of Standards' Standards, the Physical planning act, CAP 286.

1.1 Introduction to the Proposed Development

The proposed DTF is a small-scale decentralized plant for treatment of faecal sludge from flush toilets and pit latrines through mechanical and biological processes. The objective of a DTF is to treat faecal sludge for safe release of the effluent into the environment.
The DTF therefore is mainly used for provision of sanitation solutions in:

- Areas not yet connected to a centralized wastewater treatment plant.
- Areas that do not allow a connection on technical, financial or institutional reasons.
- Areas where human excreta are collected for treatment at or near the point of generation and to complete the sanitation value chain.

The wastes will mainly be transported to the DTF by use of exhausters for wastes from pit latrines and septic tanks as well dry waste generated from Urine Diverting Dry Toilets (UDDTs).
The generic stages of treatment in the proposed DTF will be as follows:

i. Operator store
ii. Receiving bay / Balancing tank
iii. Anaerobic reactor
iv. Vertical flow constructed wetlands (2)
v. Sludge drying bed
vi. Waste disposal unit (Incinerator)

1.2 Terms of Reference

The EIA was carried out in compliance with the Government of Kenya's Environmental Management and Co-ordination (Amendment) Act, 2015 and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019, among other relevant laws, regulations and guidelines standards.
The scope of services that was undertaken by the consultant included but not limited to the following:
Task1. Description of the baseline environment: To collect, collate and present baseline information on the environmental and social characteristics of the existing situation in the proposed area. This will involve:

a) Physical Environment (topography, landforms, geology, soils climate and meteorology, air quality, hydrology etc.).

b) Biological Environments (i.e. flora and fauna types of diversity, endangered species, sensitive habitats etc.).
c) Social and cultural environment, including present and projected, where appropriate (i.e. population, land use, planned development activities, community structure, gender employment and labor market, sources and distribution of income, cultural properties etc.). This shall also include identification of any resettlement and compensation needs that could trigger the need to prepare a Resettlement Action Plan (RAP)

Task 2: Detailed description of the proposed project: which include geographic location, ecological, general layout of facilities including maps at appropriate scale where necessary.

Task3: Legislative and institutional framework: identification and description of all pertinent regulations and standards of governing the environmental quality, solid and liquid waste management, health and safety protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues. Compliance issues to be stated.

Task 4: Identification of potential environmental and social impacts that could result from the proposed project. The consultant shall analyze and describe all significant environmental and social impacts expected due to the proposed project. This would encompass environmental, ecological and social impacts, both positive and negative, as the result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions discussed in Task 1. The consultant shall differentiate between short, medium and long term impacts. During the analysis, the consultant shall consider both biophysical and socioeconomic factors that will include the impacts of: population change and migration; socio-economic characteristics of the different target groups in the proposed area; forms of social organization and co-operation; physical and social infrastructure, change in economic activities; development resources, vegetation clearance; mechanical disturbance; effects on flora and fauna; air quality; improved access; accident rates and visual/aesthetic change. The following specific assessment will be conducted during the EIA phase:

Ecological Impact Assessment

Based on the issues identified, the potential impacts arising should be considered in terms of both the construction and operational phases, where the former is to be considered a short term, rapid impact of varying severity, while the latter is considered to have longer term, more subtle changes in the habitats/sites in question. Impacts are considered to be both negative and positive in nature, depending upon the approach to such issues. The possible impacts arising as a consequence of the implementation of the proposed project will be considered through the undertaking of a detailed Ecological Impact Assessment (including terrestrial and aquatic ecology) that will give due consideration to the key issues highlighted.

The Ecological Impact Assessment will therefore be undertaken with the following broad **TOR** as follows:

- Identification of baseline ecological parameters, based upon the floral and faunal state of the preferred site;
- Consideration of ecological drivers upon the proposed sites;
- Consideration of possible changes in drivers as well as direct impacts that would arise as a consequence of the establishment of the proposed facility;
- Identification of significance of such change and integration into impact evaluation methods.
- Consideration of mitigation or avoidance measures that may be employed to obviate negative impacts that are identified in the evaluation processes; and
- Final consideration of planning and layout, as well as operations, will be undertaken to assist with the employment of the abovementioned mitigation measures.

Visual Impact Assessment

The overall objectives of the Visual Impact Assessment are to identify and investigate potential visual impacts associated with the development of the proposed facility and its infrastructure. The Visual Impact Assessment will therefore need to:

- Describe, in sufficient detail, the existing landscape and visual conditions of the surrounding region to form a baseline against which impacts can be measured and compared;
- Identify potential visual impacts that may occur during construction, operational and decommissioning phases of the development, as well as future potential impacts that may occur if the plant is not developed (the "no go" option), both positive and negative impacts;
- Assess the severity and significance of the potential impacts in terms of direct, indirect and cumulative impacts;
- Provide recommendations with regards to potential monitoring programmes;
- Determine mitigation and/or management measures which could be implemented to reduce the effect of negative impacts, or enhance the effect of positive impacts, as far as possible; and
- Incorporate and address issues and concerns raised during the Scoping Phase of the EIA where they are relevant to the specialist's area of expertise.

The Visual Impact Assessment will be undertaken in the following manner:

- Desktop Review and Analysis
- Impact Assessment, Mitigation and Report Writing
    - Potential direct, indirect and cumulative visual impacts will be identified and assessed for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.
    - Compile a Visual Impact Assessment report that will focus on measures to reduce negative aspects, compensatory measures to offset negative aspects, and enhancement of positive aspects. Indicators for monitoring the efficacy of mitigation measures will be suggested (for inclusion in the EMP).

Heritage Impact Assessment (Archaeology and Cultural Landscape)

The following broad TOR has been specified for the Heritage Impact Assessment (including Archaeology and Cultural Landscape) to be undertaken during the EIA Phase:

- Prepare and undertake a desktop study on the fossil heritage, archaeology, and heritage sites within the proposed project area.
- Undertake a detailed field examination of the archaeological sites and heritage features within or in the region of the development area.
- Describe the type and location of known archaeological sites and in the study area, and characterize all heritage items that may be affected by the proposed project.
- Describe the baseline environment and determine the status quo in relation to the specialist study.
- Record sites of archaeological relevance (photos, maps, aerial or satellite images, GPS co-ordinates, and stratigraphic columns).
- Evaluate the potential for occurrence of archaeological features within the study area.
- Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the archaeological heritage for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.
- Compile a report providing a review of archaeological heritage within the study area based on desktop study and new data from fieldwork and analysis.
- Provide recommendations and suggestions regarding archaeological heritage management on site, including conservation measures to ensure that the impacts are limited.
- Provide input to the EMP, including mitigation measures and monitoring requirements to ensure that the impacts on the archaeology are limited.

Desktop Palaeontological Impact Assessment

Based on the low palaeontological sensitivity of the area a desktop Palaeontology Impact Assessment will be conducted. The Palaeontology Impact Assessment will be used to identify possible palaeontological sites or features by making use of desktop sources. The study will assess the significance of such sites, describe the possible impact of the proposed project on these sites and provide recommendations for mitigation or monitoring measures where applicable.

Avifauna Assessment

The activities that will be undertaken as part of the construction and operation phases of the proposed project that will result in potential impacts to avifauna species, and thus bird monitoring has been undertaken (pre-scoping) to understand these impacts up front. The following broad TOR has been specified for the Avifaunal Impact Assessment to be undertaken during the ESIA Phase:

- Incorporate more on site data, from all monitoring site visits;
- Provide greater confidence in the findings;
- Develop a site sensitivity map;
- Assesse the cumulative impacts of the proposed development when considering other developments in the area and;
- Develop an operational phase monitoring framework.

Task 5: Occupational Safety and Health Concerns: The consultant shall analyze and describe all occupational and healthy concerns likely to arise as a result of construction and operations of the proposed facility. The consultant shall make recommendations on corrective and remedial measures to be implemented under the environment and social management plan. The consultant will include emergency /disaster preparedness for the proposed project.

Task 6: Carry out public participation and consultations on the positive and negative impacts of the proposed project: The consultant shall carry out a social due diligence which will involve a description of the social, economic and cultural status of the project area. The consultant shall organize public forum for participation to enable interested and affected parties (I &AP), including civil society organizations/NGOs, to present their concerns and opinions regarding the proposed project. Deliberate efforts will also be made to ensure inclusion of women in public consultation. The views of the public will be solicited and incorporated in the main actual report

Task 7: Proposed mitigation measures to the identified environment and social impact. The consultant shall come-up with feasible mitigation measures for the negative impacts that will result from the proposed project.

Task 8: Development of Environmental and Social Management Plan (ESMP) for mitigation of anticipated negative impacts. The consultant shall develop a comprehensive environmental and social management plan (ESMP). The consultant shall recommend a set of mitigation, monitoring and institutional measures to eliminate, minimize or reduce to acceptable levels of adverse environmental impacts and/or maximize social-economic benefits. The consultant shall provide cost outlays for the proposed measures as well as their institutional and financial support

In summary the study will include the following tasks:

- Review detailed information relating to the project description and precisely define the environmental risks to the terrestrial environment and consequences for ecology;
- Draw on desktop information sources, the knowledge of local experts, information published in the scientific press and information derived from relevant ESIAs and similar specialist studies previously conducted within the surrounding area;
- Compile a baseline description of the terrestrial ecology of the study area, and provide an overview of the entire study area in terms of ecological significance and sensitivity. The description will include the major habitat forms within the study sites, giving due consideration to terrestrial ecology (flora) and terrestrial ecology (fauna). The desktop review will be undertaken using spatial data, available

conservation data, as well as other related information;

- Provide specific ecological data in respect of the floral components of the site using ground-truthing methods, with an emphasis on those areas considered to be of "high" and possibly, "moderate" sensitivity (based on the desktop study);
- Based on the desktop study, undertake field work and spot sampling across the site to record relevant data and to compile an overview of the habitat under review. The field assessment will aim to confirm the nature and structure of the habitat within the study area from an ecological perspective, and it will aim to identify key ecological components within the study area and in specific, the sensitivity of the prevailing habitat, as well as the identification of any floral components worthy of consideration;
- Collate all data collected during the field work and undertake a statistical review using methodologies that allows for comparison of biological data;
- Incorporate relevant information from other specialist reports/findings if required;
- Provide a detailed terrestrial and aquatic ecological sensitivity map of the site, including mapping of disturbance and transformation on site;
- Identify and rate potential direct, indirect and cumulative impacts on the terrestrial ecology, communities and ecological processes within the site during the construction, operation and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts proposed solar facilities, together with the impact of the proposed project;
- Provide input to the EMP, including mitigation and monitoring requirements to ensure that the impacts on the terrestrial ecology are limited; and
- Compile an assessment report qualifying the risks and potential impacts on terrestrial ecology in the study area and impact evaluations.

1.3 Objectives

The objectives of the Environmental Impact Assessment (EIA) are:

- To fulfill the legal requirements as outlined in Section 58 to 69 of the Environmental Management and Coordination Act (EMCA) amended and Part I and II of the EIA/Audit Regulations
- To obtain background biophysical information of the site and legal and regulatory issues associated with the project
- To assess and predict the potential impacts during site preparation, construction and operational phases of the project
- To make suggestions of possible alterations to the proposed design, based on the assessment findings
- To propose mitigation measures for the potential significant adverse environmental impacts and safety risks
- To allow for public participation
- To lower project cost in the long term
- To prepare an Environmental Management and Mitigation Plan (EMMP).

1.4 Methodology

The procedure used in undertaking the environmental assessment included the following:

- A desk-study to obtain background biophysical information of the site and legal and associated regulatory issues
- Literature review
- Interviews with the proponent and relevant stakeholders
- Site visits assessment for collecting the baseline conditions and public consultation by taking photographs
- Assessment and prediction of potential impacts during the site preparation, construction and operational phases of the project

- Preparation of a Project Report, including the Environmental Management Plan and mitigation measures.

1.5 Justification of the project

Underdeveloped countries are experiencing severe environmental challenges resulting from antiquated or nonexistent septic systems, leaking sewers, an over-capacity system, sewage overflows, underfunding, watershed issues, groundwater pollution, nutrient overloading to sensitive areas, and/or regulatory non-compliance and, in some cases, an influx of wealth that is raising living standards. Both situations are placing a demand on nonexistent or limited infrastructure for water and wastewater treatment. With running water becoming a norm in homes and businesses, the need for disposal of wastewater is paramount as is the need for wastewater treatment strategies that can preserve public health at a low cost.

Decentralized treatment enables a community to focus on specific and most critical treatment needs and allows for smaller design flows and disposal areas. This places the financial burden on specific proper-ties rather than on the whole community.

The decentralized model collects, treats, and then discharges to the subsurface at, or very close to, the point of origin, restoring the original water resource to the local aquifer at a much lower energy cost. With rapid aquifer depletion and dropping water tables, minimizing the controllable impacts to the water cycle is critical for sustainability. Where no wastewater treatment exists or the systems are outdated and under capacity, traditional and advanced decentralized treatment system possibilities can protect local waterways and water supplies, upgrade outdated systems to reduce nitrogen loading, and improve overall wastewater management for the community.

For this specific project in focus, it will help to alleviate the cholera outbreak in the Kakuma camp and its environs, therefore there is great need in the region for the project to be implemented for the betterment of the society and the natural environment.

1.6 Description of the project area

The proposed project site is a 20-acre piece of land sited at Nayanae-Ngitira village, Kalobeyei Ward, Turkana West sub-county, Turkana County. The proposed site is geographically located on a latitude of 3º 42’ 5.28’’N and a longitude of 34º 45’36.75’’E lying on an altitude of 628.80m above sea level. This site is about 14km North-west of Kakuma refugee camp; about 15km North-west of Kakuma town and approx. 3km West of Kakuma-Lokichoggio A1-road. The proposed site can be accessed via an earth road not clearly defined and in poor condition. The households of the adjacent community living within a radius of 2km is about 50 in number which translate to a population of about 265 persons (KNBS, 2019).
The proposed site is about 4km adjacent of Tarach River which is the main permanent river in the area. The river is fed with intermittent waterways that traverse the region. At the proposed site there is a sea-sonal water way (lagga) that passes alongside it and channel run-offs to the river during rainy season. In addition, the site is neighbored by a borehole on the East which is about 2km from the site.

1.7 Registration

As required by NEMA, the firm of experts (**Ecowest (K) General Supply Consultancy and Construction services**) is currently registered by NEMA as a firm of Experts for “Environmental Impact Assessment and Audit” and also with EIK and is therefore authorised to undertake the EIA project study and submit a report to NEMA.

2.0 PROPOSED PROJECT DESCRIPTION

This chapter provides an overview of the conceptual project design and an overview of the site and technology selection process (as provided by GIZ).

The purpose of this chapter is to present sufficient project information to inform the Scoping and EIA Process in terms of design parameters applicable to the project. It is important to note that the project description details are preliminary at this stage and it is likely that some of the details presented herein may change during the detailed design phase and upon further investigations (including the findings and input of the specialist studies conducted during the EIA Phase of the proposed project).

As noted previously, the proposed project site is a 20 acre piece of land sited at Nayanae-ngitira village, Lopur sub-location, Kakuma Location in Turkana West sub-county, Turkana County. The proposed site is geographically located on a latitude of 3º 42' 5.28''N and a longitude of 34º 45'36.75''E lying on an altitude of 628.80m above sea level. This site is about 14km North-west of Kakuma refugee camp; about 15km North-west of Kakuma town and approx. 3km West of Kakuma-Lokichoggio A1-road. The proposed site can be accessed via an earth road not clearly defined and in poor condition. The households of the adjacent community living within a radius of 2km is about 50 in number which translate to a population of about 265 persons (KNBS,2019)

2.1 Key Components of the Proposed Facility

Decentralized Treatment Facility (DTF) is a small-scale decentralized plant to treat faecal sludge from flush toilets and pit latrines through mechanical and biological processes. The objective of a DTF is to treat faecal sludge for safe release of the effluent into the environment.
The generic modules or stages of treatment in the proposed projects are as follows and depicted in the figure below:

1. Operator Store
2. Receiving Bay / Balancing Tank
3. Anaerobic Reactor
4. Vertical Flow Constructed Wetlands (2)
5. Sludge Drying Bed
6. Waste Disposal Unit (Incinerator)

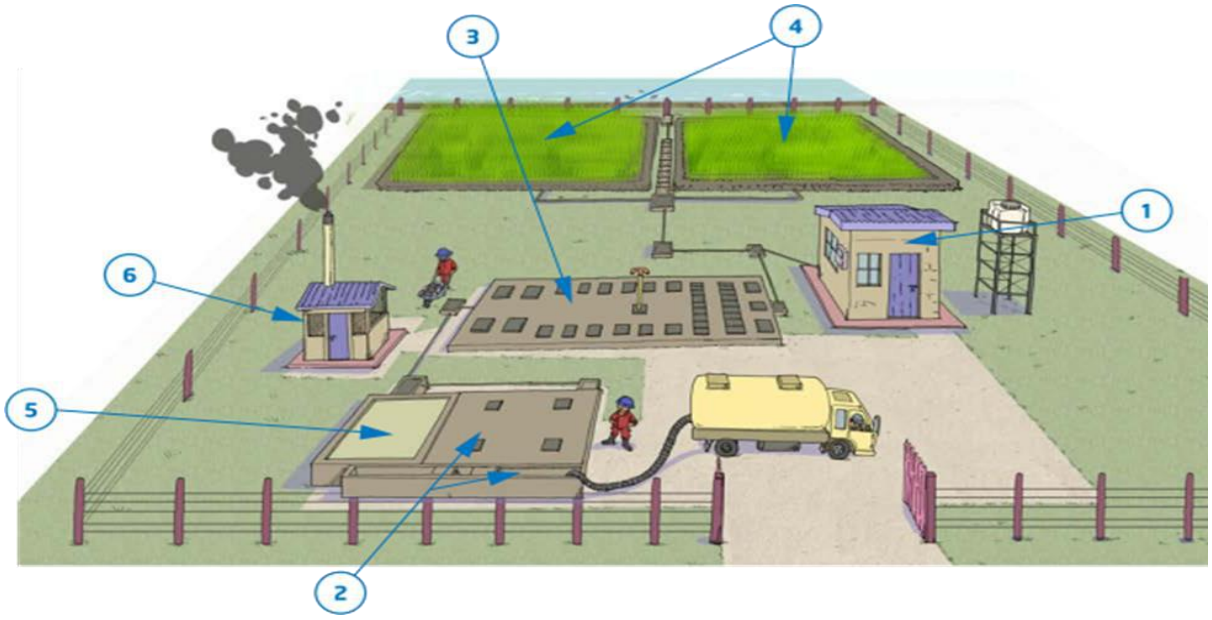

Figure 1

2.1.1 The Operator Store (OS)

The OS will be a two-room building, with one main office and one washroom with hand washing facility, shower and water closet. The building will be used as operator's office, tool and equipment store as well as guard's house. It will be supplied with water (connected to service line or supplied by water bowser) and electricity (power grid or solar). Truck drivers as well as all visitors will be reporting at the OS once they enter the facility.

- Operator's office and guard house will be equipped with toilet, sink and shower
- At the entrance there will be registration desk
- Storage room for equipment

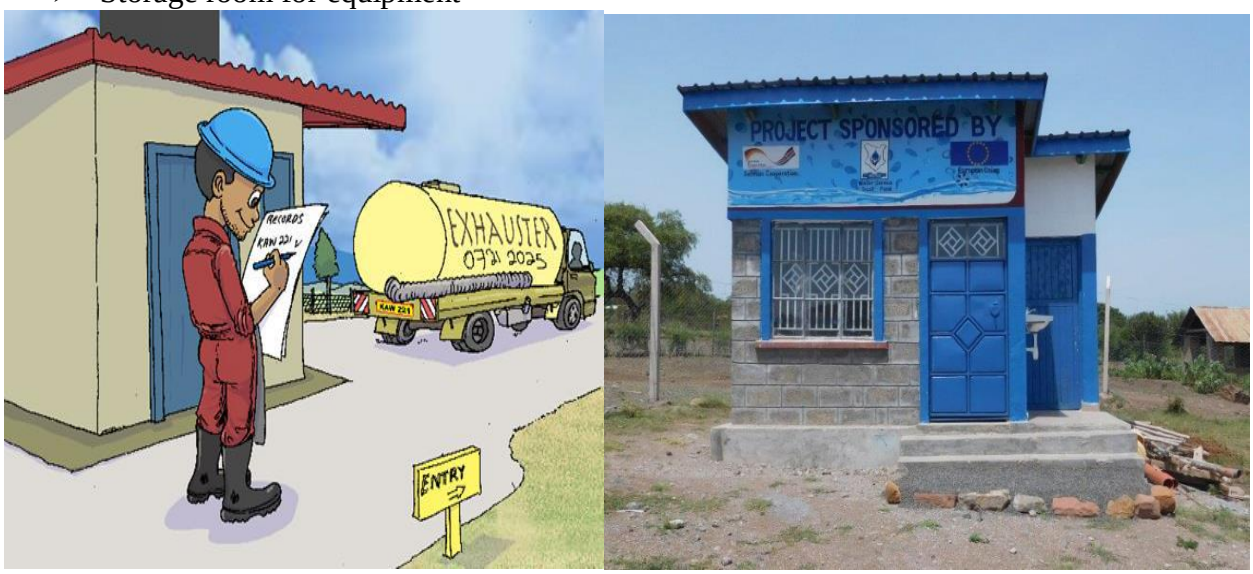

Figure 2 & 3

2.1.2 Receiving Bay/Balancing Tank (RBBT)

The RBBT is the first module of the DTF which will be offering preliminary treatment to the faecal sludge or wastewater received. It is divided in two compartments:

i. The Receiving Bay (RB)

It is an inlet arrangement with coarse and fine screens. The exhauster will be parking at the dock station and offloads its contents. The solid waste will be manually removed from the screens and placed on the platforms to dry-out. Once it is dry the waste will be transported in the solid waste incinerator.

ii. The Balancing Tank (BT)

The BT will be acting as a buffer tank that will be storing up to 50 m³ of faecal sludge or wastewater for up to 24 hours. It will also be controlling the discharge towards the rest of the DTF at a flow rate of 2 m³/hr. The opening of the valve at the outlet will always be regulated to allow for this flow rate. In case the balancing tank exceeds its capacity, an overflow pipe will be provided to discharge the surplus of faecal sludge or wastewater.

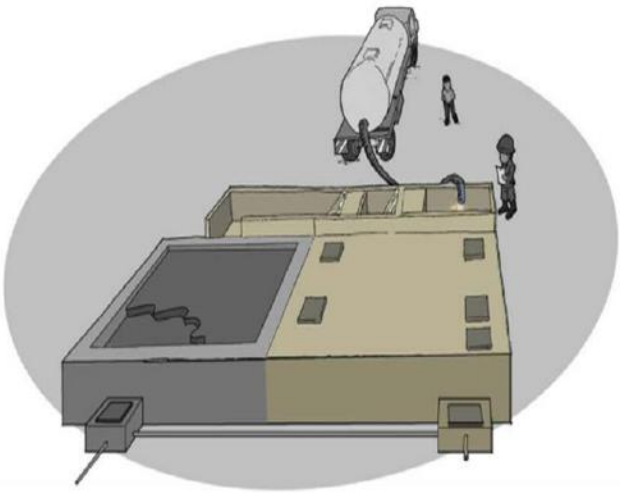

Figure 4&5

The Receiving Bay will be connected to a Sludge Drying Bed which will be located side by side with the Balancing Tank. More information on the Sludge Drying Bed is provided in the subsequent sections.

2.1.3 Anaerobic Reactor - AR

The AR will comprise of 4 treatment modules:

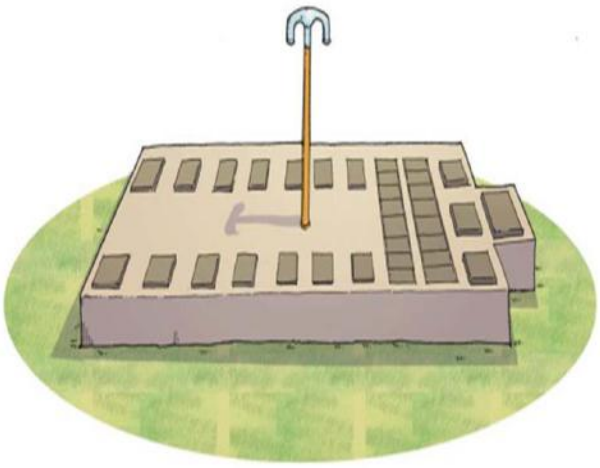

Figure 6 &7

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Nairobi

i. The Settler

The settler will provide the first segregation of heavy and light material: the solids and sludge settle and accumulate at the bottom while the scum (lightweight materials including paper, fats and greases) rises to the surface. A baffle wall prevents the scum and sludge layer from moving from one chamber to another. The inlet-outlet level difference will be 100 mm to give the required hydraulic gradient. The total volume of the Settler module will be 48 m³ with a water depth of 2.5 m and a Hydraulic Retention Time (HRT) of 24 h.

ii. The Anaerobic Baffled Reactor (ABR)

ABR will comprise of 5 successive chambers and parallel downpipes located at the inlet of each chamber, leading the incoming flow towards the bottom of the chamber. The ABR will enable a biological secondary treatment through biodegradation of organic material by the micro-organisms contained in the settled sludge. The inflow will be forced to pass through the activated sludge where anaerobic bacteria will be feeding from the organic material contained in the inflow to be treated. The inlet-outlet level difference will be 150 mm to ensure hydraulic gradient. The water depth will be 2.5m bringing the volume capacity to 96m³. The minimum HRT will be 48h to ensure biological degradation of organic material.

iii. The Anaerobic filters

The filters will be contained in two successive compartments and 11 parallel downpipes located at the inlet of each chamber, leading the incoming flow towards the bottom of the chamber. The volume of both compartments will be 48 m³ with a water depth of 2.5 m and a minimum HRT of 24h. The filter media will be seated on elevated 100 mm thick perforated slab to allow free passage of the incoming flow. The filter media will consist of aggregates of 30-42 mm diameter. The Anaerobic filters will offer both mechanical filtration and anaerobic digestion.

iv. The Siphon

This will comprise of a main chamber and a subsequent drainage chamber. The goal of the siphon will be to provide intermittent flow to the next module. The siphon will be releases intermittent flushes of 1.5 m³ every 45 minutes towards the Vertical Flow Constructed Wetland (VFCW). The level difference between the siphon drainage chamber and the VFCW will be at least 0.9 m to allow sufficient pressure in the feeding pipe network.

2.1.4 Vertical Flow Constructed Wetland

The VFCW is the last module of the DTF treatment line. It will be offering the final cleaning process that improves the effluent quality before it is discharged to the receiving environment. The VFCW is a planted filter bed that acts as:

- A filter for removing solids
- A fixed surface upon which bacteria can attach
- A base for the vegetation whose roots permeate the filter media and harbour variety of micro-organisms

The pre-treated waste water from the ABR will be loaded intermittently onto the surface of the VFCW through perforated pipe system. The water flows vertically down through the filter layer to the bottom of the bed where it will be collected in a drainage pipe system. The waste water will be treated by a combination of biological and physical processes. The intermittent batch loading and long resting periods will be to enhance the oxygen transfer through the porous media and leads to high aerobic degradation activities. By forcing the organisms into a starvation phase between dosing phases, excessive biomass growth can be decreased and porosity increased. This will be ensured by the intermittent load from the siphon and the alternate use of each filter bed: 1 bed will be used for 15 consecutive days only. Nutrients and organic material will be absorbed and degraded by the dense microbial population and pathogens are removed by natural die-off or predation by higher organisms.

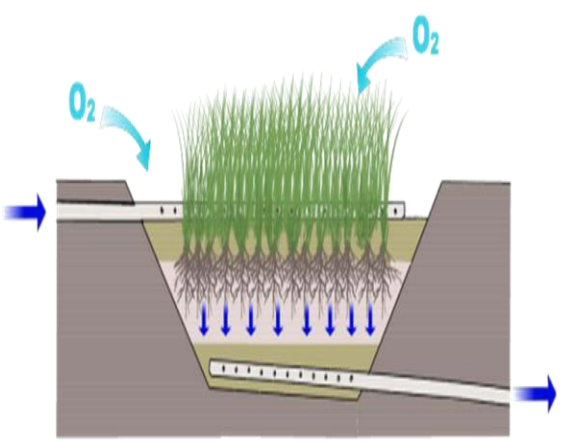

Figure 8 & 9

2.1.5 The Sludge Drying Bed (SDB)

The SDB is a treatment module that will runs parallel to the main DTF treatment line. SDB is a shallow unplanted filter bed with media consisting of sand and gravel. An under-drain pipe at the bottom of the bed collects the leachate which will be conveyed to the next treatment module

Sludge from other DTF modules (Balancing tank and Anaerobic Reactor) will be discharged to the sludge drying bed for dewatering through the Receiving Bay. The passage of the sludge through the Receiving Bay enables the screening of the sludge which might contain coarse material, and the reduction of velocity to prevent disturbance of the superficial sand layer. A total of 18 m^3 of sludge can be received into the sludge drying bed. The drying process in a SDB will be based on drainage of liquid through the sand and gravel to the bottom of the bed, and evaporation of water from the surface of the sludge to the air. Approximately 50 to 80% of the sludge volume will drain off as leachate, which will then be directed to the DTF treatment line for further treatment prior to discharge. After reaching the desired dryness, the sludge is removed from the bed manually and can be used as soil conditioner or base for organic fertiliser (compost). The thickness of dry sludge should not exceed 300 mm, leaving 400 mm of freeboard between the top level of the sludge and the edge of the bed.

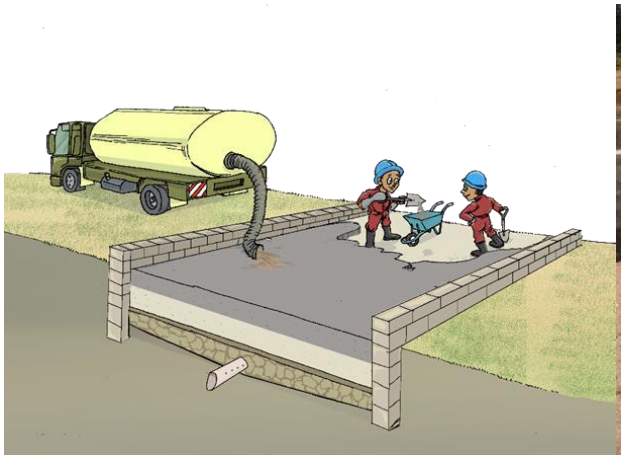

Figure 10 & 11

2.1.6 The Solid Waste Incinerator

The Waste disposal unit will include the following elements:

- An incinerator (De Montfort model) to burn waste and reduce it. The incinerator will be used to destroy 67 kg of solid waste per hour.
- A waste store will be used to securely accumulate waste that is to be incinerated and to stock the fuel material (wood or agro-residues) required to preheat the incinerator.
- A shelter to protect the incinerator, the operator and the waste being incinerated, the fuel and the operator's tools. Moreover, it supports the 4 m high chimney.

The incinerator will be made of firebricks and prefabricated metal components. It will comprise of a primary and a secondary chambers. The burning zone of the primary chamber will be accessible through a front door, which lets in air, allows the operator to light the fire and also allows the removal of ashes. Once the solid waste screened at the Receiving Bay is dry, it will be dropped in through a loading door, above the primary chamber. The secondary chamber, which is inaccessible to the operator, is separated from the primary chamber by a brick column with an opening at the bottom to induce a cross draught during operation. Additional air is drawn into the secondary chamber through a small opening in the lower section of the rear wall of the secondary chamber. This air mixes with the partially burnt flue gas from the primary chamber and causes secondary combustion. The chimney mounted above the secondary combustion chamber releases the flue gases into the atmosphere.

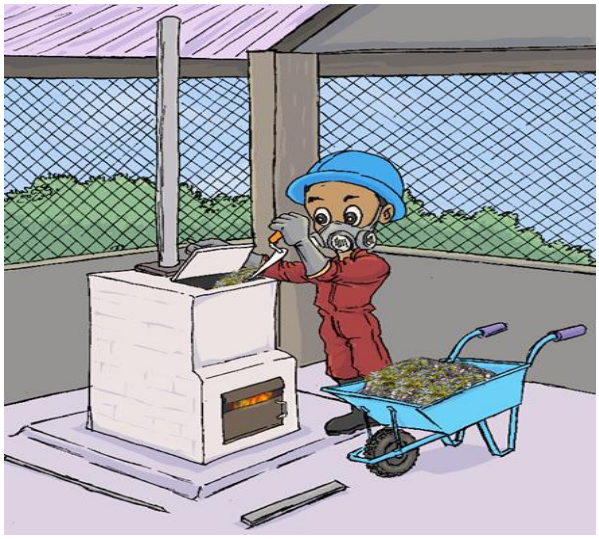

Figure 12 & 13

3.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Preamble

There is a growing concern in Kenya and at global level that many forms of development activities cause damage to the environment. Development activities have the potential to damage the natural resources upon which the economies are based. A major national challenge today is how to maintain sustainable development without damaging the environment. The Environmental Impact Assessment is a useful tool for protection of the environment from the negative effects of developmental activities.

These legal obligations relating to environmental auditing (EA) which covers all existing enterprises, including firms, industries, warehouse, factories, waste treatment plants, power stations, quarries, mines and any ongoing projects specified under the second schedule of EMCA. There are other legislations to be complied with in the project and include those discussed below. These have been selectively reviewed to ensure that the project complies environmentally as required by the country's constitution.

3.2 The importance of EIA

EIA is conducted for the following purposes:

i. Identify impacts of a project on the environment.
ii. Predict likely changes on the environment because of the development.
iii. Evaluate the impacts of the various alternatives on the project.
iv. Propose mitigation measures for the significant negative impacts of the project on the environment.
v. Generate baseline data for monitoring and evaluating impacts, including mitigation measures during the project cycle.
vi. Highlight environment issues with a view to guiding policy makers, planners, stakeholders, and government agencies to make environmentally and economically sustainable decisions.

3.3 The Constitution of Kenya 2010

Article 42 of the Bill of Rights of the Kenyan Constitution provides that 'every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures'. Under Chapter 5 (Land and Environment), Part 1 is devoted to land. It requires that land be used and managed in 'a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles:

(i) Equitable access to land;
(ii) Security of land rights;
(iii) Sustainable and productive management of land resources;
(iv) Transparent and cost effective administration of land; and
(v) Sound conservation and protection of ecologically sensitive areas.

Part 2 of Chapter 5 of the Constitution is dedicated to Environment and Natural Resources. Article 69 in Part 2 provides that the state shall;

(i) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
(ii) Work to achieve and maintain tree cover of at least ten per cent of the land area of Kenya;
(iii) Encourage public participation in the management of, protection and conservation of the environment;
(iv) Protect genetic resources and biological diversity;
(v) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
(vi) Eliminate processes and activities that are likely to endanger the environment; and
(vii) Utilize the environment and natural resources for the benefit of the people of Kenya.

Further, Article 70 states that if a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress. The sub-project should ensure compliance with the constitution in so far as equitable sharing of the resources, between the stakeholders. Further, the project should ensure the sustainability of livelihoods and biological resources within the project areas are protected. Any development proposals should also be cognizant of the increased powers under the Constitution given to communities and individuals to enforce their rights through legal redress.

3.4 Vision 2030

Vision 2030 is the new country's development blueprint covering the period 2008 to 2030. It aims at making Kenya a newly industrializing middle income country providing high quality life for all its citizens by the year 2030. The vision has been developed through an all inclusive stakeholder consultative process, involving Kenyans from all parts of the country. The vision is based on three pillars namely; the economic pillar, the social pillar and the political pillar. The vision 2030 comes after the successful implementation of the Economic Recovery Strategy (ERS) for Wealth and Employment Creation 2003-2007.

The Kenya Vision 2030 economic pillar aims at providing prosperity of all Kenyans through an economic development programme aimed at achieving an average GDP growth rate of 10% per annum over the next 25 years from the year 2008. The social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment'. On the other hand, the political pillar aims at realizing a democratic political system founded on issue based politics that respects the rule of law, and protects the rights and freedoms of every individual in the Kenyan society.

3.4.1 Policy framework

3.4.2 The National Environmental Action Plan (NEAP) -1994

According to this plan, it's recognized that the development projects on the environment i.e. industrial, economic and social development programs that do not take care of environmental considerations in their operations are not sustainable. Under the NEAP process, EIA was introduced and among the key targets recognized were the industrialists, business community and local authorities.

3.4.3 The National Water Resources Management Policy -1999

It enhances the systematic development of water resources for all the sectors in promotion of the country's socio-economic development. It also recognizes the by-products of these developments as wastewater and therefore calls for development of appropriate sanitation systems to protect the people's health and water resources from institutional pollution.

It is therefore imperative that these activities be accompanied by appropriate waste management plans. The policy also recommends that all such developments should undergo comprehensive EIA that will provide measures to protect environment and people's health in the neighborhood of the project including the downwind communities.

As its predecessor, the EMCA (1999) calls for annual Environmental Audits (EA) to ensure continuous implementation of Environmental Management Plans (EMP) proposed in the EIA and any other recommendations and issues arising.

The policy requires that those who pollute water bodies must pay the full cost of remediation of the contaminated water; in tandem with the "Polluter Pays Principle."

3.4.4 Sessional paper No. 6 (1999)

Policy guidelines on environment and development – the key policy objectives of this paper includes:

- Ensuring that all development projects at the inception stage and programs, as well as policies consider environmental considerations.
- Ensuring that an EIA report is prepared for any undertaking or development project before implementation.
- Coming up with effluent treatment standards that will conform to acceptable health guidelines.

It's important to note that issues of waste water management and human settlements are given prominence and therefore, the policy recommends re-use and recycling of residues i.e. waste water, use of low waste generation technologies and increasing public awareness on benefits of a clean environment. It also recognizes the role of stakeholders in all these initiatives within their localities.
The paper encourages better planning in rural and urban areas in provision of needs i.e. water, drainage system, waste disposal facilities et al.

3.4.5 The National Environment Policy, 2013

The National Environment Policy aims to provide a holistic framework to guide environmental and natural resource management in Kenya. It also ensures that the link between the environment and poverty reduction is integrated into all government processes and institutions in order to facilitate and realize sustainable development at all levels in the context of a green economy, enhancing social inclusion, improving human welfare, creating employment opportunities and maintaining a healthy functioning of the ecosystem.

This policy presents the framework to deal with the ever-growing environmental issues and management challenges in Kenya, such as:

- The need to harmonize sectoral policy instruments with the Environmental Management and Coordination Act and the Constitution.
- Implementation of the Land Policy
- Valuation of environmental and natural resources
- Rehabilitation and restoration of environmentally degraded areas
- Loss of biodiversity
- Concessions and incentives
- Urbanization and waste management
- Pollution
- Energy
- Climate change and disaster management
- Conservation of shared natural resources
- Invasive and alien species
- Public participation, environmental education and awareness
- Data and information
- Poverty
- Weak enforcement
- Fragmentation

3.4.6 The Land Policy (Sessional Paper No. 3 of 2009)

The overall objective of the National Land Policy is to secure land rights and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. Specifically, it seeks to develop a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide all citizens with:

- The opportunity to access and beneficially occupy and use land;
- Economically, socially equitable and environmentally sustainable allocation and use of land;
- Effective and economical operation of the land market;
- Efficient use of land and land-based resources; and
- Efficient and transparent land dispute resolution mechanisms.

Inadequate environmental management and conflicts over land and land-based resources is one of the major issues the policy aims to resolve.
The need for land reforms in Kenya arose from the inadequacy of the old constitution to establish an efficient,

accountable institutional framework for land ownership, administration and management. This resulted in:

- Centralisation of state responsibility over land matters, irresponsive to the citizens' needs;
- Lack of accountability by governments in land governance, leading to irregular allocations of public land;
- Constitutional protection of private property rights even when acquired illegitimately;
- Mass disinheritance of communities and individuals of their land;
- Inequitable access to land, particularly for women, children, minority groups and persons with disabilities; and
- Ineffective regulation of private property rights, as a result of which unplanned settlements and environmental degradation were commonplace.

With the passing of the Kenya Constitution 2010, these issues have been addressed. The previously existing land laws have been repealed and the law consolidated into three statutes, namely the Land Act 2012, the Land Registration Act 2012 and the National Land Commission Act 2012. Read together with the Constitution (Land and Environment, Chapter 5) these statutes now govern all land issues including security of communal tenure, benefitsharing from land-based resources, restoration and conservation of land quality, land use regulation and development, conservation and sustainable management of land-based resources, ecosystem protection and management principles, land rights delivery, settlement land allocation and land adjudication, among others.

3.4.7 The Kenya Health Policy 2012 – 2030

The policy is based on the Constitution of Kenya 2010, Vision 2030 and global health commitments. It was developed through an inclusive and participatory process involving the health sector and other related sectors. Its broad aim is to ensure equity, people centeredness and participation, efficiency, multi-sectoral approach and social accountability in delivery of healthcare services. It sets out the goal, objectives, guiding principles and policy directions aimed at achieving Kenya's health agenda and a comprehensive implementation framework. Also included is the institutional management plan under the devolved system of government taking into account the varied roles of the national and county levels of government. The policy also sets out a monitoring and evaluation framework to track progress in achieving the policy objectives.

3.4.8 The National Environmental Sanitation and Hygiene Policy 2007

The Environmental Sanitation and Hygiene (ESH) Policy is intended to improve people's health and quality of life. Strategic interventions have been developed to determine the success of the policy implementation.
One of the key purposes of this policy is to clarify the various roles in order to enhance the existing legal and constitutional framework and to encourage the private sector, civil society and community participation in the planning, implementation and ownership of ESH services.

Sanitation and the Environment: One of the key objectives of the policy is to protect the environment from pollution and its negative effect on human health. The government will seek to minimize negative impacts arising from various types of sanitation systems, and maximize positive effects. In situations where inappropriate hygiene and sanitation systems have negative environmental impacts, the particular choice of technology will be weighed against the unimproved or less elaborate sanitation practices. The Health Ministry, through its Division of Environmental Health in conjunction with relevant agencies, will provide guidelines for the delivery and management of environmental infrastructure, particularly household sanitation, and solid waste disposal including healthcare waste and other wastes.

Well-functioning sanitation and hygiene systems are a means of protecting the environment. Monitoring will be increased and undertaken systematically to help prevent environmental pollution from liquid and solid wastes. The policy is designed in a manner that will create job opportunities, e.g. labour intensive construction, sustainable livelihoods and long-term entrepreneurial activities. Poor access to adequate sanitation and hygiene

is a major hindrance to poverty alleviation.
The health risks associated with poor ESH increase poverty. The government envisages that this policy is an important step towards poverty reduction.

3.5 Legal framework

The relevant national legal framework for the proposed project includes the following:

i. Environmental Management and Coordination Act of 1999
ii. Water Act of 2016
iii. The Physical Planning Act Cap 286
iv. The Public Health Act, Cap 242.
v. The land Act, Cap 303
vi. The Environmental (Impact Assessment and Audit) Regulation. Kenya Gazette supplement No.56 of 13.06.2003
vii. The Environmental Management and Coordination (Water Quality) Regulation. Kenya Gazette supplement No.68 of 2006.
viii. The Environmental Management and Coordination (Waste Management) Regulation. Kenya Gazette supplement No.69 of 2006.
ix. The Water (Services Regulatory) Rules, Kenya Gazette supplement No. 183 of 23.11.2012
x. Guidelines on drinking water quality and effluent monitoring of WASREB

3.5.1 Environmental Management and Co-ordination (Amendment) Act, 2015

According to section 58 of the Environmental Management and Co-ordination Act (EMCA) of 1999 Legal Notice No. 8, a project proponent whose project falls under the second schedule 9 (i) of the act is required to submit Impact Assessment and audit report to the National Environment Management Authority (NEMA). Part V of the Environmental Impact Assessment (EIA) and Environmental Audit (EA) regulations provide for the Environmental audit and Monitoring. The Act provides that an Environmental Impact Assessment shall be undertaken on all upcoming development activities, which are likely to have adverse Environmental Impacts. These development activities include ongoing projects that commenced prior to the coming into force of the fore said regulations.

This Act of Parliament came in to force on 14th January, 2000. It's aimed at providing for the establishment of appropriate legal and institutional frame work for the management of the environment, and covers over seventy other statutes, it's important to note that this Act eliminates duplication of rules and consolidates all other environmental laws hence enhancing its practicability. The Act entitles every person in Kenya to a clean and a healthy environment and safeguards it. The Act stipulates that any operator of any undertaking should carry out an EIA and EA afterwards every year, and submit the report to NEMA, which in turn issues an EIA license if the report is accepted.
The said Act prohibits discharging or application of poisonous, toxic, noxious or obstructing matter or other pollutants into aquatic environments. Any person who goes against this rule must pay for restoration of the damaged environment, or pay third party's compensation.

Section 74 requires that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of prescribed permit from local authorities.
Section 147 provides the framework for carrying out EIA and EA by NEMA through licensed experts and firms of experts.

The proponent will have to ensure that environmental protection facilities or measures to prevent pollution and ecological deterioration such as septic tanks construction, solid waste management plans, landscaping improvement programme are implemented and maintained throughout the project cycle.

The institutional framework of the Act

The Act provides for various administrative structures, which includes the National Environment Council (NEC), charged with the responsibility of developing the National Environmental Policy (NEP) in Kenya and sets the annual environment goals and objectives.

NEMA was established to deal with general supervision and coordination with all matters pertaining to the environment in Kenya. It's a principal government organ for implementation of environmental policies in Kenya. The Public Complaints Committee (PCC) was formed to investigate environmental complaints and submit its findings to NEC. The Standards and Enforcement Review Committee (SERC) advises NEMA on criteria and procedures for measurement of water quality in Kenya and minimum water quality.

3.5.2 The Environmental Management and Co-Ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009

The following principles shall be observed in the management and conservation of river banks, lake shores and the seashore;

a) Resources on the river banks, lake shores and the sea shore shall be utilized in a sustainable manner;
b) Environmental impact assessment as required under the Act shall be mandatory for all major activities on river banks, lake shores and the seashore; and
c) Special measures, including prevention of soil erosion, siltation and water pollution are essential for the protection of river banks, lake shores and the seashore.

Identification and inventory of degraded river banks, lake shores and sea shores and conservation measures within five years from the date of commencement of these Regulations, the Authority shall, in consultation with the relevant lead agencies –

a) Identify river bank, lake shores and the part of the seashore which are at risk from environmental degradation;
b) Prepare and maintain an inventory of the river banks, lakeshore and the part of the sea shore which are at risk from environmental degradation, and cause such measures as are necessary to be taken to prevent and reduce degradation of such areas;
c) Promote soil conservation measures along river banks, lake shores, and the seashore, including the following.
   i. bunding;
   ii. terracing;
   iii. mulching;
   iv. tree planting or agro forestry;
   v. grassing;
   vi. Soil engineering, compaction and placement of fills;
   vii. zoning and planning
   viii. building of gabions;
   ix. control of grazing, and
   x. Recommending the promulgation of appropriate by-laws by the relevant local authorities.

3.5.3 The Environmental Management and Coordination (Waste Management) Regulations, 2006 Relevant parts of this regulation include

- Prohibition of any waste disposal on a public highway, street, road, recreation area or in any public place except in designated waste receptacle;
- All waste generator to collect, segregate and dispose such waste in a manner provided for under these regulations;
- All waste generators to minimize waste generated by adopting cleaner production methods;
- All waste transporters to be licensed according to the act;
- All vehicles used to transport waste to be labelled in such a manner as may be directed by the Authority;
- Collection and transportation of the waste to be done in such a manner no to cause scattering of the waste;
- The vehicle and equipment for waste transportation to be in such a manner not to cause scattering of or flowing out of waste; andThe vehicles for transportation and other means of conveyance of waste to follow the scheduled routes approved by the authority from the point of collection to the disposal site.

PART IV: HAZARDOUS WASTES	
Hazardous Waste Specifications	22. For the purposes of this part, waste considered as hazardous, shall be any waste specified in the Fourth Schedule or any waste having the characteristics defined in the Fifth Schedule, and any wastes which do not fit the said categories of classification will be treated as non-hazardous waste.
Requirement for Environmental Impact Assessment	23. No person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment licence issued by Authority under the provisions of the Act.
Handling, storing, and transporting of hazardous waste	24. (1) Every T The generator of hazardous waste shall ensure that every container or package for storing such waste is secure and labelled in easily legible characters, written in English and Kiswahili. (2) The label shall contain the following information: (a) the identity of the hazardous waste. (b) the name, physical address and telephone contact of the generator of waste. (c) the waste composition and total weight of waste. (d) the normal storage stability and methods of storage. (e) the name and percentage of weight of active (f) warning or caution statements which may include any of the following as appropriate: (i) the words **"WARNING"** or **"CAUTION"**; (ii) the word **"POISON"** (marked indelibly in red on a contrasting background; and (iii) the words **"DANGER! KEEP AWAY FROM UNAUTHORIZED PERSONS"**; and (iv) a pictogram of a skull and crossbones. (g) a statement of first aid measures, including the antidote when inhaled, ingested or dermal contact and a direction that a physician must be contacted immediately. (3) The provisions of Part II of these Regulations relating to the license for transportation of waste and mode of transporting waste shall apply *mutatis mutandis* to this Part.
Treatment of Hazardous Waste	26. (1) Every person who generates toxic or hazardous waste shall treat or cause to be treated such hazardous waste using the classes of incinerators prescribed in the Third Schedule to these Regulations or any other appropriate technology approved by the Authority. (2) Any leachate or other by-products of such treated waste shall be disposed of or treated in accordance with the conditions laid down in the license or in accordance with guidelines issued by the Authority in consultation with the relevant lead agency. (3) In issuing a license for the disposal of waste, the Authority shall clearly indicate the disposal operation permitted and identified for the particular waste
operators of disposal sites. Cap 265	tor of a disposal site or plant shall apply the relevant provisions on waste treatment under the Local Government Act and Regulations thereunder to ensure that such waste does not present any imminent and substantial danger to public health, the environment and natural resources.
Validity of license and renewals	to operate a waste disposal site or plant shall be valid for a period of one year from the date of issue and may be renewed for a further similar period on such terms and conditions as the Authority may deem necessary or impose for purposes of insuring public health and sound environmental management.
Requirement for Environmental Audit	Owner or operator of a waste disposal site or plant shall carry out an annual environmental audit pursuant to the provisions of the Act.

Table 3.5-1: ***Hazardous Wastes management guideline***

To ensure optimal solid waste management, the proponent will comply with the following:

- *No disposal of waste on the highway should occur;*
- *Segregate waste and group them according to their similarity for example plastics, toxic, organic etc.*
- *Ensure all waste is deposited in a designated dumping area approved by the County Government;*
- *All waste handlers engaged by the proponent are licensed by NEMA and possess all relevant waste handling documents, such as; waste transport license, tracking documents license to operate a waste yard, insurance cover, vehicle inspection documents among others;*
- *Implement the cleaner production principles of waste management strategy namely reduce, reuse and recycle*

3.5.4 County Governments Act (2012)

Section 109 of the Act helps counties to ensure effective coordination of spatial developments. Sub section 2 part C states in part; spatial County Plan shall:

i. Indicate desired patterns of land use within the county
ii. Address spatial construction or reconstruction of the county
iii. Provide strategic guidance in respect of the location and nature of development within the county
iv. Set out basic guidelines for a land use management system taking into account any guidelines, regulations or laws as provided under Article 67 (2) (h) of the Constitution of Kenya
v. Set out capital investment framework for the Counties development programs
vi. Contain a strategic assessment of the environment impact of the spatial development framework

3.5.5 The Physical planning act, CAP 286

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

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

The proponent has submitted architectural and structural drawings to the Turkana County Government for approval.

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

The proponent has fully complied with this provision by appointing Environmental Experts to prepare and submit an Environmental Impact Assessment report to the authority.

3.5.6 The Water Act 2016

Part III, section 21, of the Water Act 2016 provides for national monitoring and geo referenced information system on water resources. Following on this, sub-section 2 allows the Water Resources Authority 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 proponent and the information thereof furnished to the authority.

The Water Act 2016 vests the rights of all water to the State, and the power for the control of all body of water by the Cabinet Secretary, the powers is exercised through the Cabinet Secretary and the Director of water resources in consultation with the water catchments boards, requires among other things that:

"Every person abstracting ground water by means of a well shall, in order to prevent contamination or pollution of the water-

a) effectively seal off to a sufficient depth any contaminated or polluted surface or shallow water in rock openings or soft broken ground;
b) effectively seal the top of the well between the surface casing and the internal pump column, and the suction or discharge pipe;
c) dispose of all return or waste water by means other than by return to the well;
d) extend the well casing to a point not less than twenty centimeters above the elevation of the finished pump house or pump pit floor
e) use either welded or screw type well joints on the casing if made of metal;
f) dispose of effluents or drainage from any household, stable factory, trade premises or other premises in such a manner as will prevent any such effluent or drainage from reaching such seal or ground water; and
g) carry out such other work as the Authority may by order direct, from time to time, for the prevention of contamination or pollution."

The contractor will be required to implement necessary measures to prevent any form of water contamination during the construction phase. The proponent will ensure that appropriate measures to prevent pollution of underground and surface water resources are implemented throughout the project cycle additionally they will ensure that water usage in all phases of the project cycle is in line with the provisions of this Act.

3.5.7 The Public Health Act

This Act, among other provisions: Regulates the maintenance, repair and inspection of drains, latrines cesspools and septic tanks, gives requirements for the construction of the drains in connection with a building; Prohibits nuisance that may cause injury or health hazard. Subsidiary regulations give requirements for medical examination of workers dealing with food manufacture, sanitation and food preservation.

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable

to be injurious or dangerous to human health. Section 116 requires that county Government take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health.
Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.
The main contractor will be required to provide sanitary facilities and solid waste containers for use by construction workers on site during construction phase. A licensed solid waste transporter will be contracted to collect all solid waste from the site for dumping at approved sites. Sewage from the site during operation phase will be discharged into an onsite sewer facility within the site which will be based on biodigestor technology. At the moment the proponent is scouting for the appropriate technologies as highlighted by NEMA waste office.

3.5.8 The Way leaves Act Cap 292

According to the Way leaves Act cap 292 Section 2, Private land does not include any land sold or leased under any Act dealing with Government lands. Section 3 of the Act states that the Government May carry any sewer, drain or pipeline into, through, over or under any lands whatsoever, but May not in so doing interfere with any existing building.
Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an offence and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary May cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and May recover any expense incurred by the Government in so doing from the offender. The proposed site is not inhabited hence there will be no need for compensation.

3.5.9 The Malaria Prevention Act Cap 246

Section 5 – Drainage System
No operations shall obstruct flow of water into or out of any drainage. The management shall be required to maintain the drainage system within the area of the project for removal of water from any land around the project to prevent larvae breeding.
The contractor and the proponent will ensure that drainage systems are well maintained throughout the project cycle

3.5.10 The Penal Code Cap 63

Section 191 – Fouling water
The management shall ensure that no foul water of any public spring or reservoir is rendered unfit for

the purpose for which it was ordinarily used for by the community.
Section 192 – Dwellings and Neighborhood
The operation phases of the project shall ensure that health of persons in general dwellings or carrying on business in the neighborhood or passing along a public facility are protected.
Section 193 - Offensive Trade
The proponent shall control loud noises or offensive and unwholesome smells so as not to interfere with the common rights of the people within the surrounding. This offence is punishable for common nuisance.
The proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle in order to mitigate against any possible negative impacts.

3.5.11 The Land Acquisition Act (CAP. 295)

This Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land to things such as survey upon necessary authorization will be undertaken in accordance with section 5 of the Act. Likewise here land is acquired compulsorily; full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters;

i. Area of land acquired,
ii. Property value in the opinion of the Commissioner of land (after valuation)
iii. Amount of the compensation payable,
iv. Market value of the property
v. Damages sustained from the severance of the land parcel from the land
vi. Damages to other property in the process of acquiring the said land parcel.
vii. Consequences of changing residence or place of business by the land owners.
viii. Damages from diminution of profits of the land acquired

Part II of the Act allows for the temporary acquisition of land for utilization in promotion of the public good for periods not exceeding 5 years. At the expiry of the period, the Commissioner of Land shall vacate the land and undertake to restore the land to the conditions it was before. Any damages or reduction of value shall be compensated to the land owners.

3.5.12 Occupational Health and Safety Act (2007)

This legislation provides for protection of workers during construction and operation phases. It is tailored at implementation of the Environment, Health and Safety (EHS) plan in compliance with the relevant sections of this Act. It shall be the duty of every employer to:

1. Ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his employees.
2. Without prejudice to the generality of an employer's duty under subsection (1), the matters to which that duty extends include in particular;
   a) The provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;
   b) Arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of equipment, machinery, articles and substances;
   c) The provision of adequate and suitable protective clothing or devices of an approved standard to employees who in the course of employment are likely to be exposed to the risk of head, eye, ear, hand or foot injury, injury from air contaminant or any other bodily injury and the provision of adequate instructions

in the use of such protective clothing or devices;

d) The provisions of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the safety and health at work of his employees;
e) So far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks;
f) The provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards amenities and arrangements for their welfare at work;
g) Compliance with sections 7, 12, 37, 46, 75 and 76, Parts III and IX and such other duties as may be imposed on him by regulations made under this Act.

3. An employer shall—

Ensure that all hazardous chemicals present in the industrial establishment are labeled in a way easily understandable to the employees, or are identified in the prescribed manner;
Obtain or prepare, as may be prescribed, an unexpired chemical safety data sheet for all hazardous chemicals present in the workplace;
The proponent will provide personal protective equipment i.e. protective clothing, helmets, goggles, or other garments or equipment designed to protect the workers body from injury or infection. On fire safety there will be a fire exit, good ways of handling of flammable substances, a fire fighting team, first aid team and firefighting appliances (fire extinguishers).

3.5.13 Licenses and Permits

In order to manage the environmental quality standards, the EMCA requires that project proponents apply to the NEMA for various types of permits depending on the nature of the project once it becomes operational. These permits include:

- Effluent Discharge License (for wastewater discharges into sewer systems)
- Air Emission License (for air pollution)
- Waste License (for transport, storage and disposal of all types of wastes)
- Other statutory licenses and permits

3.5.14 Policy Guidelines on Environment and Development

Among the key objectives of the Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999) are to ensure that from the onset, all development policies, programmes and projects take environmental considerations into account and to ensure that an immediate environmental impact assessment (EIA) report is prepared for any industrial venture or other development before implementation among others.
The policy recommends the need for enhanced re-use/recycle of residues including wastewater, use of low non-waste technologies, increased public awareness and appreciation of clean environment. It also encourages participation of stakeholders in the management of wastes within their localities.

3.5.15 Building Code 2000

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

The proposed project area has no existing sewer line. The proponent will construct a septic tank and will also install an oil interceptor at the site to ensure that no used oil waste from the Gas station is directed to the soak pit.

3.5.16 International Conventions

The Kenya Constitution provides that the general rules of international law shall form part of the laws of Kenya, as shall any treaty or convention that she ratifies (Article 2). Kenya has ratified or subscribed to a number of international conventions that relate to the environment within her borders.

Table 3.5-2: International conventions that Kenya has ratified

	Convention	Entry into force	Date of ratification
1.	African Convention for the Conservation of Nature and Natural Resources, Algiers, 1968 Parties must conserve their natural resources – soil, water, flora and fauna – ensuring that they are used and scientifically developed in a manner that will benefit their people.	16 June, 1969	12 May, 1969 (accession)
2.	African Convention on the Conservation of Natural Resources (Revised Version) Maputo, 2003 Parties must ensure that developmental and environmental needs are met in a sustainable, fair and equitable manner.	11 July, 2003	17 December, 2003 (signature)
3.	Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971. It provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	21 December, 1975	5 October, 1990
4.	Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972. It establishes a system of collective protection of cultural and natural heritage of outstanding universal value.	17 December, 1975	1 July, 1983
5.	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington, 1973. It aims at ensuring that international trade in specimens of wild animals and plants does not threaten their survival.	1 July, 1975	13 March, 1979
6.	Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979. It aims to protect those species of wild animals that migrate across or outside of national boundaries. Parties	1 November, 1983	1 May, 1999

	must protect them, conserve and restore their habitat, mitigate obstacles to migration and control other factors that might endanger them.		

	Convention	**Entry into force**	**Date of ratification**
7.	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 1989. It aims at protecting human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous wastes.	5 May, 1992	2000 (accession)
8.	Amendments to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Geneva, 1995. The amendment prohibits exports of hazardous wastes destined for final disposal or recycling purposes from Annex VII countries to non-Annex VII countries (Annex VII not yet in force).	5 May, 1992	9 September, 2009 (acceptance)
9.	United Nations Framework Convention on Climatic Change, New York, 1992. It sets an overall framework for intergovernmental efforts to tackle the challenge posed by climatic change, recognizing that the climate system can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases.	21 March, 1994	30 August, 1994
10.	Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto, 1997. It sets binding targets for 37 industrialized countries and the European Community as well as for countries undergoing the process of transition to a market economy in order to reduce greenhouse gas emissions.	16 February, 2005	2005 (accession)
11.	Convention on Biological Diversity, Rio de Janeiro, 1992 It aims at granting the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the use of genetic resources.	29 December, 1993	27 June, 1994

12.	Stockholm Convention on Persistent Organic Pollutants, Stockholm, 2001. It protects human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife. It requires Parties to take measures to eliminate or reduce the release of persistent organic pollutants into the environment.	17 May, 2001	24 September, 2004

	Convention	**Entry into force**	**Date of ratification**
13.	Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, Bamako, 1991 It binds Parties to take appropriate legal, administrative and other measures within the area under their jurisdiction to prohibit the import of all hazardous wastes, for any reason, into Africa from non-Contracting Parties.	22 April, 1998	17 December, 2003 (signature)
14.	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994 It seeks to combat desertification and mitigate the effects of drought through national action programmes and is based on the principles of participation, partnership and decentralization – for good governance and sustainable development.	26 December, 1996	24 June, 1997
15.	Convention of the African Energy Commission, 2001 It aims to ensure, co-ordinate and harmonise the protection, preservation, development and the national exploitation, marketing and integration of Africa‘s energy resources.	13 December, 2006	29 December, 2006
16.	Convention for the Protection of the World Cultural and Natural Heritage, 1972 It seeks to have nations co-operate to protect world heritage that is of such outstanding universal value that it is vital to preserve it for future generations.	17 December, 1975	5 June, 1991

4.0 BASELINE INFORMATION

4.1.1 Location and General Description

As noted previously, the proposed project site is a 20 acre piece of land sited at Nayanae-ngitira village, Lopur sub-location, Kakuma Location in Turkana West sub-county, Turkana County. The

proposed site is geographically located on a latitude of 3º 42' 5.28''N and a longitude of 34º 45'36.75''E laying on an altitude of 628.80m above sea level. This site is about 14km North-west of Kakuma refugee camp; about 15km North-west of Kakuma town and approx. 3km West of Kakuma-Lokichoggio A1-road. The proposed site can be accessed via an earth road not clearly defined and in poor condition. The households of the adjacent community living within a radius of 2km is about 50 in number which translate to a population of about 265 persons (KNBS,2019)

4.1.2 Biophysical Environment

4.1.3 Climatic Conditions

The entire Turkana County is classified as an arid area where the climatic conditions are characterized as warm to hot, with temperatures ranging between 24 to 38 degrees Celsius. Rainfall is erratic and unpredictable both in timing and distribution. Turkana West located to the northwestern area border with Uganda and Sudan receives more than 500mm per year.

Figure 14 below shows rainfall distribution in Turkana County.

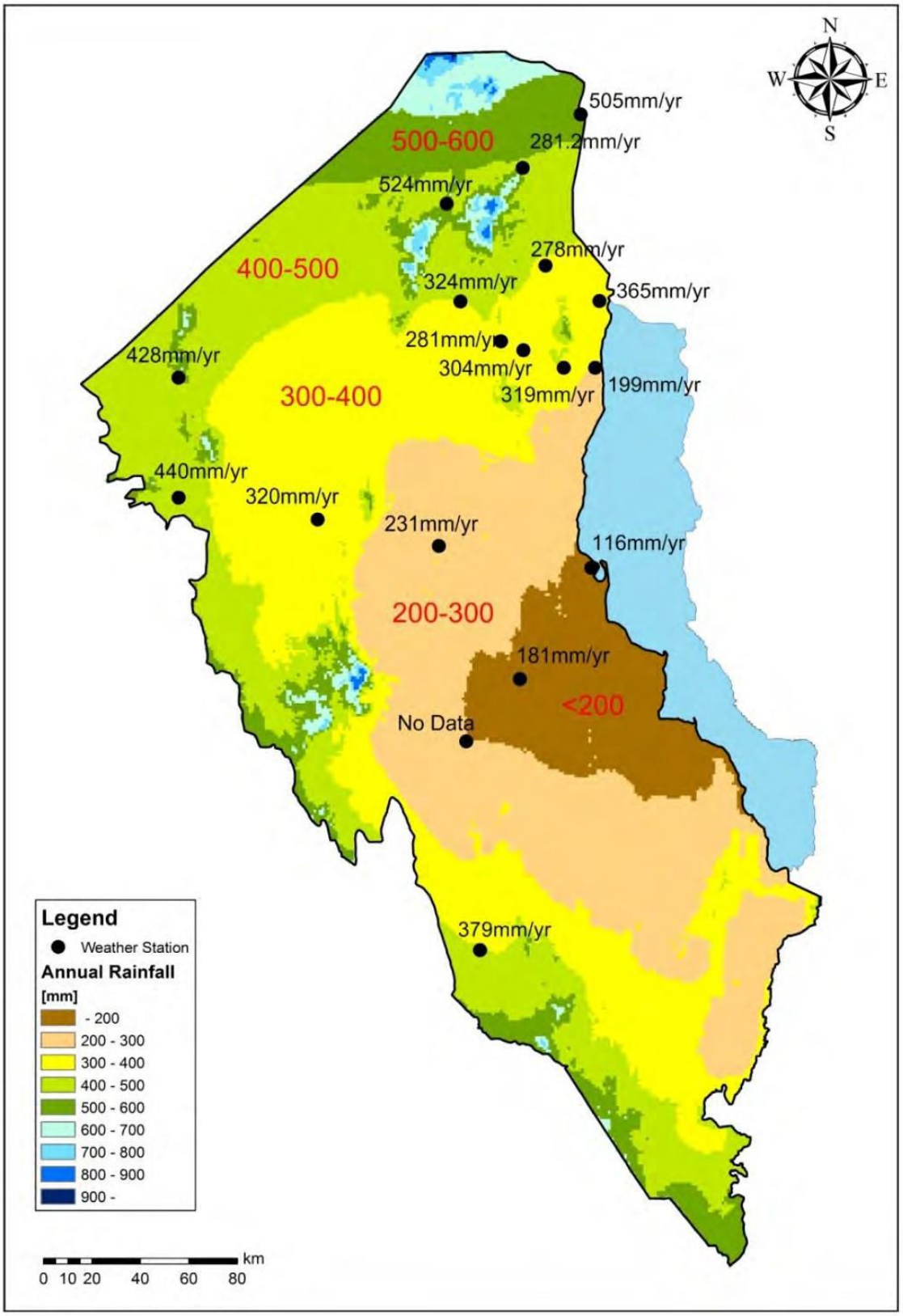

Figure 14: Annual Rainfall Distribution Map. Source: JICA Project Team

4.1.3.1 Climate change

Over the past several decades, Kenyan government data show a clear trend in increasing average temperatures in the country as a whole and in Turkana County. While global mean temperatures are estimated to have increased by 0.8°C (1.5°F) in the past century, in Turkana County minimum and maximum air temperatures have increased by between 2 and 3°C (3.5 and 5.5°F) between 1967 and 2012. Rainfall patterns have also changed: the long rainy season has become shorter and dryer and the short rainy season has become longer and wetter, while overall annual rainfall remains at low levels.

Climate data from a meteorological station in Turkana's capital Lodwar documents increased (minimum and maximum) temperatures of 2-3°C (3.6 to 5.4°F) between 1967 and 2012. Rainfall patterns in Turkana also appear to have changed, with the short rainy season becoming longer and wetter and the long rainy season becoming shorter and dryer. Overall annual rainfall in Turkana remains at low levels, with repeated intense droughts across Northern Kenya. These patterns appear consistent with scientific evidence suggesting a correlation between increasing overall temperatures and droughts and more extreme rainfall.

4.1.4 Water Resources

In Turkana West Sub County rural water supply projects rely considerably on groundwater to meet the needs of pastoralists and displaced populations. Rainfall contributes a total volume of approximately 24 km3 of water into Turkana. Overall, the rainfall in the County has been on the decline over the years as reported by Savatia (2010). Runoff contributes approximately 4.8 km3 (16.7% of rainfall) Turkana West has several rivers. The Tarach is a seasonal river and brings floods waters from mountain ranges near the Ugandan border. The worst flood in Kakuma was recorded in May 2003 when some 16,800 refugees saw their homes destroyed. A number of latrines overflowed and collapsed, leading to the spread of water-borne diseases, including cholera and dysentery. Tarach River has high number of shallow wells most of which are less than 10m located in sandy riverines that overlie shallow aquifers. They are important water sources since new shallow wells and boreholes are tapped on these aquifers. This shallow wells are the most important water sources for livestock. An RTI (RTI, 2012) report mapped the boundaries of watershed catchment areas within the study region, and calculated the total rainfall harvested per year for catchment, prior to subtracting evaporation or runoff (seen in Figure 15). It was observed that the watersheds in Turkana North and Central are naturally oriented towards Lokichogio, Kalobeiyei, Kakuma Refugee Camp and Lodwar. The western watershed system and its four sub- watersheds replenishing the Lotikipi Basin (outlined in blue) have a cumulative rainfall harvest of 7.36 BCM/year. The eastern watershed system (outlined in red) replenishes Lake Turkana with a global input of 9.6 BCM/year

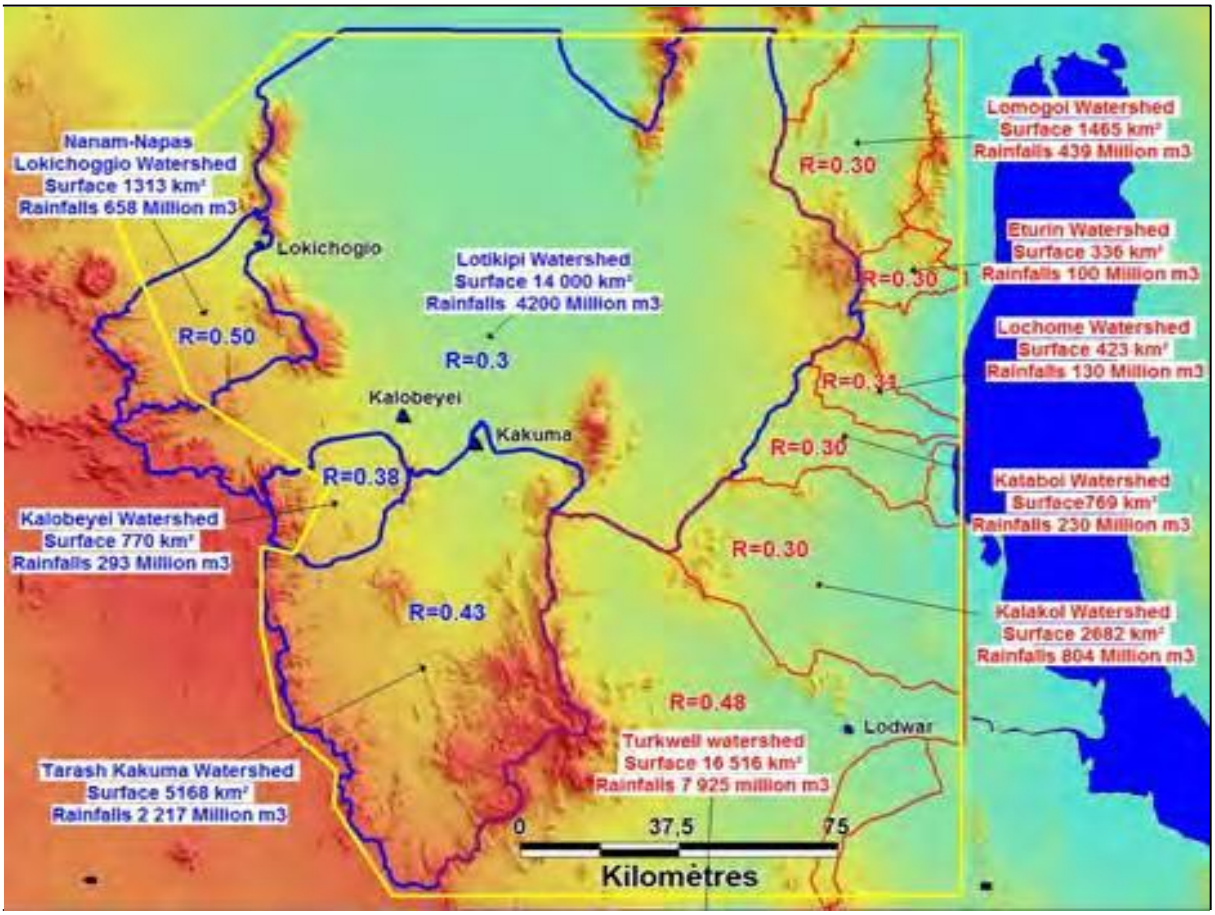

Figure 15: *Map of watersheds and sub-watersheds of northern-central Turkana County. RTI, 2012*

Table 4.1-1: *Surface area, rainfall rates and Rainfall: Area ratios of watersheds of northern-central Turkana County. RTI, 2012*

Watershed	(S) Area (km2)	(R) Volume rainfall (MCM/yr)	R / S ratio
(1) Tarash-Kakuma sub-watershed	5,168	2,217	0.43
(2) Nanam-Napas sub-watershed	1,313	658	0.50
(3) Lotikipi sub-watershed	14,000	4,200	0.30
(4) Kalobeiyei sub-watershed	770	293	0.38
Lotikipi watershed system (all sub-watersheds)	**21,251**	**7,368**	**0.35**
(1) Turkwel-Lodwar	16,516	7,925	0.48
(2) Kalakol	2,682	804	0.30
(3) Lomogoi	1,465	439	0.30
(4) Kataboi	769	230	0.30
(5) Lochome	423	130	0.31
(6) Eturin	336	100	0.30
L.Turkana watershed system (all sub-watersheds)	**22,191**	**9,628**	**0.43**

Other than the naturally occurring surface water bodies, there are also the man-made ones such as pans and dams. See figure 16 a) and b)

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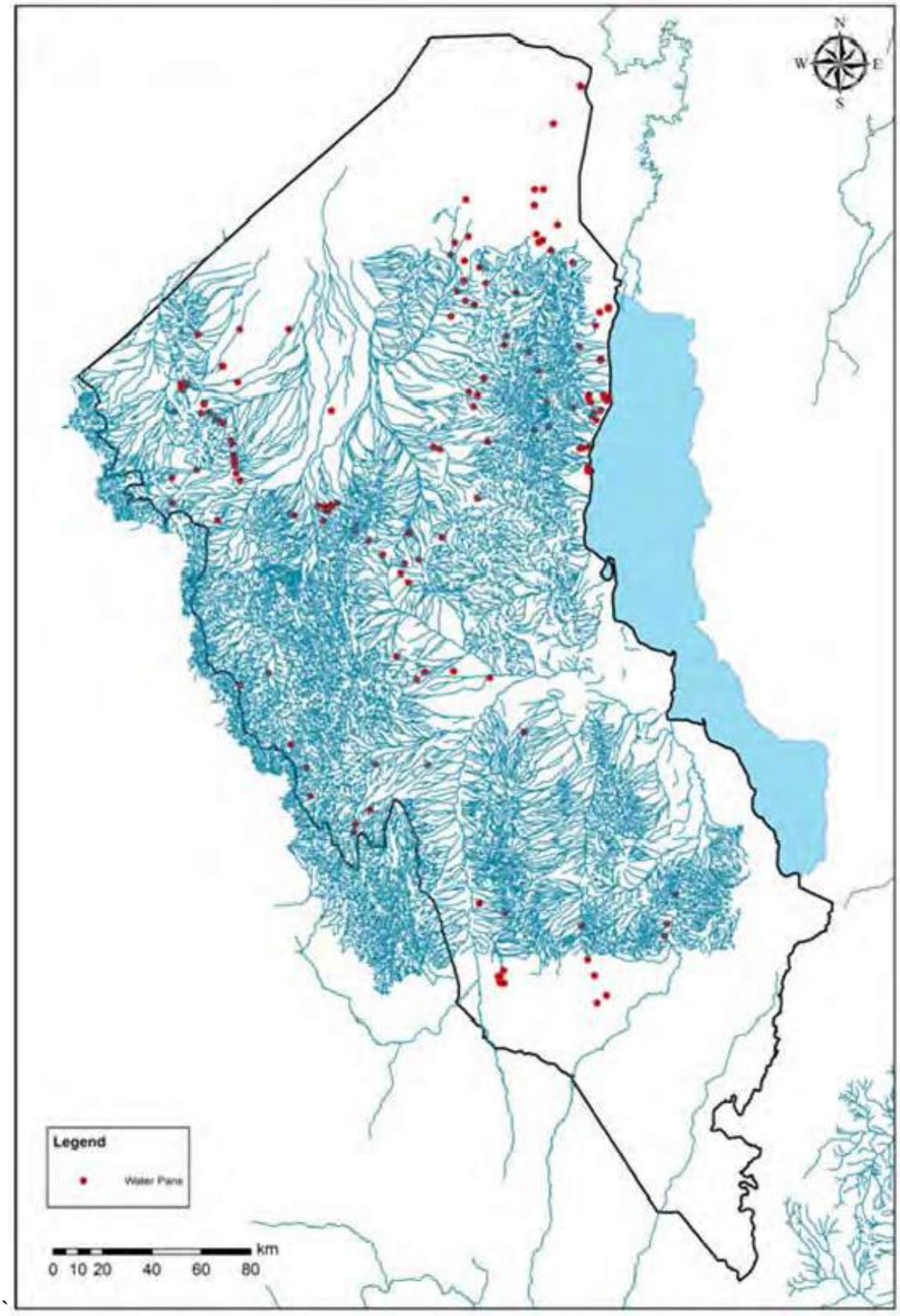
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Figure 16 a): Existing Water Pan and Lagas. *Source: JICA Project Team*

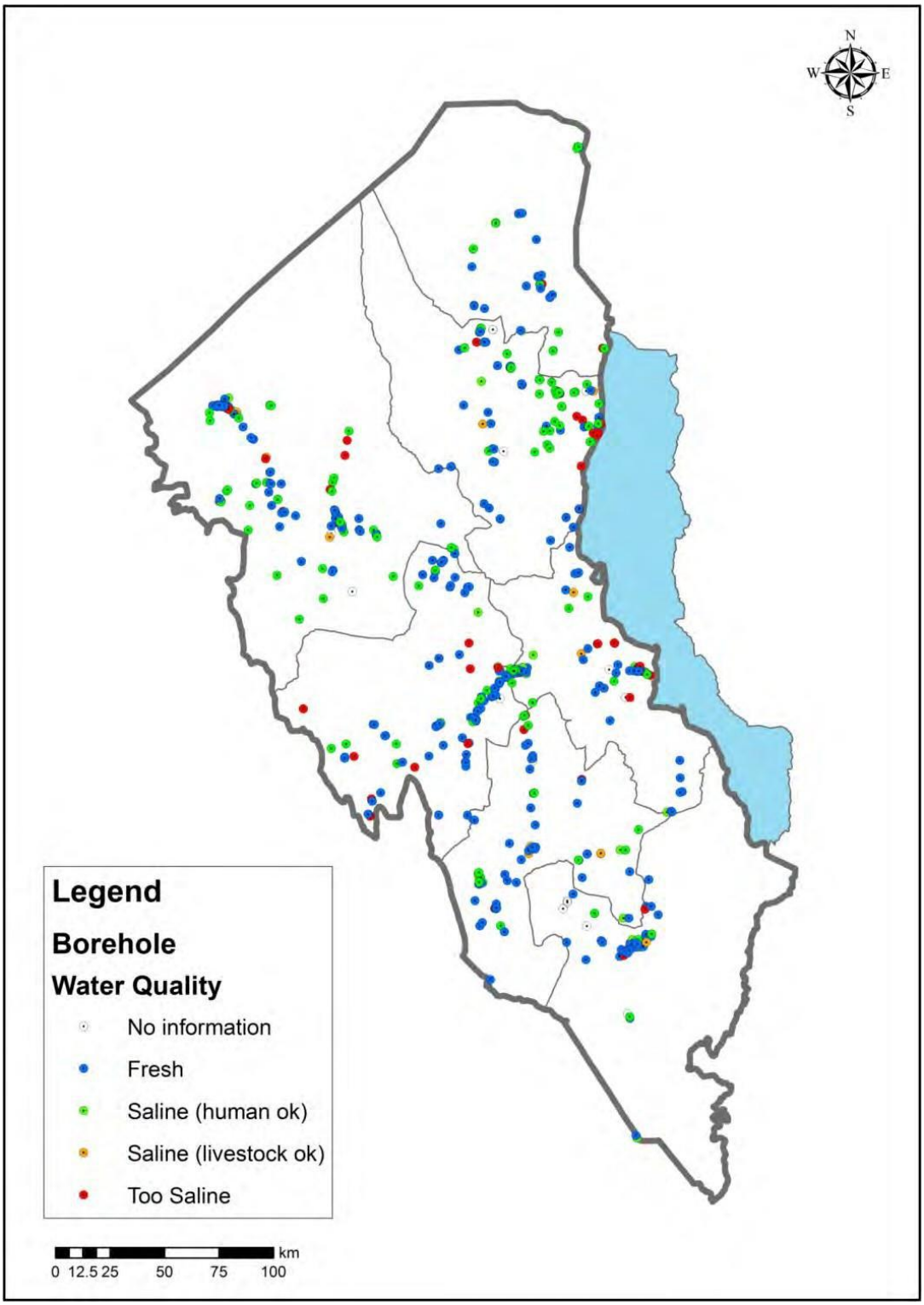

Figure16 b): Compiled Turkana Borehole Locations with Water Quality. Source: JICA Project

Team

4.1.5 Biodiversity

4.1.5.1 Flora

Regional overview Turkana West is characterized by low rainfall with a high degree of spatial and temporal variability. This has resulted in a high degree of variability in the distribution of vegetation resources. The vegetation in the area is generally thin in density and poor in diversity. Most of the perennial plants, the majority of which are short bushes and shrubs, depend on percolated sub-surface rainwater that occurs within depths reachable by the root zone. The seeds of only few plants succeed in germinating under such conditions. A considerable concentration of vegetation appears around the dry river beds too.

The proportion of native vegetation within the project area consists mainly of dwarf shrubs of Indigofera spinosa (herbaceous) and bushes of Acacia reficiens (woody vegetation). Patchy grassed areas comprising of Chloris virgata and Aristida mutabils are also found.

The vegetation cover exhibits the protective influence of plants in terms of shade, protection of the soil from rain impact and control of soil movement. These are important considerations in Turkana, given the high average daily temperatures (35^0C) and torrential nature of the rainfall whose large water drops can cause considerable soil erosion.

Land cover and vegetation distribution in the area of study is provided in the table below.

Table 4.1-2: Land cover and vegetation distribution in the area of study

Category	Distribution
Shrubland	This habitat type is mainly composed of woody plants that reach a maximum height of 8 metres and bushes which make up more than 50% of the vegetation matter observed. the dominant species being *Acacia reficiens, Acacia melliifera, Boscia sp., Indigofera sp.,* and *Grewia sp., Maerua angolensis, Acacia tortilis, Calotropis procera, Euphobia spp.*, wild sisal, *Indigofera spinosa* and *Prosopis juliflora*. The development and establishment of species within this habitat type can be linked to soil salinity levels, soil sodicity levels, water and anthropogenic influence. Shrub-land habitats in the project area are found in the undisturbed sections of the land and in areas with moderately well drained and developed soils.
Grassland	This type of habitat is characterized by savannah grasslands extensively covering the area with a few patches of shrubs, *Prosopis juliflora* species or woody trees occurring as well. Some areas had palatable grass such as *Chloris virgata* and *Aristida mutabilis*. The Lokitipi floodplain are dominated by a mix of grass species growing on frequently flooded stratified loamy and/or clayey soils that are associated with the seasonally inundated sites and areas surrounding lugga systems. The predominant species was *Chloris virgate* is found in few areas particularly at Nasinyono.

Bushland	This type of vegetation is dominant in most of the study area. The
	Prosopis juliflora species shrub was introduced from South America to help curb desertification in the 1980s but has since turned to be a major invasive species in the area dominating the majority of habitats. The species has invaded most of the area and due to its rapid growth has formed bushlands that have made most areas within the study area inaccessible. This type of habitat is found mostly within the proposed area forming a significant portion of vegetation cover in the area.
Grassed shrubland	This type of habitat comprises a mixture of two types of habitats namely; grasses and shrubs. Where the habitat occurs shrubs represent at least 50-60% and grasses take over the remaining 40-50%. This type of habitat is found in patches within vast areas of bare surface especially in the Lotikipi plains, Nasinyono, Lokangae and Nanaam and within the project area. The shrubs and grass species observed in this ecotype habitat include; *Acacia melifera* and *Cadaba sp., Indigofera spinosa.*
Riverine vegetation	The expansive floodplain habitat has numerous seasonal channels (*luggas*) that drain water into the main *luggas* such as Tarach and Anum luggas. The presence of water and sediment load in the channels has led to the establishment of riverine forest. These forests are not very rich in terms of species diversity and are dominated by *Prosopis juliflora* and *Acacia tortilis* intermixed with *Boscia sp.* and *Salvadora persica.* In most cases a significant portion of the vegetation is found along seasonal *luggas* that are within the project area.

Plate 1: ***The site visit team together with the area chief and community Committee representatives inspecting the beacon at the proposed site and the rocky surface of the proposed site***

Plate 1.2: ***Vegetation distribution at the proposed site***

4.1.5.2 Fauna

Despite the low carrying capacity of the area the fauna is relatively diverse, especially in breeding and migrant birds. The table below shows fauna found in the project area

Table 4.1-3: fauna found in the project area

Fauna	Distribution
Arachnids	Arachnids spotted in the project area are represented by a single species of scorpion, they are seen very rarely and this is attributable to their nocturnal activity. In daylight they remain hidden under rocks. There were also several ant hills throughout the project area, hence a likely indication of termites in the region.

Reptilia (Reptiles)	Reptiles are relatively scarce in the project area since only a single species Turkana Gecko *Hemidactylus barbieri* is known to be around Nasinyono area. A crocodile habitat has been spotted in the Lotikipi plains and at water pans charged by the Tarach River.
Aves (birds)	The common avifauna of the project area is the white-headed buffalo weaver *(Dinemellia dinemelli)*, Superb starling (*Lamprotornis superbus)*, helmeted guinea fowl (*Numida meleagris*), Hornbills (*Tockus jackson* and *Tockus deckeni*), African paradise flycatcher (*Terpsiphone viridis)*, Lappet- faced vulture (*Torgos tracheliotus*), Dwarf necked raven *(Corvus edithae)*, Kori bustards (*Ardeotis kori)*, Lesser bustards, Rollers *(Coraciidae)*, Gabar goshawk (Micronisus gabar) and ostriches (Struthio spp.). Regionally threatened bird species in the Turkana County area include the ostrich (*Struthio camelus)*, Great egret (*Casmerodius albus)*, Saddle-billed stork (*Ephippiorhynchus senegalensis)*, Banded snake-eagle (*Circaetus cinerascens)*, African fish eagle (*Haliaeetus vocifer)*, Fox kestrel (*Falco alopex)*, Heuglin's bustard (Neotis heuglinii), Abyssinian ground hornbill (Bucorvus abyssinicus), African skimmer (Ryncops flavirostris) and Somali sparrow (Passer castanopterus) (Bennun &Njoroge, 2001; Stattersfield et al, 1998). The site is also an important staging post for migrating warblers and wagtails (KWS, 1992).
Mammalia (mammals)	Mammals in the project area are represented by a handful of species. The range of the large herbivores is restricted to the lake region of the County, which support permanent vegetation. Mammalian population is under extreme pressure from indiscriminate hunting. The mammalian species observed in the study area include: Waller's gazelle (Litocranius walleri), Grant gazelle (Gazella granti), Guenther's dikdik (Madoqua guentheri), Bat- eared fox (Otocyon megalotis), Black-backed jackal (Canis mesomelas) and Golden common Jackal (Canis aureus).

Plate 2: ***Livestock grazing near the proposed site***

4.1.6 Soil Geology and Topography

Soils of floodplains are developed from sediments from various pyroclastic and volcanic rocks, basic igneous rocks (basalts) while those of hills are developed from undifferentiated tertiary recent volcanic rocks. Soils of floodplains are well drained, dark grayish brown to dark yellowish brown, friable, stratified, moderately calcareous, none to slightly saline, moderately sodic and loam to clay. Others soils may be well drained to imperfectly drained, very deep, dark brown to yellowish brown, stratified and predominantly loamy soils. Soils of hills are well drained, shallow, dark reddish brown, boulder or stony, loam to clay loam and in many places saline.

The main geological units within the project area comprise of basement system of Gneisses Olivine Basalts, Rholites and Residual soils. The oldest rocks in the Turkana West region are metamorphosed rocks mainly sediment of the basement system, considered to be pre-Cambrian in age. These rocks have been obscured in the project sites area by the overlying younger pile of volcanic lava and pyroclasts. Laval Olivine basalts are easily identifiable with their distinct dark bluish-grey or black in the near the foot of the ranges.
The project site is characterized by dark grey soil widely distributed and majorly covered with gravel & pebbles and has clay loamy texture.

Plate 3: ***The rocky surface of the proposed site***

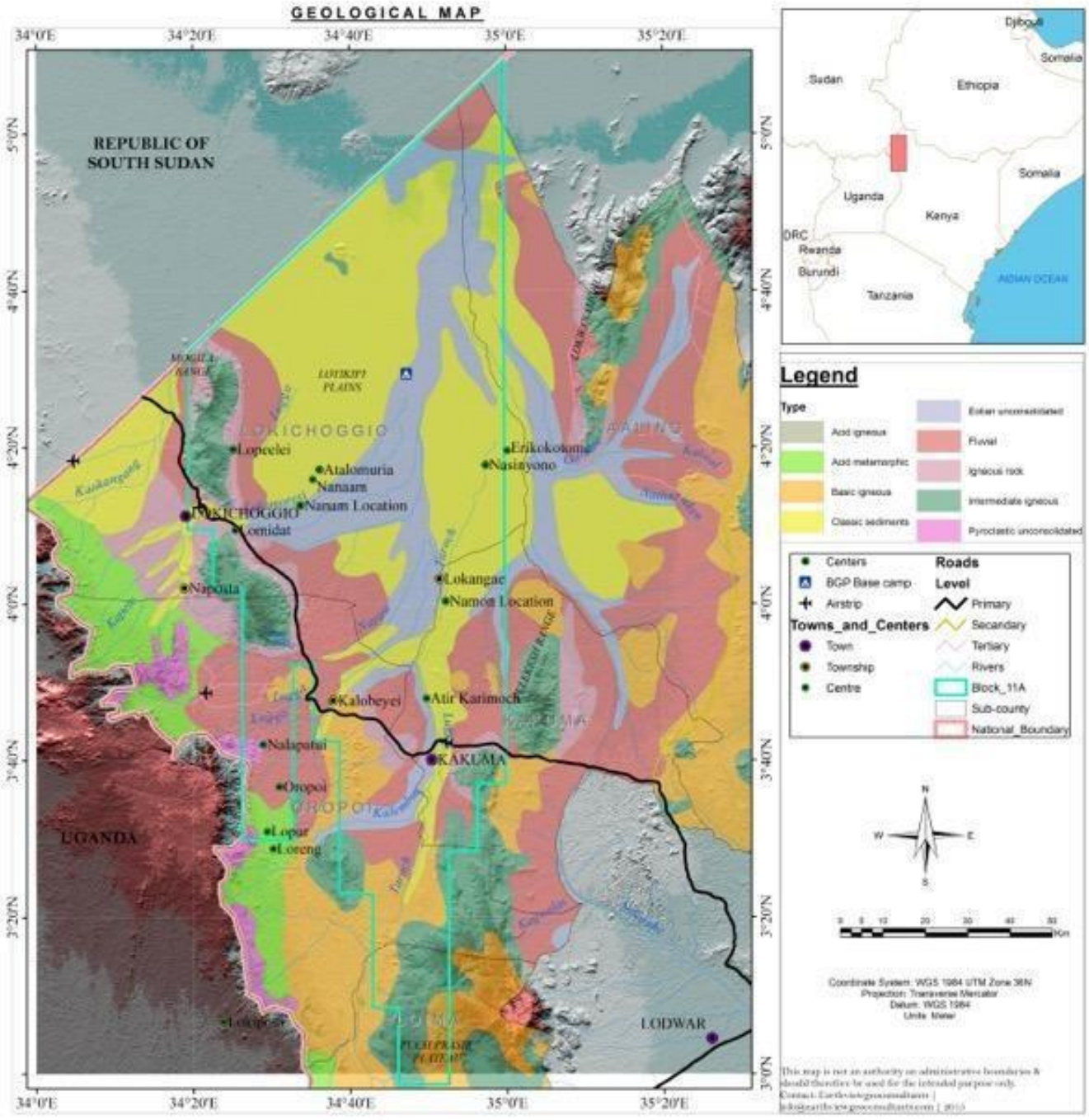

Figure 17: *Soil-mapping units of the proposed project area (Source Cepsa, 2014)*

4.1.7 Important or protected flora or fauna

From the red list of International Union for Conservation of Nature (IUCN) the fauna found in the Turkana west is not threatened. There is also no important or protected area for fauna and flora but there are plans to gazette Lotikipi plains as a game reserve. A February 2016 report from the Directorate of Environment Turkana county states that County government is in the process of surveying, mapping and gazetting Lotikipi as a nature reserve to protect, conserve and sustainably

manage the ecosystem to make Turkana the next tourism destination of choice. Terms of Reference were developed for consultancy service to do aerial survey and mapping of resources therein. In February 2016, the ministry held a meeting with the warden Turkana County and agreed on the following;

1. Ministry of Environment and Natural Resources to re-forward a letter to the Assistant Director KWS requesting KWS carry aerial survey and mapping
2. Officially request the KWS to forward the budget for the survey, beacon and mapping of the resources therein.

4.1.8 Socio Economic Baseline

4.1.9 Demographics

According to the Kenya Population and Housing Census (2019) Turkana County has a population of 926,976. The population of Turkana West is at 239,627 as per the 2019 census. Turkana West Sub County is the most populated sub county in Turkana due to the presence of the refugee camp in Kakuma.

Table 4.1-4: Population density

Sub County	2009 (Census)		2019(Census)	
	Pop	Density (Km^2)	Pop	Density (Km^2)
Turkana West	245,327	14	239,627	14

Source: KBS 2009/2019

4.1.9.1 Social Organization and Ethnic Groups

The indigenous community inhabiting the proposed project area is the Turkana community. Other minor tribes in the sub-county include Luo, Kisii, Kalenjin, Luhya, Kikuyu and Somali who are mainly civil servants and businessmen. These minor tribes are mainly found in Lokichoggio and Kakuma towns. The Turkana are the dominant ethnic group in the proposed project area.

The Turkana community have several clans within the project area which include Yapakuno, Nalukumong, Ngiduya, Ngiponga, Ngipucho, Ngimeturuana, Sonyoka, Ngiduya, Ngijie, Ngidocha, Ngimecharimukata and Kwatela. Among these the dominant clan is Kwatela. There is a traditional hierarchy of leadership in all the locations where the senior most is the prophet called Emurwan who is followed by the kraal elders then the community members follow. The Emurwan is in charge of directing the community and prophesizing what may befall the community.

Major decisions in the Turkana community are made by elders. Apart from decision- making, the elders also perform the following duties:

- Resolving conflicts in the community
- Counselling troubled community members
- Help the chief in governing the area
- Custodians of the Turkana culture

Middle aged men who have not yet attained the age to be regarded as elders perform the following duties:

- Provide security to the community from thieves and bandits
- Grazing and watering the animals
- Supervising the society activities
- Fending for their families

Women on the other hand have well defined roles in the community including:

- Fencing the livestock boma and the homestead
- Taking care of the children
- Food preparation
- Taking care of animals left in the homestead
- Fetching water
- Advising the young girls
- Building manyattas

The youth carry out the following duties: The girls help their parents and the elderly and fetch water. Boys offer security to the society, look after animals and migrating with the livestock in search of water and pasture. Duties assigned to the young children include: Looking after the young goats (kids), Running errands in the home

Plate 4: Area residents, road and distribution of local housing

4.1.10 Land Rights and Usage

In Turkana County, land is governed by the community. Currently the land is held in trust for the

community by the county government. The recent oil exploration activities in other parts of Turkana County such as Lokichar are on communal land. In the proposed project area, land is also communal and mainly used for pastoralism activities, settlements and small portions are used for agriculture. The community members can freely graze and live in any area depending on the availability of pasture and water. However, each clan has its own designated area for settlement and grazing but in case people want to migrate to another area the chiefs communicate and agree before migrating. Settlement pattern in the project area is therefore determined by the availability of pasture and social facilities. The locals live in clusters in places near water points, schools, markets and pasture. In the project area the people migrate during dry seasons to look for pasture and water and mostly they are the young men and middle aged men who migrate with the livestock, however, in case of conflicts and banditry attacks, the whole community migrates.

4.1.3 Livelihood and Economic Activities

Livelihood activities in the area range from livestock keeping, crop farming, charcoal and firewood selling, small-scale business and casual labour among others. The main livestock kept in the area are goats, sheep, donkeys and a few people keep camels in areas of Nanaam. Livestock in Turkana community are a key source of wealth with camels and cattle being highly prized while goats and sheep kept for immediate needs (GOK 2009). Additionally, the livestock provide resources for immediate nutritional needs such as meat and milk and also sometimes they sell the by-products and the animals to generate cash income for buying other food stuffs.

Crop farming is slowly being adopted by people in the project area. According to the Sub county agricultural officer, the uptake of agriculture in the area is due to frequent banditry attacks and droughts that lead to deaths of livestock in a short time. The agricultural officer added that almost 60% of the residents are engaged in agro-pastoralism in the Sub county. This is through the help of government through the department of agriculture and organization such as Johanniter International and German Cooperation who help in installation of irrigation facilities. Through this, locals in Nasinyono, Nanaam, Lopur and Namon are involved in sorghum farming. These farms are communally owned.

Most community members from the area of interest are also involved in charcoal and firewood selling mainly in the refugee camp in Kakuma and other urban centres in the area. The community members mentioned that during rainy seasons the roads become impassable hence lorries from Kakuma do not collect the charcoal and firewood affecting their source of income. They therefore depend on farm produce, meat and milk from the livestock while during the dry seasons they mostly depend on income from charcoal and firewood selling. According to the Lokichoggio ward administrator, poverty rates are very high and most people especially during dry seasons depend on support from NGOs, relief food from the county government and some are involved in small scale businesses. This was echoed by focus group discussion participants who added that they get relief food from government and other development partners.

4.1.4 Energy

The project area has long periods of sunny and windy conditions that are suitable for solar and wind energy generation. The Lake Turkana Wind Power Project which is the largest in Kenya is located in the nearby Marsabit County.

Solar energy is not fully utilised in the area in that only few institutions use solar energy for lighting and running electronic machines. Various social amenities such as health facilities, schools and water boreholes in the area are fitted with solar panels to provide energy. The solar panels in those

institutions were installed by the government through the Ministry of Energy and Petroleum.

4.1.5 Industries

Lomidat meat processing industry is the only industry found in Turkana West Sub-county. It is located ten kilometres from Lokichoggio town along Lokichoggio–Kakuma road. The industry's goal is to contribute towards poverty alleviation of pastoral communities in Turkana County by providing its membership and other nomadic communities in the region a steady market outlet that is cash based. Lomidat in the local language means "tastes so good that one cannot get enough of it" - hence the motto of the slaughterhouse is to supply quality meat and meat products to its esteemed customers. Their products include beef ossobucco, beef sausages, beef sirloin steak, beef strip loin, ox tail, T-bone steak, stir fries, Lomidat beef topside among other products. All products are derived from animals originating from the arid and semi-arid lands (ASALs) of Turkana and its environs.

There are also a thriving basketry and cottage industries where locals make necklaces, beads and bungles from locally available materials which they sell.

A number of accommodation facilities are also found in the project area: from lodges to camps and camp sites. These facilities have a wide range of on-site facilities such as restaurants, bars, indoor parking and health club with indoor swimming, pool-table and gymnasium. Most of these facilities offer self-contained double and single rooms and tented facilities that have running water, electricity and some provide Wi-Fi. Ample security is provided in these facilities.

4.1.6 Cultural Heritage

Turkana County is well known for its rich archaeological and paleontological record that stretches back to the Cretaceous period. Although not evidenced in the project area the Lake Turkana basin has been an active arena for biological, cultural and human behavioural research mainly due to existence of fossils in the area such as that of the Turkana boy a nearly complete skeleton of a hominid classified as either Homo erectus or Homo ergaster who died in the early Pleistocene period (NMK 2012).

There exist immovable heritage sites within the project area. Such sites include shrines such as Nakinaeakir in Nanaam, where members of the public are not allowed to visit the site and only the elders are allowed by the community prophet called Emurwan who is in charge of the shrine. When the elders visit the site they are supposed to perform rituals, sacrifices, and traditional cultural prayers. In addition, when the community is faced with calamities, the elders visit the place to petition the gods. There are also few fossil finds found in areas of Mogila hills pointing to possible paleontological sites (NMK 2014). In addition, artefacts such as lithics, pottery and flakes were also found in the project area.

Although gravesites in the area are also revered places, there is no set aside gravesite for the community members but people bury their dead in the homesteads. The area has also a peace and cultural site in Kakuma town which helps to promote cultural integration, empowerment and peace education, improve communication and dialogue, alleviate tensions and foster reconciliation among communities both in the communities in the refugee camp and the local community.

4.1.7 Education

According to the Kenya National Bureau of Statistics (2019), Turkana West Sub-ounty has 10,532 Pre-primary pupils, 40,799 primary pupils, 14,647 secondary school students, 2,419 students in vocational training, 1,179 students in Universities and about 312 people in adult basic education.
The literacy levels in the Sub County are below average which he largely attributes to the nomadic pastoralist nature of the community. Over-reliance on pastoralism has promoted the constant migration of people to regions as far as Uganda and South Sudan in search of water and pasture for their livestock therefore making children to drop out of school.

4.1.8 Infrastructure

Transport network in Turkana County is made up of both air and road as expounded below. The total road network in Turkana County is approximately 5,496.2 km most of which is earth, murram and gravel surface. Generally, the county road network is poorly developed. According to the Turkana County Development Profile 2013, the county transport sub-sector is faced with a number of challenges including seasonal rivers that cut through roads and poor soils that increase the cost of road construction and maintenance. In Turkana West project area, the only tarmacked road is from Lokichoggio through Kakuma to Lodwar while the roads leading to Nanaam, Lopur, Lokangae, Lorus, Kapalsuk, Kapatadie and Nasinyono are always rendered impassable especially during rainy seasons and during dry season the roads become very dusty. The road to Lorus, Kapalsuk and Kapatadie are rocky hence vehicles are driven at a low speed.
Most local transit this area by foot. The locals also use donkeys to transport luggage especially during migration in search of water and pasture. There are few public service vehicles (taxis) that ply Kakuma Lokichoggio route and Kakuma, Lopur, Namon and Lokangae route.
In terms of air transport, there is an airport in Lokichoggio and an air strip in Kakuma.

Communication facilities in the project area consist of post office, base transmission stations and courier services. These facilities are only found in Kakuma and Lokichoggio towns in the project area. The mobile phone service providers are Safaricom, Airtel and Telkom and these serve Lokichoggio and Kakuma town and areas bordering them. The rest of the project area has poor mobile phone network. The courier service providers in the area are G4S and Wells Fargo. The fact that mobile telephone coverage is limited to major urban centres/towns has greatly affected communications, investments and security as people are forced to move to the urban centres to communicate.

4.1.9 Refugee Camp Infrastructure

This section lists existing refugee camp infrastructure within Kakuma and the new Kalobeyei refugee camp.

Table 4.1-5: Refugee Camp Infrastructure

Infrastructure	Kakuma	Kalobeyei
Health	7 health facilities	Clinic and hospital
Water	14 operational boreholes 22 elevated water tanks	3 boreholes 25km pipeline 100,000 litre capacity elevated water tanks
Education	21 primary school 5 secondary school	primary schools

5.0 ANALYSIS OF ALTERNATIVES

An assessment of Project alternatives was carried out to fulfill the requirements of the ToR and EIA Guidelines. The alternatives were selected through professional experience and consultation with Project stakeholders, including Regulatory Agencies and the public. The screening criteria considered potential environmental effects, social acceptability, engineering feasibility and cost.

This section includes but is not limited to the acceptable alternatives carried forward from the ToR. Alternatives further identified during the development of the Project are also assessed.

This chapter provides an overview of the alternatives assessment process, the alternatives assessed, and the set of preferred alternatives for the proposed project.

The alternatives assessment considers two categories of alternatives:

- ✓ **Alternatives to the Project**, which are the functionally different ways to meet the Project need and achieve the Project purpose.
- ✓ **Alternative Means**, which are the various technically and economically feasible ways the Project can be implemented.

5.1 Alternatives to the project

The assessment of alternatives to the Project compares the likely benefits of proceeding with the Project with the "Do Nothing"/ The No Action Alternative where the decision would be made not to proceed with the Project.

5.1.1 Proceeding with the project

Proceeding with the Project entails construction of the Decentralized Treatment Facility (DTF) by implementing the Project components described in chapter 2 of this report. Construction process and overall conduct of the Project would use proven and effective technical methods of construction in Kenya.

Proceeding with the Project would have both positive and negative effects on the biophysical and socio-economic environment. Most biophysical effects would be restricted to the Project Site, while socio-economic effects would likely extend to a regional level. The design of the Project and the assessment of alternatives are focused on ensuring that all significant adverse effects of the Project can be reduced or avoided entirely through good design, mitigation measures or compensation where applicable.

5.1.1.1 Advantages of the project

The Project will have substantial benefits on the socio-economic environment at a local, county and national level.

Positive effects of the Project would occur in the community-at-large and on the closest communities to the project area.

These positive effects would be evident on individuals, including: job creation, increased household

and individual incomes, improved purchasing power, and improved health condition. The Project would be expected to make a substantial contribution to the development of new business opportunities and economic growth in the project area, through the development of business activities as a result of Project purchases of goods and services during all phases of the Project. Finally, the Project would encourage a level of general optimism and growth in communities facing significant development challenges.

The Project's purchase of solar system will result in increased revenue for solar retailers in the county and if there will be electricity purchase this would result in increased revenue for KPLC during the Project's phases. The Project would also help collect valuable environmental data on the Project Site and surrounding area through its monitoring programs. Monitoring before, during and after the Project development would contribute to a more focused understanding of the environment and identify areas where protection or enhancement is needed.

5.1.1.2 Disadvantages of the project

A major purpose of the environmental assessment is to ensure that the Project can proceed without the creation of significant adverse effects. The preliminary screening of the potential Project effects identified some adverse effects on the biophysical environment. These included loss of insect habitat, the loss of few vegetation cover, nuisance effects such as increased noise and vibration from construction machineries, soil erosion and soil compacting in the Project footprint.
The consequences of these effects would be considerably reduced once mitigation measures are applied.

A detailed description of the potential effects of the Project on both biophysical and socio-economic environment is provided in this EIA report. Appropriate mitigation measures to address these potential effects are identified in this same report as well.

5.1.2 "Do Nothing" Alternative/ The No Action Alternative

The "do nothing" alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed DTF project. This alternative would result in no environmental impacts on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. The following implications will occur if the "no- go" alternative is implemented:

- No benefits will be derived from the implementation of an additional land-use;
- There won't be waste treatment plant in the area which will increase the outbreak of water borne diseases and other health related problems;
- The "no go" alternative will not contribute to and assist the government in achieving its 2030 vission mainly in health sector;
- Electric lighting will not be enhanced for security improvement in the study area (i.e. no additional renewable energy generation will occur on the proposed site) and the local economy will not be diversified;
- Local communities will continue their dependence on agriculture production and government subsidies. The local municipality's vulnerability to economic downturns will increase because of limited access to capital;

- There will be no opportunity for additional employment in an area where job creation is identified as a key priority. Approximately 500+ (Both direct and indirect) employment opportunities will be created during the construction period and about 200 (Both direct and indirect) employment opportunities will be created during the operation period of the proposed project;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realized; and
- The local economic benefits associated with the proposed project will not be realized, and socio-economic contribution payments into the local community trust will not be realized.

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- There will be no development of faecal sludge treatment facility at the proposed location;
- Only the agricultural/Pastoral land use will remain;
- No vegetation will be removed or disturbed during the development of these facilities;
- No change to the current landscape will occur;
- No heritage artefacts will be impacted on; and
- No additional water use during the construction phase and during the operational phase.

5.1.3 Analysis of alternatives 1 and 2

The table below gives a comparison of the two alternatives considered above.

Table 5.1-1: Summary of Analysis of Alternatives

Alternative	**1 (Proceeding with the Project)**	**2 (No Action)**
Cost	Expensive (-)	Continue being fallow (-)
Land value	Increase (+)	None (-)
Use of natural resources	Minimal (+)	Minimal (+)
Vegetation clearing	Needed (-)	None (+)
Creation of DTF	Substantial (+)	None (-)
Creation of employment	Substantial(+)	None (-)
Improvement of hygiene	Substantial (+)	None (-)
Impact Analysis	**(+) =5; (-) = 2**	**(+) =2 ; (-) = 5**

Key: + = positive impacts; - = negative impacts

5.1.4 Selection of Preferred alternative

As noted, the selection of the preferred alternative involves the choice between proceeding or not proceeding with the Project. A decision not to proceed with the Project is identified as the "Do Nothing" alternative.

In the "Do Nothing" alternative none of the potential effects - positive or negative - of the Project would occur. No increase in economic activity would occur. The existing conditions of the biophysical and socio-economic environment would remain unchanged. Any adverse effects of the Project on the existing environment would be avoided. However, the infrastructural development will not be realized and the resulting socio-economic benefits to the local community, entire County would not occur.

Specifically, the loss of socio-economic benefits arising from the Do Nothing alternative would result in a loss of employment, business and general economic activity for the locals and neighbouring communities. The scope of these benefits is identified in the socio-economic assessment in this report.

Proceeding with the Project is not expected to have significant negative effects on the biophysical and socio-economic environment due to the implementation of appropriate mitigation measures. The potential positive socio-economic effects of the Project make it an attractive opportunity for County government, the neighbouring community, and partners.

Based on the foregoing analysis, the preferred alternative is "Proceeding with the Project." Subsequent sections of this chapter identify and evaluate alternative means of carrying out the Project so that the positive effects would be enhanced and negative effects reduced or eliminated entirely.

5.1.5 The proposed development with modifications

If there are issues concerning the project that may be enhanced, changed or modified to increase the acceptability of the project, then these issues should be considered. At this time based on consultation with residents of the area, it appears that there are several issues that once resolve satisfactorily whether through modification or compromise would further increase support for the development. These include but are not limited to:

- The proponent should follow requisite laws when constructing
- Foul odours should be controlled

All these issues are easily resolvable through either modification or compromise and we do not foresee these issues resulting in disapproval of the development by interested persons and regulatory agencies. The proponent has resolved to work with the neighbours and residents to design, construct and operate a quality facility that will be the pride of all involved or benefiting in its operation. This alternative retains the same positive benefits as with maintaining the proposed development option.

5.1.6 Land- use Alternatives

5.1.7 Agriculture

At present the proposed site is zoned for agricultural land-use, and is mainly used for livestock grazing. Agricultural potential is uniformly low across the preferred and alternative sites and the choice of placement of the proposed facility on the farm therefore has minimal influence on the significance of

agricultural impacts. Generally there are no agriculturally sensitive areas that were identified within the area under consideration. Hence, agricultural land use is not a preferred alternative.

5.1.8 Renewable Energy Alternatives

Possible reasonable and feasible land-use alternatives for the proposed properties include Biomass, Hydro Energy and Wind Energy. However, based on the preliminary investigations undertaken, there is no other land-use that will help in ameliorating the current sewage condition in kakuma camp.

Biomass Energy

The proposed project site lacks any abundant or sustainable supply of biomass. According to the kenya Renewable Energy Resource Database, the project site is identified as having no cumulative biomass energy potential, therefore, the implementation of a Biomass Facility at the proposed site is therefore considered to be an unfeasible and unreasonable alternative to the implementation of the proposed project.

If biomass energy be selected for the site, significant negative socio-economic implications could be created as it would not be feasible in terms of operations. A biomass facility is also likely to result in unnecessary pollution due to waste generation (especially waste water generated during the operational phase of the biomass facility), traffic impacts and air emissions as a result of operations. A biomass facility is likely to create traffic impacts as the material required for the plant (i.e. biomass) would need to be transported to the site on a regular basis during the relevant seasons.

Hydro Energy

The proposed project site lacks any large inland water bodies, which precludes the possibility of renewable energy from small/large scale hydro generation. In terms of micro hydro power potential, the site lack permanent river, the implementation of a Hydro Energy Facility at the proposed site is therefore also considered to be an unfeasible and unreasonable alternative to the implementation of the proposed project.

Wind Energy

Wind energy is considered to be the most feasible alternative in terms of renewable energy when compared to biomass and hydro energy; however the site specific requirements of wind energy facilities make it a less feasible alternative when compared to the proposed project. Wind energy facilities require that wind turbines are spaced a significant distance from one another. Due to the fact that there is only a certain amount of land available for development, the implementation of a wind energy facility would not make optimum use of that land which is available.

Solar Energy

The proposed site has highest Global Horizontal Irradiation (GHI), relevant to Photovoltaic (PV) installations and Direct Normal Irradiance (DNI), relevant to Concentrated Photovoltaic (CPV) and tracking PV installations. Therefore, this section of Kenya is deemed the most suitable for the construction and operation of solar energy facilities. Despite this alternative being the suitable there is great need for waste treatment plant in this region bearing in mind the poor sewerage facilities in this part of the county. Therefore, this means that this is not the best alternative so far.

5.1.9 Alternative Means of carrying out the project

The EIA Guidelines require the environmental assessment to identify and describe alternative means of carrying out the Project, and assess the environmental effects of any such means.

Environmental assessment context alternative means are referred to as "alternative methods". Alternative means or methods can include consideration of alternative technologies, alternative methods of applying specific technologies, alternative sites for a proposed undertaking, alternative design methods, and alternative methods of operating any facilities associated with a proposed undertaking.

It is neither practicable nor necessary to evaluate alternative means for every aspect of the Project. Accordingly, the identification, assessment and selection of alternative means focused on alternative means for those aspects of the Project that have the greatest potential for adverse environmental effects. These alternatives are as follows:

5.1.1 Site Alternatives

On a site specific level, the site was deemed suitable due to all the site selection factors (such as land availability, site accessibility, topography, current land use and landowner willingness) being favourable.

Furthermore, from an impact and risk assessment perspective, the implementation of the proposed project on the proposed site will result in fewer risks in comparison to its implementation at alternate sites within Turkana West Sub-county. The following risks and impacts will be likely in this case:

- There is no guarantee that suitable land will be available for development of the proposed project. Site geotechnical conditions, topography, fire potential and ready access to a site might not be suitable, thus resulting in negative environmental implications and reduced financial viability.
- There is no guarantee that the current land use of alternative sites will be flexible in terms of development potential, for example the agricultural potential for alternative sites might be higher and of greater significance.
- There is no guarantee of the willingness of other community landowners to allow the implementation of the proposed project on their land and if the landowners strongly object, then the project will not be feasible.

5.1.2 Alternative Locations of the Development Footprint

The proximity of the site location (preferred) for the waste treatment project to the Kakuma Camp was the main consideration in terms of technical and economic feasibility of where the preferred site is.

The determination of the development footprint within the site was determined through a rapid desktop screening assessment of the site and consultation with the relevant landowner identifying possible areas that should not be proposed for the development (i.e. no-go areas). These have already been excluded from the proposed development footprint. During the EIA study specialists identified sensitive features within the development footprint. As a result, the final siting of the proposed project within the development footprint was undertaken during the EIA study phase. Any sensitive features identified will be avoided by the proposed layout.

5.1.3 Technology Alternatives

5.1.3.1 Oxidation Ponds

This technique relies on micro-organisms and algae to breakdown organic nutrients and inorganic nutrients respectively. The system is extremely robust as it can accept a range of sewage types and sporadic quantities, although it is only appropriate for small sewage inflows. In some cases, however, it does not meet the standards required for effluent discharge but typically oxidation ponds DO NOT discharge into any water courses. The treatment capacity of the existing oxidation ponds will not manage with the anticipated increase in sewage production due to the expansion of facilities at Kakuma Camp.

Therefore a new pond is needed. An evaporation pond or irrigation option is being investigated for effluent disposal.

5.1.4 Layout Alternatives

The findings of the specialist studies will be used to inform the layout within the development footprint of the proposed project. The specialist studies that were conducted during the field study identified that there were no environmental sensitivities on the proposed site that that need to be avoided during the determination of the proposed layout of the proposed project.

5.1.5 Alternative to Construction Materials and Technology

There is a wide range of construction and furnishing materials which can be sourced locally and internationally. In this construction, certified raw materials/equipments and modern technology will be used. Also, electrical appliances that save energy will be given first priority. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

Beautiful and durable reinforced concrete roofs with tiles finishing will be used because they are good in heat insulation as compared to the iron sheet roofs, and afford more security.

Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise. However, this construction methods and technologies to be used will require very little timber.

5.1.6 Alternative Schedule

This option entails carrying out the proposal at a later time thereby offsetting its impacts to that time. Only benefit is if there is an improvement in baseline conditions and technologies that may be involved with the proposal. However these are not guaranteed and it may only lead 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.

5.1.7 Concluding Statement of Preferred Alternatives

Based on Section 5.0 above, the following alternatives were be taken forward:

- **No-go Alternative:**
  - The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed project. This alternative would result in no environmental impacts on the site or surrounding local area, as a result of the facility. It will provide a baseline against which other alternatives will be compared and considered during the EIA Phase.

- **Land Use Alternative:**
  - No other land-use were deemed to be appropriate for the site
- **Preferred Site and Development Footprint within the site:**
  - The preferred site for the project is a communial land of about 20ha
  - The preferred development footprinting within the site was determined based on a rapid desktop screening assessment of the site and consultation with the relevant landowner identifying possible areas that should not be proposed for the development (i.e. no-go areas). These were already excluded from the proposed development footprint.
- **Technology Alternatives:**
  - Applicable and relevant technology options are explained in section 2 of this report.

- **Layout Alternatives:**
  - Layout alternatives for the project will be determined following the input from the various specialists. The studies will aim to identify various environmental sensitivities within the development footprint of the site that should be avoided, which will be taken into account during the determination of the proposed layout of the proposed project.
  - The use of the existing Service Road or the unnamed farm road will also be discussed during the ESIA Phase.

5.1.8 Recommended alternative

No other location was able to offer the comprehensive package as indicated above. As a result, no location that was more suitable or amenable than the present site that was identified. The recommended alternative is the "Proposed Alternative" because it recognizes the viability and need for the proposed development, is designed to address environmental health issues and concerns, meets or exceeds all local regulatory requirements and supports communication and close relations during all stages of the development between the proponent and the surrounding residents. The area land owners have full support for the project also.

6.0 STAKEHOLDER ENGAGEMENT AND PUBLIC PARTICIPATION

6.1.1 Introduction

Stakeholder engagement can be described as an organization's efforts to understand and involve stakeholders and their concerns in its activities and decision-making processes. Stakeholders are defined here as any group or individual who can affect, or can be affected by, an organization or its activities, including employees, community groups, environmental non-profit organizations, customers and others. The overall purpose of stakeholder engagement in this project is to drive strategic direction and operational excellence for the proponent. Done correctly, engaging stakeholders can result in learning, innovation, and enhanced performance that will not only benefit the proponent, but also its stakeholders and society as a whole.

In addition to serving as a key tool to support a facility's sustainability reporting efforts, stakeholder engagement is a foundation that supports a facility's broader sustainability efforts to set strategic goals,

implement action plans, and assess its performance over time.

Due to the current COVID 19 pandemic and the resulting directives from the Ministry of Health (MOH) to curb the spread of the novel coronavirus including recommendation on hygiene practices and social distancing and restrictions on public gatherings. The public consultations for this proposed construction of DTF in Kakuma were conducted in a manner to ensure the various directives by MOH were observed and the health and safety of the team and public was safeguarded. Water and soap for hand washing and face masks were provided to participants and social distancing was also ensured in the seating arrangements. Additionally, community members were met is small groups rather than all together in the usual public baraza.

Public participation is essentially concerned with involving, informing and consulting the public in planning, management and other decision-making activities. Public participation tries to ensure that due consideration is given to public values, concerns and preferences when decisions are made. It encompasses the public actively sharing in the decisions that government and other agencies make in their search for solutions to issues of public interest.

The main objectives of the consultation were to:

- Inform the public and key stakeholders about the proposed project and activities that will be undertaken;
- Seek views, concerns and opinions of people in the area concerning the project;
- Incorporate the views, concerns and proposals of community members, and other stakeholders on their expectations from the project activities;
- Establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed; and
- Obtain socioeconomic information about the project area.

6.1.2 Methodology

Public participation was mainly achieved through direct interviews, observations and questionnaire administration. Traditionally the tool used to collect information is the administration of open ended questionnaires where the respondent is free to comment on issues at own thinking. After individuals complete the questionnaires individually and the expert finds some divergent and conflicting responses, usually Focus Group Discussions are held only on the conflicting ideas for the respondents to discuss the contentious issues and come to an agreement by themselves after informing each other.

Stakeholders were identified and Key Informant interviews carried out. One public consultation meetings were carried out in Nayanae-Ngitira village to gather information on concerns regarding the proposed project. Questionnaires were then administered. For the study reported here interviews were conducted individually on a pre-set open ended questionnaire to collect the views of various stakeholders. Respondents were selected among the communities surrounding the proposed project site. All the stakeholders accepted to respond.

The following is a detailed discussion of public consultation methodology used by the EIA team:

6.1.3 Key Informant Interviews

Key Informant interviews were used to get responses from key stakeholders in the project area. Their comments were sought through engaging them in discussions about the proposed project and associated activities.

Plate 5: EIA team having a brief with Mr. Patrick at GIZ office, Kakuma and Kakuma mission hospital before consultation

6.1.4 Questionnaire administration

Questionnaires were uniformly distributed to the sampled residents. The neighbours were informed of the proposed project and requested for their views concerning the project. They were used to capture their views in terms of the positive and negative impacts that they anticipate the project will cause and the mitigation measures.

Plate 6: Engagement session with the community members

6.1.5 Questionnaire analysis, Issues and concerns raised

Below is a summary of the analysis of questionnaires, expectations, concerns and the mitigation measures that were discussed during the key informant interviews, stakeholders consultations/public meeting.

In general a 100% of all the respondents supported the proposed DTF by Turkana County government for sewage treatment.

Question 3 &5:
All of the respondents did not find any sensitive sites of cultural, scientific or of their interests that would be interfered with permanently or temporarily by the implementation of the proposed project.

Question 4 & 7a:
100% or all the respondents said that there will be positive aspects during implementation of the proposed project. The respondents highlighted the following as the positive aspects of the proposed project;

- The project will encourage investors to develop high-rise buildings in the proposed areas as the management of sanitation waste will be catered for.
- The new sewer system will help accommodate more people in Kakuma town as well as commercial and residential buildings that are not currently connected to the already existing sewer system.
- Some respondents were of the view that they will be able to save a lot of money that they use to pay for services rendered by exhauster companies that are always very expensive.
- The respondents acknowledged that the construction of the proposed DTF will ease the congestion currently experienced at the existing sewer plant which is very inadequate.
- The respondents said that the proposed project will create job opportunities for the locals
- The respondents noted that the proposed DTF will enhance and improve the hygiene of Kakuma camp as well as that of Kakuma town in general.

- The respondents noted that the DTF will be able to curb the use of pit latrines in some low income areas hence promoting hygienic practices.
- The new DTF will ease the treatment process that is currently burdening the existing sewer system.
- Cleanliness in plots currently using pit latrines will be greatly enhanced.
- The proposed project will reduce land pollution that is usually as a result of leakages in the existing sewer system as well as sewer line bursts experienced in some parts of the camp
- The respondents noted that the facility will be able to cater for the increasing number of Kakuma Town residents since the town's population is rising steadily.

Question 7a:

The respondents highlighted the following as some of the negative impacts of the proposed project implementation;

- Foul odors will affect neighbors adjacent to the proposed facility as well as the areas' residents.
- The site will become a breeding ground for mosquitoes hence increasing the cases of illnesses in the area.
- Improper treatment of waste water in the sewer plant may cause diseases.
- Accumulation of waste substances in the facility may affect the adjacent lands making them unsuitable for agricultural practices.
- Leakages of untreated water from the sewer plant may find its way into rivers hence leading to water pollution.
- Air pollution may occur.

Question 7c &d:

The respondents gave the following as issues they would like to be addressed concerning the proposed project;

- The proponent should ensure proper maintenance of the facility to avoid any leakages and run-offs.
- The proponent should ensure proper maintenance of sewer pipes to avoid bursts that have been experienced previously in some parts of Kakuma town.
- The DTF should be operated well to reduce bad odor associated with sewer facilities.
- The facility should be properly fenced to reduce chances of occurrence of any accidents around the place, for example, cases of drowning of children in the the Sludge Drying Bed (SDB).

Table 6.1-1:Summary of Stakeholders' Expectations, Concerns and Mitigation Measures

Stakeholders	Expectations (Positive Impacts)	Concerns (Adverse Impacts)	Proposed Mitigation Measures and Recommendations by the Stakeholders
Alfred Kapoko Kimat	• Creation of employment • Improvement of security in the area	• Was concerned that the project may not feasible at the proposed site without having in place appropriate environmental measures to avert anticipated serious negative impacts such as odor from the facility	• Consider alternative if any; • *Issues raised have been addressed adequately by the proposed EMP.*
Cosmas Nakayaa E(Area Chief)		• Was concerned that air pollution by dust during the construction phase will be a major issue to residents and neighbours.	• Sprinkle water to reduce dust accumulation in the air
Osa Opanda		• Was concerned that the proposed project may be a drowning place for livestock and children	• The site should be fenced • *Issues raised have been addressed in the proposed EMP*
Maiyo Elphas	• Economic impacts of the project will the fruitful in both phases	• Noise and air pollution/damage of existing road (currently not in good condition to accommodate building machinery). • Air pollution • No objection to the project.	• *Issues raised have been addressed adequately by the proposed EMP*

Stakeholders	Expectations (Positive Impacts)	Concerns (Adverse Impacts)	Proposed Mitigation Measures and Recommendations by the Stakeholders
Samwel Kamau	• It will boost the economy of the whole county not only proposed project area • Job opportunities for our boys and girls	• The site will become a breeding ground for mosquitoes hence increasing the cases of illnesses in the area;	• The proponent to develop proper mechanism for controlling mosquito breeding
Kapochori Alokitode Lopotio	• The project is good for the county	• Foul odors will affect neighbors adjacent to the proposed facility as well as the areas' residents.	• *Issues raised have been addressed adequately by the proposed EMP.*
Nancy Najula		• Destruction of vegetation at the propose site during clearance of the land for construction	• Environmental restoration should be done by the proponent at the end of construction phase • *Issues raised have been addressed adequately by the proposed EMP*
Haggai Nangori		• Air and dust pollution which may cause respiratory ailments to local residents. • Ecological system will be disrupted during construction phase hence displacement of flora and fauna in the project site is expected.	• *Issues raised have been addressed adequately by the EMP.*

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7.0 ENVIRONMENTAL IMPACT IDENTIFICATION AND MITIGATION

An environmental impact is defined as any change to an existing condition of the environment. To systematically identify the impacts associated with the proposed development, an impact matrix was made which arrayed the main project activities against the relevant environmental factors and mitigation measures.

7.1 CONSTRUCTION PHASE IMPACTS

The proposed project is anticipated to generate the following impacts on the biophysical environment. It is expected that the significance of these impacts will reduce with the proposed mitigation measures as outlined.

7.1.1 Geology and Physiographic Impacts

The geology and physiography of the project area will be affected by activities that will include; mobilization of equipment, earthworks and civil related works and erection during facility construction. The risk of subsidence due to passage of heavy vehicles is negligible due to the geology, but localized compaction of surface soils may occur in some places due to vehicular movement. There might be scarring and displacement of sediments from quarries and borrow pits while extracting materials for civil work activities.

7.1.1.1 **Mitigation measures**

The proposed project site is localized in coverage thus no major alterations to geomorphology, geology and physiography. However, to prevent the localized impacts:

- The proponent should strive to confine heavy equipment and vehicular movement to existing road access
- Defined vehicular access routes will be in place onsite and within the project area,
- In case a borrow pit is established to acquire materials for civil work then the pit/quarry should be reclaimed afterwards,
- The construction activities should not alter or in any way interfere with any natural or manmade watercourses.

Potential geological and physiographic impacts during construction are generally low

7.1.2 Soil Erosion and Pollution

There is a possibility of soil erosion and pollution to occur during construction phase of the project. There will be vegetation clearance which would lead to soil erosion when bare-land is exposed to natural agents such as wind and surface run-off. Removal of top soil after site clearance by agents such as wind, rain water, and surface run off is a likely action to occur. Similarly, accidental oil spills from construction equipment and discharge of wastewater from equipment washing to the environment might accelerate soil pollution to some extent.

Oil spills may infiltrate into soil causing soil pollution and later water/marine pollution. However, this impact is localized around machinery maintenance areas or garage and areas of concentrated activities.

7.1.2.1 **Mitigation measures**

- Minimal vegetation clearance on the site and where necessary stumps left intact to bind soil together,
- A safety data sheet should be maintained for all potentially hazardous materials, as well as supporting documentation for the transport, use and disposal of such materials used in construction,

- Used motor oil and filters from vehicles and generators should be removed from the area for proper disposal,
- Used motor oil should not be used for dust suppression on access roads,
- Disposal of chemicals and motor oil should be documented, including quantities involved and disposal locations,
- A plan should be prepared to prevent and contain accidental oil discharges or fuel spillages, and
- A licensed waste oil handler should collect used oil from the site for safe disposal.
- Re-vegetate disturbed areas once construction and demolition works are completed; during construction and decommissioning phases respectively;
- Carrying out site audits and surveys to identify any contaminated areas and remediate them accordingly

Severity of impacts are localized with low intensity and expected to be low and short-lived.

7.1.3 Noise and vibration

Construction techniques will involve:

- Driving of piles into the ground extending to the basalt formation. Methods may include driven, percussive or auger installed piling techniques.
- Noise generated through excavation and tipping of fill material
- Noise generated from power generator
- Noise generated through the operation of heavy construction plant

Impact receptors will be:

- Construction workers within the site
- Personnel on adjacent property closest to the noise source;

Adjacent properties are located a significant distance from the construction site and this will provide a good level of attenuation from the noise sources. These properties are of largely an industrial nature and may therefore be considered less sensitive, especially where heavy plant or noisy processes are in operation.

All construction activities will be of a temporary nature. It is anticipated that the piling will be undertaken over 1 to 8 days period.

7.1.3.1 **Mitigation Measures**

It is not possible to avoid the construction techniques above, however the following mitigation measures are proposed to reduce the impacts.

- Construction workers will be provided with appropriate ear protection
- Use of vibratory hand operated equipment will be minimized
- Noisy operations will be restricted to daytime operation
- Power generator and other equipment should be state-of-the-art and equipped with silencers/mufflers where the option is available
- Effect a noise regulation policy for all operations in accordance with the Environmental management and Coordination (Noise and Excessive vibration pollution) Regulation.
- Construction plant will be maintained in good running order; all vehicles should comply with the requirements of Road Traffic Act.

The potential noise and vibration impacts during construction are therefore assessed as low.

7.1.4 Air quality

The main issues with regard to air quality during construction are:

- Dust generated during the earthworks, mud on roads

- Exhaust gases from the operation of heavy plant can be a potent source of NOx, CO, PM and other pollutants

Impact receptors will be:

- Construction workers within the site
- Personnel on adjacent properties closest to the noise source.

Adjacent properties are located a significant distance from the construction site and this will provide a significant buffer to the proliferation of dust nuisance. In addition the prevailing easterly wind will tend to also reduce the impact, however it is noted that when the wind turns from the south or the west this could exacerbate any nuisance.

7.1.4.1 Mitigation Measures

The following mitigation measures are proposed to reduce the air quality impacts.

- For potentially dusty earth works operations, construction workers to be enclosed within ventilated cabs or provided with facemasks for potentially dusty earth works operations.
- Where appropriate water damping to be used to control dust. Particular attention to be paid when the wind is from the south or west.
- Limit traffic speed and restrict movement of vehicles as to minimize dust generation
- Construction plant will be maintained in good running order; all vehicles should comply with the requirements of Road Traffic Act and its subsequent regulations for emission control.

The potential air quality impacts during construction are therefore assessed as low.

7.1.5 Water Usage

It is assumed that all potable/fresh water requirements during the construction stage will be met through borehole at the proposed site. Potable and fresh water will be provided for the welfare of construction workers, for washdown of equipment and for damping down of earthworks to reduce dust. These requirements will be commensurate with efficient construction practices.

7.1.5.1 Mitigation Measures

- Install and properly manage site sanitation facilities
- Ensure that all taps are well fit and leaking
- Ensure that portable water is not used in ablution or sanitary facilities.

Therefore potential potable water usage impacts during construction are therefore assessed as low.

7.1.6 Energy Usage

It is assumed that all electrical requirements during the construction stage will be met through on-site generators or a temporary Kenya Power connection to feed a site office. It is in the contractor‘s interests to ensure that fuel consumption is reduced to a minimum and commensurate with efficient construction practices.

7.1.6.1 Mitigation Measures

- Ensure that all lighting system are switched off when not in use
- Install energy saving bulbs
- Design the office infrastructure to maximize the use of natural light.
- Install metering system for monitoring

Therefore, potential energy usage impacts during construction are therefore assessed as low.

7.1.7 Road Traffic

Road traffic will be generated to and from site during the construction stage due to;

- Transportation of construction workers using the existing road network.
- Transportation of imported construction materials using the existing road network; i.e. imported mound fill, ready mixed concrete, reinforcement, road materials, other building materials.
- Transportation of exported fill to an agreed reclamation site or other licensed dumping ground.

Impact receptors will be:

- Users of the entrance roads and the connecting public access.

It is estimated that a peak of approximately 20 Heavy Goods Vehicle (HGV) movements (each way, to and from site) per day will be necessary during the earthworks activities

The likely increase in HGV movements during peak construction (8 to 12 weeks) will therefore amount to minimal compared to the existing situation. This impact is therefore assessed as negligible and it is proposed that a full Traffic Impact Assessment is not necessary.

7.1.7.1 **Mitigation Measures**

In order to minimize the impact of additional road traffic during construction stage the following measures will be adopted:

- Deliveries will be made to site outside of the periods of high congestion on the public road system (i.e. early morning, late afternoon).
- Materials haulage companies to use competent drivers and ensure that shift patterns do not result in excessive working hours resulting in compromised road safety
- All haulage vehicles shall be maintained in good running order and should comply with the requirements of Road Traffic Act.
- Should the surface materials at site generated by preliminary earthworks and piling be of suitable quality these materials shall be deployed and the volume of imported materials diminished.

Potential road traffic impacts during construction are therefore assessed as low.

7.1.8 Impacts on Terrestrial Biodiversity

Construction activities at the project site will require stripping of top soils and clearance of few trees, shrubs and vegetation where the facilities will be located. Floral species that will be affected mainly include Acacia spp. And the invasive Prosopis juliflora and Ekabonyo, Engoumo, Emaret.

These vegetation will be cut to pave way for new facilities. The project site has no rare or scarce plant species, the vegetation consists mainly grasses and common shrubs.

In addition, the Site lies largely on rocky grazing field with the surface material comprising 100% fill material with no landscaped features of any kind; it is therefore determined that, there is negligible impact to terrestrial biodiversity.

7.1.8.1 **Mitigation Measures**

- Plant more ornamental trees/flowers to stabilize stripped top soil.
- Clear vegetation only in construction areas and demarcate areas where no clearing will happen.
- Educate contractors on the importance of flora and fauna in the area, including the appropriate regulatory requirements to preserve fauna and flora
- Avoid/minimize paved surfaces on the site,

7.1.9 Water Quality

Removal of the vegetation can result in high suspended sediment concentrations from the runoff from the site, during construction phase. Fortunately, the majority of the earth works are stable areas to gently sloping areas and hence the storm water will be naturally drained in the area.

7.1.9.1 Mitigation:

- Earthworks activities shall be halted when rain conditions are such that excessive erosion and silt loaded run-off noticed.
- The construction programme will avoid excessive exposure of bare earth surfaces which may be more prone to erosion.
- If appropriate, settlement lagoons can be used to allow silts to be retained prior to discharge of run-off to the existing drainage channels or direct to water bodies;
- Care will be taken to avoid excessive mud being transferred by construction plant to the access roads and public highway. Where this is likely to become a nuisance it will be cleared by the Contractor.
- Consideration will be given to undertaking routine maintenance of plant and vehicles off-site in a properly equipped workshop
- All haulage vehicles shall be maintained in good running condition and should comply with the requirements of Road Traffic Act.
- Existing drainage channels to be cleared of silt / debris and trash screens installed if appropriate.
- Used oil interceptors shall be installed to trap any accidental leakages.
- All effluent shall be treated before discharge to any sewer line

7.1.10 Solid Waste

Construction activities will lead to solid waste generation mainly from Non-degradable and non-toxic materials: Such as Plastic and metal packaging materials, excess concrete from ready-mix deliveries, Metal off-cuts from trimming reinforcing bars and pipes to length. Whereas Degradable and non-toxic: shall be generated from food wastes, Papers, cardboard and timber packaging materials and this will lead to an increased load on the County waste authority.

All options will be considered in avoiding or minimizing transporting any unsuitable excavated materials from site, as this is undesirable from both an ecological and economic perspective.
In order to minimize the impacts due to the generation of solid wastes during construction stage the following measures will be adopted;

7.1.10.1 Mitigation Measures

- The contractor shall put in place a waste management plan aimed at minimizing the production of all wastes.
- Where possible measures will be put in place to recycle materials such as metal offcuts, some plastics and clean paper/cardboard utilizing existing specialist recycling firms in Kenya.
- A suitable location within site for placing excess concrete and washing down equipment will be agreed with no discernable impact.
- Non-recyclable materials will be segregated and stored in plastic bins, collected and disposed of through the municipal waste system.
- Provide disposal bins at designated areas at the project site to help in waste segregation to encourage recycling.

- Enforce regular collection and disposal of garbage by the project contractor through licensed NEMA waste handler
- Clean storm water drains to minimize clogging

Potential impacts due to the generation of solid wastes during construction are therefore was assessed as being Low.

Potential impacts due to the possible spread of unsuitable excavated materials will be assessed when the quantity and location is known. However, it is reasonable to assume that measures can be put in place to ensure that high impacts are avoided, with a resulting impact being either low or moderate.

7.1.11 Foul Smell

There shall be effluents from the civil works, workers and storm water drainage. It is envisaged that during construction stage, effluents that shall be discharged will be domestic effluent generated by the construction workers which will peak at an estimated 100 people per day. Essentially from toilets, showers and mess facilities.
No construction process related effluents will be generated.

Mitigation measures

- Firm measures will be enforced to ensure that construction workers do not foul areas surrounding the site.
- The sewerage will be collected and transported using a carrier licensed by County Government of Turkana and NEMA.

Potential impacts due to the generation of foul effluent during construction are therefore assessed to be Low.

7.1.12 Landscape and Visual Environment

Construction activities such as clearing of top soil and few shrubs, transportation of earth moving materials/equipment to the site and construction of the storage mounds will have insignificant impact on aesthetic values of the area.
An appropriate level of external lighting will be installed for operational and security purposes which is not considered to be significantly visually detrimental. Despite the facility posing no major visual impact consider the following mitigation measures will be appropriate.

7.1.12.1 Mitigation measures

- Consider suitable paint colour for large structures that can blend with the background minimize visual impact to adjacent areas.
- Ensure good housekeeping of the site in order to create a positive image in the eyes of the public.
- Consolidating facilities within the boundaries of the project area
- Designing fencing to follow the contour of natural and planned vegetation to maximum visual screening to the extent practicable
- Use of directional lighting to limit light spill (i.e. spread of light outwards from where it is needed into adjacent areas)

7.1.13 Occupational Accidents

Construction workers are prone to accidents resulting from construction activities. These accidents may have acute or chronic impacts depending on nature, severity and intensity. In this regard, construction and mobilization activities of the proposed DTF would result into accidental injuries and hazards which can negatively impact the workforce.

Because of the intensive engineering and construction activities including erection and fastening of roofing materials, metal grinding and cutting, concrete work, steel erection and welding among others, construction workers will be exposed to risks of accidents and injuries. At times, such injuries may be from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets and collapse of building sections among others.

7.1.13.1 Mitigation Measures

The proponent should provide and maintain a working environment in which employees are not exposed to hazards through:

- maintaining safe workplaces, plant and work systems;
- providing information, instruction and trainings;
- consulting with employee-elected health and safety representatives and/ or other employees about occupational health, safety and welfare;
- providing adequate personal protective clothing and equipment;
- ensuring all work procedures are undertaken without exposing workers to hazards;
- staff needs to be educated on preventing infection by thorough hand washing after work and before eating and also by ensuring all PPE are in good condition;
- adequate respiratory protection including properly fitted masks equipped with filters especially designed to capture dust and micro-organisms and covid-19 virus shall be provided;
- ensuring chemicals are stored in a designated enclosed area, and material safety data sheets (MSDS) that provide advice on storage, emergency and first aid of these chemicals are within easy reach;
- Install and operationalize effective Fire-fighting and Emergency Evacuation Plans;
- ensuring that there are basic first aid facilities for staff and clean up equipment for any spills that occur; and
- Training should be provided for all staff to ensure adequate knowledge of safe manual handling and correct use of equipment and vehicles by covering all safety procedures to ensure that general work safety exists on the project.

7.1.14 Employment opportunities

Construction of the DTF will have substantial labour benefits to the county. It is therefore concluded that the provision of employment opportunities during construction will therefore provide a positive socio-economic impact.

7.1.15 Impacts on Security

The presence of labourers and expensive construction equipment, machinery and materials in the sites could potentially pose a security risk at the project site. Furthermore, offenders may capitalize on the increased movement during construction and anonymity created by the construction activities to carry out criminal activities in the site and surrounding areas. The impacts on the area‘s security are considered to be of medium significance. Therefore, appropriate security measures should be provided at the site through fencing, security checks/screening of workers and their guests and 24 hours security watch by expert security men to prevent such criminal activities from happening at the site.

7.1.16 Income Generation among Suppliers

During construction phase, the proposed project plan to use locally available construction materials such as cement, iron sheets, steel bars, pipes, etc. from the local market. This demand therefore, will create market for local people in Turkana and/or elsewhere in the country engaged in supplying construction materials leading to significant positive economic benefits to suppliers in Turkana.

7.1.17 Increased STDs and HIV/AIDS Cases

The project is expected to employ or contract a significant number of staffs and casual labourers during construction and operation phases. Social interactions among staffs and with locals cannot be avoided. Considering the nature with which HIV/AIDS is contracted and spread, this number is significant to make a serious contribution to the pandemic. Also, presence of monetary strength will act as catalyst and thus enhance such social interactions between the project workers and the local people. The extent of this impact is localized with a medium intensity. It is likely that the impact might occur. The impact can be highly improved/eliminated with mitigation. Therefore, the impact is negative and of high significance.

7.1.18 Informal Business Growth

During construction period the informal sector will benefit from the operations. This will involve different local entrepreneurs such as local food vending operators who will be selling their products and services to be used on site. Such a move for instance, shall promote these local entrepreneurs in the local areas as most of the workers working on the proposed project site will be buying food from them.

7.1.19 Impact on surrounding social facilities

The impact on the surrounding social facilities and services will be detrimental. A study of the area suggests that the existing social facilities are not sufficient to sustain and accommodate the people who currently live in the area hence the pressure that will be placed on the resources. This is very significant and the proponent needs to make plans on how basic needs will be met by his work force. Such social facilities include water supply and healthcare facilities.

7.2 OPERATIONAL PHASE IMPACTS

7.2.1 Flooding

The construction of the facility could minimize the areas of natural detention of water and result in more peaked storm water runoff flows. The potential for this impact from the project on the storm water flow regime of the catchment involved was assessed.

The natural drainage on the site should be modified in the design in order to minimize flooding and protect the vertical flow constructed wetlands and Sludge Drying Bed. The flood plain investigation results indicated that the flood plains downstream would be reduced as a result of the reduction of the effective catchment area. The flood plain upstream of the area is noted to be affected by implementation. It can therefore be concluded that the implementation of the project with the drainage provisions considered will have a positive impact on the flood plain characteristics of the catchments involved, by reduction of the likely flood plain area.

7.2.1.1 Mitigation:

Site drainage system should be made to recommended standards and maintained

7.2.2 Employment creation

During this phase, an average of approximately 10 staff may be needed for the proper operation of the project. This represents an increase in the level of employment within the project area. This has the potential to be a positive impact.

7.2.2.1 Mitigation

Not required.

7.2.3 Solid Waste Generation and Disposal

The operation of the development has the potential of significantly increasing the solid waste at the site. There will be a need to remove the screenings and grit from the site on need basis. This material can be handled with the same care as municipal solid waste and should be carried to the County Government of Turkana (CGT) dumpsite for proper disposal. The volume of solid waste is anticipated to be medium; hence it must be well disposed.

7.2.3.1 Mitigation:

- Sludge drying beds should be incorporated in the design
- Provision of solid waste storage bins.
- Provision of adequately designed bins to prevent access by vermin.
- Monitor exhauster trucks so that they do not become overfilled and spill waste enroute to the site.
- Ensure that the solid waste generated is disposed of in an approved dumpsite/landfill or incinerated onsite.

7.2.4 Transportation/Traffic

The project is expected to increase the traffic along the access roads marginally, as there will be approximately 1 0r 2 septage trucks driving to the site each day.

7.2.4.1 Mitigation:

- Limit septage delivery to the site between the hours of 8 am and 5 pm. This will limit the noise nuisance to residents and possibly reduce the population exposed to potential accidents, as most persons would have already left their homes to go to work and schools.
- Add adequate and appropriate signs including speed limits along the access roads.

7.2.5 Septage Disposal

The proposed development will be a receptacle for septage disposal. This activity has the potential to have two negative impacts. The first being unscrupulous cesspool emptiers who carry septage from the source to the site. The other impact is on the operations of the system, in that it has the potential to impact the final effluent quality.

7.2.5.1 Mitigation:

- Institute and maintain a ticketing system for cesspool emptier, where upon successful disposal, the site operator would issue a receipt to the cesspool emptier.
- County Government and particularly NEMA, should put in place a system to monitor cesspool service providers and in addition, have a public educational campaign to educate and inform the public about the system.
- Ensure that septage is only accepted at the site when there is enough capacity for treatment.

7.2.6 Emergency Response

The operation of the proposed project will involve workers who may become ill or have accidents. In addition, disasters such as, floods and drowning are real possibilities.

7.2.6.1 Mitigation:

- Make prior arrangements with health care facilities such as a Health Centre in proximity.
- Design and implement an Emergency Response Plan (ERP).
- Coordinate with first aid organisations/agencies i.e. St. John's Ambulance, Red Cross to prepare for any eventuality.
- Display telephone numbers of emergency response departments for all people accessing the site to clearly see

7.2.7 Foul odours

Wastewater treatment facilities carry a risk of odour nuisance if proper buffers between the treatment units and existing populations are not provided. A buffer area should be provided on all boundaries. Additionally, the perimeter of the proposed site will be vegetated with trees and plants of varying heights thereby forming a windbreaker.

7.2.7.1 Mitigation:

- Monitor and ensure that influent sulphate levels are below 240 mg/l.
- Ensure that the system has adequate flow to reduce the potential of odour formation.
- Maintain the system regularly as per schedule

7.3 Environmental monitoring programme/waste management plan

7.3.1 Monitoring during site clearance and preparation of the proposed development

- Daily inspections to ensure that construction activities are not being conducted outside of regular working hours (e.g. 8 am – 5 pm). The project engineer / construction site supervisor should monitor the construction work hours. NEMA should conduct spot checks to ensure that the hours are being followed. It is not anticipated that this exercise will incur additional costs.
- Daily monitoring to ensure that the cleared areas and access roads are not creating a dust nuisance. The project engineer/construction site supervisor should monitor or nominate a named person to carry out this activity. NEMA should conduct spot checks to ensure that this requirement is followed. It is not anticipated that this exercise will incur additional costs.
- Undertake daily inspections of trucks carrying solid waste generated from site clearance activities to ensure that they are not overloaded as this will damage the public roads and onsite soil compaction as well as spillages.

7.3.2 Monitoring during the construction phase of the proposed development

Daily inspection of site construction activities to ensure that the proposed plans are followed and to ensure that site drainage is being constructed as planned. NEMA and the county administration can provide checks and balances. Person(s) appointed by the developer may perform this exercise.
No additional cost is anticipated for this exercise.

- Undertake monthly water quality monitoring to ensure that the construction works are not negatively impacting on the water quality in the nearby water bodies. The parameters that should be monitored are as indicated i.e. dissolved oxygen, nitrates, phosphates, turbidity and total Coliforms et al according to NEMA Water quality standards.
- NEMA approved labs with the capability to conduct monitoring of the listed parameters should be used to perform this exercise i.e. NEMA approved lab. It is recommended that a

report should be given to NEMA at the end of each monitoring exercise.

- This is estimated to cost approximately **Ksh 20,000** per monitoring exercise.
- Daily inspections to ensure that construction activities are not being conducted outside of regular working hours (e.g. 8 am – 5 pm). In addition, a one off noise survey should be undertaken to determine workers exposure and construction equipment noise emission.
- The project engineer / construction site supervisor should monitor the construction work hours. NEMA should conduct spot checks to ensure that the hours are being followed. Any suitable qualified company or individual may conduct the noise survey. The monitoring of the construction work hours is not expected to incur any costs.
- Daily monitoring to ensure that fugitive dust from cleared areas, access roads and raw materials are not being entrained in the wind and creating a dust nuisance. The project engineer / construction site supervisor should monitor the construction work hours. NEMA should conduct spot checks to ensure that this requirement is being followed. In addition, the local community within the area can be used to provide additional surveillance.

It is not anticipated that this exercise will incur additional costs.

- Undertake daily inspections of trucks carrying raw material to ensure that they are not over laden as this will damage the public access roads and onsite leading to soil compaction. Also to ensure that they are covered and not spilling materials along the roadway.

Person(s) appointed by the developer may perform this exercise. ***No additional cost is anticipated for this exercise.***

- Conduct daily inspections to ensure that trucks carrying raw materials and heavy equipment are parked at the designated area on the proposed site so as to prevent traffic congestion and accidents. Person(s) appointed by the developer may perform this exercise. No additional cost is anticipated for this exercise.
- Conduct daily inspections to ensure that flagmen are in place and that adequate signs are posted along the access road as necessary. This is to ensure that traffic along the access roads have adequate warnings and direction. Person(s) employed by developer may perform this exercise. No additional cost is anticipated for this exercise.
- Undertake daily assessment of the quantity of solid waste generated and keep records of its ultimate disposal. Additionally, solid waste generation and disposal of the campsite should also be monitored. Person(s) appointed by the developer may perform this exercise. No additional cost is anticipated for this exercise.
- Weekly assessment to determine that there are adequate numbers of portable toilets and that they are in proper working order. This will ensure that sewage disposal will be adequately catered for. Person(s) appointed by the developer may perform this exercise. No additional cost is anticipated for this exercise.
- Where possible, construction crews should be sourced from within the project area. This will ensure that the local community will benefit from the investment. Person(s) appointed by the developer may perform this exercise. No additional cost is anticipated for this exercise.

7.3.3 Monitoring during the operational phase of the proposed development

The proponent should undertake quarterly water quality monitoring exercises yearly to ensure that the development is not negatively impacting on the local water quality. The parameters that should be monitored are PH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD),

Suspended solids Ammonia, Total Dissolved solids, E. Coli and Total coliform as per NEMA waste water quality guidelines.
It is recommended that both influent and effluent water quality be monitored on a weekly basis sanitization company. This recommendation is based on NEMA guidelines for the monitoring of wastewater treatment plants with discharges especially those above 1,000 m^3/day. It is further proposed that the flow rate be estimated from Parshall Flume measurements. This information should be compiled and stored in a database by the facility manager and compared with NEMA guidelines for compliance. Corrective action should be undertaken in the event of non-compliance. The recommended list of parameters and the point of sampling is summarized on the table below.

Table 7.3-1 : List of Parameters to be monitored at the facility

Parameter	Guide value
PH	6.5 – 8.5
BOD	30 mg/l max
COD	50 mg/l max
Suspended solids	30 mg/l max
Ammonia	100 mg/l max
Total Dissolved solids	1200 mg/l max
E. Coli	Nil/100ml
Total coliform	1000/100 ml

The proponent should undertake daily assessment of the quantity of solid waste generated and keep records of its ultimate disposal. This is to ensure that the drying areas do not become overfilled.

- Person(s) appointed by the developer may perform this exercise.
- No additional cost is anticipated for this exercise.

7.4 IMPACTS DURING DECOMMISSIONING

Demolition is the reverse of construction; however the following assumptions are made;

- The foundations and base slab for the mound will be rehabilitated for future alternative use, or left in-situ. Breaking up and removal should be avoided if possible.
- The precast components of the retaining wall should be examined as suitable for stockpiling and reuse, or sent to a local crusher plant for recycling.
- The piping components will be examined as suitable for recycling.
- It is anticipated that the mound fill, following removal and disposal of the geogrid, will be stockpiled on site for alternative re-use as a construction material locally. An alternative may be to raise the level of the site by spreading evenly.

7.4.1 Loss of Aesthetics due to abandoned project facilities

In closure of the project, the proponent may decide to demoli**sh the facilities including all** other temporary structures. Loss of aesthetics may r**esult from the demolished waste** remaining on site for a long time to the extent of becoming an eyesore. The proponent shall ensure that demolished waste is removed from the site and properly disposed of in designated and licensed dumpsites.

7.4.2 Loss of Employment

If for whatever reason the project is closed down, the peop**le employed by the project will** lose their jobs. This will have significant impact to these people and their families. Other groups of people who are dependent on the project, such as suppliers of various services (e.g. Security Company) will also

lose the market. There is need for workers to have saving schemes that will cushion them in the event of losing employment.

7.4.3 Abandoned Infrastructure

When it happens that operation should be halted there will remain behind machinery which will need proper disposal. **The proponent** should undertake proper decommissioning process of all its facility activities. Therefore, the potential impacts during decommissio**ning and demolition are summariz**ed as follows:

- Noise and vibration – low
- Air quality – low
- Water usage – low
- Energy usage – low
- Road Traffic – low or moderate
- Export of LPG vessels by Sea – low
- Water quality – low
- Generation of solid wastes – low
- Generation of foul effluents – low
- Terrestrial biodiversity – low
- Employment opportunities - positive

7.4.4 Fire Prevention and Management

Fire prevention and management measures developed **during operation phase shall be** implemented by **Proponent** and contractors.

8.0 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) specifies the mitigation and management measures which the proponent will undertake and shows how the project will mobilize organizational capacity and resources to implement these measures. The EMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation and decommissioning.
The proposed EMP will be the responsibility of the project proponent and the approach to be employed in managing impacts is as follows;

Table 8-1: Approach to be employed in management of impacts

Approach	Description
Avoidance	Avoiding activities that could result in adverse impacts and/ or resources or areas considered sensitive
Prevention	Preventing the occurrence of negative environmental impacts and/ or preventing such an occurrence having negative impacts.
Minimization	Limiting or reducing the degree, extent, magnitude or duration of adverse impacts through scaling down,

	relocating, redesigning and or realigning elements of the project
Mitigation	Measures taken to minimize adverse impacts on the environment
Enhancement	Magnifying and/ or improving the positive effects or benefits of a project
Rehabilitation	Repairing affected resources
Restoration	Restoring affected resources to an earlier (possibly more stable and productive) state, typically "background" or "pristine" condition

Table 8-2: Key Project Roles and Responsibilities

Role	Responsibility
Management	➢ Manage implementation of the Environmental Management System(EMS): plan, implement, assess and improve. ➢ Oversee and monitor implementation of the EMP for the Project. ➢ Provide strategic environmental and social direction to the Project.
Supervision	➢ Work with contractors to achieve environmental and social performance by undertaking the following: o conduct readiness reviews with contractors to ensure their EMS implementation meets Project requirements; o work with contractors to improve their EMS where gaps are identified; o conduct training and awareness programmes with personnel involved in EMP implementation; o ensure regular monitoring and evaluation of the project's performance against the EMP; o maintain records of all non-conformances and work with the relevant parties to resolve within reasonable time frames; o assess the efficacy of the mitigation measures and manage continuous improvement around these measures; o work with contractors to close out grievances lodged by communities within the defined timelines; o maintain accurate records of open and closed grievances, and work with contractors towards reducing the number of grievances lodged by implementing appropriate mitigation measures; and o Assist with the development of relevant and timely communications to Project-impacted communities by providing information to the Stakeholder Engagement team on upcoming project activities.
Delivery/ Implementation	➢ Monitor and report on any Project activities that could negatively impact on communities. ➢ Facilitate on-going, reciprocal information sharing and communication

	between the Project and impacted communities; including helping to resolve any Project-related issues raised. ➢ Support the project's grievance procedure by providing on-going grievance procedure guidance and training to Project personnel, contractors and impacted communities and other relevant stakeholder groups (e.g. tourism industry stakeholders). ➢ Conduct regular inspections and note non-conformances with the Project's environmental and social requirements.

8.1 Training, Education and Competency

The Proponent will ensure that all contractors' staffs are inducted on health and safety, environmental and emergency response procedures. The Proponent will use written (posters/toolbox talks) and verbal (as part of routine briefings) communication methods to raise awareness on a range of health, safety mainly in regard to **covid-19 pandemic** and environmental issues. This will be done in both Kiswahili and English languages (as appropriate) to ensure that all members of the workforce are made aware.

8.2 Monitoring and Compliance Assessment

During the construction phase, the Proponent will monitor and inspect contractors' written records to demonstrate compliance with the EMP. This compliance monitoring will verify that the responsible parties are implementing the specifications contained in the ESMP. Compliance will mean that the contractor is fulfilling contractual obligations. To determine the effectiveness of the EMP, the Proponent will use a series of internal and external inspections and audits:

- Internal environmental, health and safety inspections will be carried out once every week by Health, Safety and Environment (HSE) Executive;
- Minor non-conformances will be discussed during the inspection and recorded as a finding in the inspection report. Major non-conformances will be formally reported as an incident and will be subject to the Proponent's existing incident reporting and handling procedures
- Environmental, Sanitation and Health (EHS) Manager, will arrange for initial and subsequent environmental audits and will provide relevant information required by relevant authorities including NEMA. The audit will be carried out in accordance with EMCA, 1999 and its subsidiary legislation, EIA/EA Amended Regulations, 2019. Any negative findings arising from the audits will be addressed accordingly

8.3 Incident handling and Reporting

An incident can arise from the following:

- Significant non-conformance with the EMP identified during an internal inspection
- Any non-conformance identified by either the authorities or an external audit
- Accidents or spills resulting in potential or actual environmental harm
- Accidents or near misses that did or could result in injury to staff, visitors to site or the surrounding communities
- Significant complaints received from any source.

All incidents will be formally recorded and noted in the General Register in accordance with requirements of OSHA 2007.

8.4 Checking /Assessment and Improvement

Checking and if necessary implementing corrective action, to ensure that required EMP management activities are being implemented and desired outcomes are achieved. As such this component includes four key activities namely:

- Monitoring selected environmental quality variables as defined in the objectives and targets.
- On-going inspections of the operational controls and general state of the operations.
- Internal audits to assess the robustness of the EMP or to focus on a particular performance issue.
- External audits to provide independent verification of the efficacy of the ESMP.

8.5 Corrective Action

As part of the EMS, the Project will implement a formal environmental and social tracking system that will include the details of all environmental and social non-conformances, identify the corrective actions required, assign actions/timings to responsible parties and indicate the status of the actions required. This will ensure a coordinated approach between the Project and its contractors, and drive changes for continuous improvement.

8.6 Grievance Management

The Project will develop and implement a Grievance Procedure that is described in the Project‘s Stakeholder Engagement Plan (SEP). The Grievance Procedure describes how community members can raise grievances regarding the Project‘s activities. The Grievance Procedure addresses verbal or written grievances, which must include sufficient information about the complaint or claim so that a proper and informed evaluation of the grievance can be made.

When a grievance is filed, it will be logged and evaluated using the process outlined in the SEP. All grievances will be tracked for monitoring and reporting purposes and to ensure timely and proper resolution

8.7 Reporting

This section outlines the reporting and notification associated with implementation of the EMP.

The Project and contractors will work closely together to identify and agree all such Project notification and reporting requirements.

It is envisaged that reporting will cover at least the following areas:

8.7.1 Contractor Monthly Reporting

Contractors will prepare a monthly report containing key information around the contractors‘ implementation of the environmental and social requirements and mitigation measures and will cover, among others:

- environmental and social assessment and improvement findings;
- incident notifications;
- non-conformances/non-compliances and corrective actions;
- key performance indicators;
- details of any environmental or social surveys or studies; and
- environmental and social training conducted.

8.7.2 Incident Notification and Reporting

Contractors will notify the Project proponent immediately following any environmental or social incident. The project proponent will ensure that all environmental and social incidences are appropriately documented, that the relevant parties are notified, and that reporting requirements around the incident are adhered to.

8.7.3 Management Review

The Proponent will organize for formal management review at defined intervals during the project cycle. The purpose of the management review is for senior project management to review the environmental management performance during the preceding period and to propose measures for improving that performance in the spirit of continuous improvement.

8.8 Liaison /Communication to Stakeholders

Throughout the project cycle, the Proponent will liaise with authorities especially NEMA Kenya to ensure on-going feedback on the environment performance of the project. As part of the project monitoring and evaluation, it is that an independent environmental and social consultant will be engaged by the proponent and their auditing reports will be shared with stakeholders in a transparent manner, as they become available.

8.9 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

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Table 8-3: Environmental and Social Management Plan (EMP)

Environmental / Social issue/ aspect/ activity	Anticipated negative impact	Management and mitigation	Responsibility	Performance indicator	Estimated cost (KES)
Site preparation phase					
Establishment of site office:	Construction wastes generation.	• Landscape the area once construction is complete to incorporate as many trees as possible; • Develop a waste management plan and implement it.	Project Manager / Supervising Consultant.	Waste disposal records.	5,000 once
Earthworks, demolitions and excavations:	• Collection and stagnation of surface runoff; • Increase in susceptibility to soil erosion; • Production of spoil from excavated ground; • Reduction in aesthetic value of the area; • Risk of contamination to surface water; • Control dust and noise onsite • Provide workers with personal protective equipment	• Excavation should be carried out such that drainage is controlled, and water is not allowed to accumulate; • Establish controls for surface runoff during excavation; • Control excavation activities to limit excavation to land which is required for construction; • Cordoning the site off using iron sheets or other appropriate materials to protect passersby and control noise. • Control any likelihood of occurrence of risks	Project Manager / Supervising Consultant.	Performance of erosion control measures. Noise and dust generation General due diligence practised	15,000 once

Transportation of debris:	Fuel consumption and exhaust fumes; Increase in traffic flow in the area.	• Maintenance of equipment for efficiency, minimizing noise production, emissions, spills and consumption; • Erect informative signs prior to commencing construction activities to warn residents; • Avoid transporting during periods of peak traffic activity.	Project Manager / Supervising Consultant and Contractor.	• Fuel consumption; • Frequency of equipment replacement and repair.	15,000 per month
Leveling and laying of foundation:	Noise and dust.	• Water sprinkling and use of screens to control dust; • Maintenance of equipment for efficiency, minimising noise production, emissions and spills; • Cordoning the site off.	Project Manager / Supervising Consultant and Contractor.	• Daily spot checks; • Regular servicing of equipment.	• 2,000 when dusty conditions set in • 10,000 for site isolation

Environmental / Social issue/ aspect/ activity	Anticipated negative impact	Management and mitigation	Responsibility	Performance indicator	Estimated cost (KES)
Occupational health and safety:	Health hazard; Physical injury from slipping falling and handling equipment.	• Carefully plan for construction sanitary facilities • Provide personal protective equipment (PPE) appropriate to working area for staff and visitors to the site; • Regular site reporting on health, safety and environment (HSE) issues by an appointed HSE representative; • Develop a monitoring programme to assess noise performance in accordance with the revised Noise Prevention and Control Rules (April 2005); and NEMA Noise Control Regulations, 2009 • Assessment of HSE mitigation measures and recording of any matters arising as per Legal Notice No 40, The Factories (Building Operations and Works of Engineering Construction) Rules	Project Manager / Supervising Consultant.	• Regularly check on performance of provided sanitary facilities; • Have regular spot checks on use and adequacy of PPE provided • Conduct regular internal assessments on environmental site performance and record findings.	3,000 per month

Production of waste:	Soil degradation and surface water pollution.	• Develop a solid waste management plan prior to project commencing, identifying optimal waste re-use options and licensed disposal areas; • Waste should not be burned on site or dumped in undesignated waste disposal areas; • Minimise waste production by utilising best available techniques for site preparation; • Re-use construction waste to the maximum extent possible; • Excavation activities and dumping of spoil should be properly managed such that land which is not required for the project is left undisturbed.	Project Manager / Supervising Consultant.	Report on all waste production and handling procedures.	10,000 once

Construction phase					
Environmental / Social issue/ aspect/ activity	**Anticipated negative impact**	**Management and mitigation**	**Responsibility**	**Performance indicator**	**Cost estimate (KES)**
Vegetation Clearance	Loss of vegetation cover Soil erosion	• Areas with exposed soil should be replanted with grass as soon as possible after construction; to help mitigate against flash flood caused soil erosion. • Waste generated during the site clearance/construction phases of the project must be disposed of at an approved disposal site (County dump site). • Suitable trees should be planted at the periphery of project site and near the River bank • No unnecessary removal of any vegetation shall be done	Contractor proponent	• Spot checks • Number of trees planted	35,000 for planting trees and other suitable vegetation

Loss of Water Quality and interference with riparian reserve	Pollution of nearby stream and sedimentation	• Runoff channels to be constructed to drain storm waters • Water quality tests at the river to be conducted quarterly • Maintain the riparian reserve of 10 meters • Replant the riparian zone with suitable trees	Contractor WRMA	• Spot checks • Water quality tests • Number of trees planted	20,000 quarterly
Air Quality	Excessive generation of dust and other particulate matter	• Site access roads should be dampened every 4-6 hours or within reasonable time to prevent a dust nuisance and on hotter days, this frequency should be increased. • The access roads (unpaved sections) through to the site should also be wetted and the sections of the road monitored so that any material falling on it as a result of the construction activities be removed. • Minimize cleared areas to those that are needed to be used. • Cover or wet construction materials such as soil for backfill to prevent a dust nuisance. • Where unavoidable, construction workers working in dusty areas should be provided and fitted with respirators	Contractor	• Workers with respirators, nose masks, ear plugs • Wetted roads	3,000 on demand
Storage of Raw Material and Equipment	Stored materials becoming air, water or soil borne	• Raw materials that generate dust should be covered or wetted frequently to prevent them from becoming air or waterborne. • Raw material should be placed on hard stands surrounded by walls. • Equipment should be stored on impermeable hard stands surrounded by walls to contain any accidental surface runoff. • No storage of oils or fuels onsite	Contractor	• Impoundment walls constructed • Labeling of materials	30,000 once
Wastewater	• Pollution of	Provide portable sanitary conveniences for the construction workers for	Contractor	Sanitary facilities	35,000

Generation and Disposal	ground water • Pollution of local stream	control of sewage waste. A ratio of approximately 25 workers per toilet should be used as a guide.	Public Health	provided	
Transportation of Raw Material and Equipment	Interference with traffic flow including pedestrians	• Adequate and appropriate road signs should be erected to warn road users of the construction activities. For example, reduced speed near the entrance roads. This should be done in conjunction with the Ministry of Transport • Raw materials such as sand, murram and cement should be adequately covered within the trucks to prevent any escaping into the air and along the route to the site. • The movement of equipment (trucks) during the construction of the system should be limited to the working hours, 8:00 am - 5:00 pm per day. • Equipment should be transported early morning (6 am – 7 am) with proper care being taken. • The use of flagmen should be employed to regulate when trucks have access to the main roads.	Contractor	Road signage erected	20,000
Traffic Obstruction	Obstruction caused by laying of sewer lines to persons and vehicles	• The laying of sewer pipes across any access road should be done when traffic volumes are lowest, for example, early morning or on weekends (specifically on Saturdays and Sunday). • Adequate notices should be placed along the route. • Adequate signs and flagmen should be put in place.	Contractor	• Signage posted • Flagmen posted appropriately along the route	No extra cost

Emergency Response plans	Occurrence 0f accidental injuries	• A lead person should be identified and appointed to be responsible for emergencies occurring on the site. This person should be clearly identified to the construction workers. • Make prior arrangements with health care facilities such as a Health Centre in proximity, a private doctor or the Provincial Hospital to accommodate any eventualities. • Material Safety Data Sheets (MSDS) should be store onsite.	Contractor	• Availability of MSDS on site • Lead person to oversee health and safety issues appointed	30,000
Drainage management	Soil, surface and ground water pollution, work area health and safety	• Proper construction site drainage management i.e.: Control erosion • Avoid ponding water; • Proper waste and material handling, and storage to avoid flushing of wastes in to the neighbouring stream • Follow designs made for the system	Construction supervisor. Contractor.	Daily auditing and spot checks	No additional cost
Waste management	Pollution, infestation by vermins, work area health and safety	• Waste bins should be strategically placed within the construction site. • The waste bins at the construction site should be adequately designed and covered to prevent access by vermin and minimize odour. • The bins at the construction site should be adequately covered to prevent a dust nuisance. • The bins at the construction site should be emptied regularly to prevent overfilling. • Disposal of the contents of the bins should be done at an approved disposal site or incinerated. • Controlled use of materials on site; • Waste minimization at the source • Safe waste storage and handling on site • Monitoring and reporting • Erect warning signs against poor waste disposal • Sensitization of workers on waste disposal methods Encourage and practice reuse and recycling	Construction supervisor. Contractor.	Daily auditing and spot checks	20,000

Soil erosion	Soil loss and sedimentation of the local stream	• Minimize vegetation disturbance; • Reinstate site immediately after construction • Put bunds to prevent soil and any material from getting to the local stream	Construction supervisor. Contractor.	• Daily spot checks • Workers wearing protective gear • Monitoring of the stream nearby	25,000
Noise / vibration	Nuisance in the project area	• Use equipment that has low noise emissions as stated by the manufacturers. • Use equipment that is properly fitted with noise reduction devices such as mufflers. • Operate noise-generating equipment during regular working hours (e.g. 8 am – 6 pm) so as to reduce the potential of creating a noise nuisance during the night.	Construction supervisor. Contractor.	Daily spot checks	20,000

		• Construction workers operating equipment that generates noise should be equipped with noise protection. A guide is a worker operating equipment generating noise of ≥ 80 dBA (decibels) continuously for 8 hours or more should use ear muffs. Workers experiencing prolonged noise levels 70 - 80 dBA should wear earplugs. • The working hours shall be regulated i.e. from 8 AM to 6PM • Workers shall wear earplugs during construction phase • Implement noise minimization measures; • Site screening; • Manage vibration, where it occurs • Monitoring, reporting and community liaison			
Earthworks excavation	Wastes arising, safety, noise, vibration, surface contamination,	• Noise, dust, vibration minimization measures should be put into place • Minimize excavation and materials for disposal • Exclude water from excavation; • Properly support excavated areas as appropriate • Manage any contaminated materials found • Minimize risk of contaminating surface water • Safe material storage and disposal at appropriate sites.	Construction supervisor. Contractor.	Daily auditing	10,000
Materials for construction	Destruction caused by mines and quarries, wastage.	• Document and report on all material sources • Control wastage of block, brick and stone work et al; • Utilize damaged materials elsewhere.	Construction supervisor. Contractor.	Monthly reporting	No additional cost
Concrete works	Dust, noise, materials, oil contamination.	• Controlled batching; • Control dust and noise • Use re-usable shuttering;	Construction supervisor. Contractor.	Daily, spot checks	No extra cost

Fire safety and general accidents	Working conditions, fire related incidents and accidents, pollution.	• Compliance with OHS laws and health and safety committee rules; • Provision of PPE (personal protective equipment) • Secure / screen hazardous areas; • Provision of fire suppression equipment; • "No smoking" signage Prominently displayed; • Provision of First Aid box facilities; • Training in fire response/ First Aid; • No burning of waste or material on site • Fencing the site with strong wire mesh material	Construction supervisor. Contractor. community	• Regular fire audit • Strict site supervision • A register of incidents and accidents should be kept	30,000

Operation phase					
Environmental / Social issue/ aspect/ activity	**Anticipated negative impact**	**Management and mitigation measures**	**Responsibility**	**Performance indicator**	**Cost estimate (KES)**
Solid Waste Generation and Disposal	Increase in solid waste on site	• Provide sludge drying beds in the project • Provision of adequately designed bins to prevent access by vermin. • Monitor skips so that they do not become overfilled. • Ensure that the solid waste collected is disposed of in an approved dumpsite	• Waste bins onsite • Disposal of grit/sludge in licensed dump sites	Proponent WRMA NEMA	30,000

Transportation/ Traffic	Increase in traffic along the access road	• Limit septage delivery to the site between the hours of 8 am and 5 pm. This will limit the noise nuisance to residents and possibly reduce the population exposed to potential accidents, as most persons would have already left their homes to go to work or and schools. • Add adequate and appropriate signs including speed limits along the road in proximity to the access roads.	• Regulated transport hours and times • Noise levels generated enroute by vehicles minimization • Signs posted enroute	Proponent	No extra cost
Septage Disposal	Poor depositing of septage by cesspool emptier	• Institute and maintain a ticketing system for cesspool emptiers, where upon successful disposal, the DTF operator would issue a receipt to the cesspool emptier. • County Government and particularly NEMA, should put in place a system to monitor cesspool service providers and in addition, have a public educational campaign to educate and inform the public about the system. • Ensure that septage is only accepted at the site by authorization	Tickets issued by the proponent	proponent Cess pool operators NEMA	No extra cost
Emergency Response	Accidents occurrence and sicknesses	• Install safety valves on gas conveyance system • Reduce distances for conveying gas to neighbours • Make prior arrangements with health care facilities such as a Health Centre in proximity. • Design and implement an emergency response plan. • Coordinate with first aid organisations/agencies i.e. St. John's Ambulance, Red Cross to prepare for any eventuality. • Display telephone numbers of emergency response departments for all people accessing the site to clearly see	• Sickness and Accident records • Safety valves on gas conveyance system • installed	Proponent	10,000

Wastewater Disposal/Water Pollution	Pollution of local stream	Follow the NEMA waste water quality guidelines strictly	Periodic Water quality tests	Proponent WRMA	40,000
Foul Odours	Generation of foul smell at the site	• Monitor and ensure that influent sulphate levels are below 240 mg/l. • Ensure that the pond series have adequate water flow to reduce the potential of odour formation.	• Periodic tests • Presence of foul smells	Proponent NEMA	6, 000 per test
Future environmental protection	Any impact arising	• Environmental monitoring procedures • Involve all stakeholders and let them play their roles in monitoring activities	Documented procedures	Proponent	80,000
Project maintenance / impacts on the local stream and the neighbourhood	• Leakage • Visual impacts; • Health and safety; • Water quality	• Timely maintenance of sewer conveyance, distribution system; • Maintenance of access routes; • Manage solid wastes and dispose appropriately; • Monitor water quality, both in the river and in the conveyance system	• Monthly reporting • Once a year water quality tests in an approved lab	Proponent	6,000 per test
Decommissioning phase					
Environmental / Social issue/ aspect/ activity	**Anticipated negative impact**	**Management and mitigation measures**	**Responsibility**	**Performance indicator**	**Cost estimate (KES)**
Structures, wastes and demolition machinery	Generation of scrap material and other waste debris on site	• All buildings, machinery, equipment, structures, tools that cannot be reused or recycled shall be removed from site • Where reuse is not possible, materials should be taken into approved dumping sites	Project contractor, proponent and site manager	Amount of generated waste and stockpiles	200,000

Rehabilitation of project site	Clearing of vegetation, soil erosion	• Fencing and warnings posted at the site restricting access • Do re-vegetation of the site to restore the site to its original status • During demolition, appropriate surface run-off controls will be undertaken to minimize erosion rates • Constant monitoring and inspection of the demolition works to prevent accidents	Contractor Proponent	Number of trees planted Biomass volume present	380,000
Socio-economic and health impact	Increased disease incidents levels, lowering of quality of life	• Provide alternatives to connected plots/premises • Offer advice on alternative income generating ventures to workers • Redeploy workers. • Consider redeveloping the project • Prepare proposals to donors for a new sewer project	Project proponent	once	150,000

8.10 Decommissioning Phase

Decommissioning is an important phase in the project cycle and comes as the last to wind up the operations/activities of a project. The main purpose of decommissioning is to restore/rehabilitate the project site to acceptable standards. Rehabilitation is to occur after the close down of the project and when its no longer economically viable to continue operating it. It will entail reestablishment of topographical elements once the ponds are no longer in use. The site could be developed into a forested spot or redevelopment of the project.

The lifespan of the system is dependent on the ability of the Turkana county government to maintain them. In this particular case, the proponent will design a desludging schedule which if followed will enhance the lifespan of the project which is estimated at over 30 years. This gives the company the option of continuing to use the system and therefore they take the responsibility of decommissioning when the time comes normally after viability of the project comes into question or when other circumstances may prevail warranting decommissioning. It is therefore recommended that a closing Environmental Audit be conducted when the time for decommissioning comes so that all aspects will be looked at against the prevailing conditions and requirements. However, the purpose of decommissioning is mainly to rehabilitate the project site to an acceptable standard and all efforts should be geared towards making the site as close as possible to its original state before the project was implemented. The decommissioning will in brief involve replanting the area with suitable trees and vegetation, demolition of the structures, removal of debris and landscaping. The other social implications will involve the laying off workers who may have been employed. They will lose their income, as well as issues of health and safety et al. In the reality of this case, decommissioning on part of the proponent will be to landscape

the area and put it to any other appropriate use. As such, the effects of the decommissioning will be minimal affecting mainly the area community which will lack effective sewer services. It will also affect water quality in local stream.

Table 8-3: Environmental Monitoring Plan

Construction Stage Environmental Monitoring Plan			
Indicators	**Approach**	**Mitigation / control measures**	**Responsibility**
General	Site organization	• Site plan to be developed showing areas for stockpiles, material storage, site compound / facilities, pedestrian / vehicle routes etc • Access controlled to site via supervised gated access, manned 24/7. • Temporary building constructed for Engineers / Sub-contractors, with adequate parking. • Suitable shelters provided for construction workers	Contractor
	Site security	Site and / or site compound shall be fenced and fully maintained during construction	Contractor
	Avoidance of health and safety incidents	• Preparation and adherence to a site specific health and safety plan • Use of skilled labour and appropriate training given to construction workers • Construction workers to be provided with, an use, appropriate personal protective equipment (PPE) • Where practical, use of vibratory hand operated equipment to be minimized to reduce long term risk to operators	Contractor
Noise and Vibration	Avoidance of nuisance	• Maintain reasonable site working hours (daylight hours), particularly during potential noisy operations such as piling • Construction plant will be maintained in good running order; all vehicles should comply with the requirements of Road Traffic Act	Contractor
Air Quality	Avoidance of dust nuisance	• For potentially dusty earth works operations, construction workers to be enclosed within ventilated cabs or provided with face masks for potentially dusty earth works operations. • Where appropriate water damping to be used to control dust. Particular attention to be paid when the wind is from the south or west.	Contractor

	Avoidance of unreasonable exhaust emissions	• Plant operated by skilled operators and regularly maintained	Contractor
Water	Efficient water usage	• Measures in place to ensure efficient on site use of potable / fresh water commensurate with good construction practices	Contractor
Energy	Efficient energy usage	• Measures in place to ensure efficient on site use of electricity and fuel commensurate with good construction practices	Contractor

Water Quality	Avoid poor quality discharge of storm water	• Earthworks shall be halted when rain conditions are such that excessive erosion and silt loaded run-off can be expected. • The construction programme will avoid excessive exposure of bare earth surfaces which may be more prone to erosion. • If appropriate, settlement lagoons to be used to allow silts to be retained prior to discharge of run-off to the existing drainage channels or direct to sea (through the rock revetment) • Care will be taken to avoid excessive mud being transferred by construction plant to the access roads and public highway. Where this is likely to become a nuisance it will be cleared by the Contractor. • Consideration will be given to undertaking routine maintenance of plant and vehicles off-site in a properly equipped workshop. • Avoidance of water accumulation and stagnation • Existing drainage channels to be cleared of silt / debris and trash screens installed if appropriate.	Contractor
	Avoidance of hydrocarbon spills	• Fuel stored with containment wall • Refuelling / servicing area with hydrocarbon trap • Equipment in good working condition • Used oil disposed of by approved practises	Contractor
Traffic	Minimize impact of increased road traffic	• Deliveries will be made to site outside of the periods of high congestion on the public road system (i.e. early morning, late afternoon). • Materials haulage companies to use competent drivers and ensure that shift	Contractor

		patterns do not result in excessive working hours resulting in compromised road safety • All haulage vehicles shall be maintained in good running order and should comply with the requirements of Road Traffic Act. • Should the surface materials at site generated by preliminary earthworks and piling be of suitable quality these materials shall be deployed and the volume of imported materials diminished.	
	Construction plant and equipment in good working order	• Construction plant will be maintained in good running order; all vehicles should comply with the requirements of Road Traffic Act and its subsequent regulations for emission control. • Plant operated by skilled and appropriately trained operators	Contractor
	Avoidance of mud on public access roads	• Minimise working in wet conditions. • Drive vehicles on firm part of site, if possible, to release excess mud from wheels, or clean excess mud off wheels before reaching road • If mud is transferred to roads, use sweeper / bowser to remove excess mud from road	Contractor

Indicators	**Approach**	**Mitigation / control measures**	**Responsibility**
Waste Management	Minimization of solid waste production	• The contractor shall put in place a waste management plan aimed at minimising the production of all wastes. • Where possible measures will be put in place to recycle materials such as metal off-cuts, some plastics and clean paper/cardboard utilizing existing specialist recycling firms in Kenya. • A suitable location within site for placing excess concrete and washing down equipment will be agreed with no discernable impact. • Non-recyclable materials will be stored in plastic bins, collected and disposed	Contractor

		of through the municipal waste system. • Potentially hazardous wastes shall be stored separately, i.e. hydrocarbon containers, used batteries	
	Site is to be kept tidy and free of litter at all times	• Waste bins to be provided at toilet blocks, changing areas and other key locations • Inspections to be made of site and surrounding area, including the revetment, to remove litter. • All wastes collected and disposed of regularly by a licensed carrier	Contractor
	Adequate toilet facilities must be provided	• No. and location of toilet / shower blocks to be adequate for peak no. of construction workers, facilities to be regularly cleaned. • Foul effluents to be collected on-site and arrangements will be put in place for regular emptying and disposal using a licensed carrier. If a septic tank is to be used then a properly designed leaching field shall be installed. • Measures to be enforced to ensure that construction workers do not foul areas surrounding the site.	Contractor

Table 8-4: Operational Phase Environmental Monitoring Plan

It is envisaged that quarterly operational stage environmental monitoring reports will be prepared by the operator.

Operational Stage Environmental Monitoring Plan			
Indicator	**Approach**	**Mitigation / control measures**	**Responsibility**
General	Standard Operation Procedures	• Site specific Standard Operating Procedures to be agreed with septage carriers in accordance with international regulations and good practice. Measures to be put in place to ensure that the Standard Operating Procedures are adhered to. • All members of staff to be appropriately skilled and receive appropriate training.	Operator

		• Inspections and reviews of Standard Operating Procedures undertaken by the operator's environmental health & safety officer	
	Emergency Response Plan	• Site specific Emergency Response Plan to be agreed with the facility. • All members of staff to receive appropriate training on the implementation of the Emergency Response Plan.	Operator
	Occupational Health & Safety	• Hazardous Area Classification shall be conducted and the findings implemented	Operator
		• A flammable gas detection system will be installed at sensitive locations across the site. Records shall be maintained of all instances of detection and course of action. • A preventative maintenance programme shall be implemented. • The number of mechanical joints should be kept to minimum, replace mechanical joints by welded joints where practicable. This shall be of help in reducing the septage leaks. • Building should be constructed in-line with International standards, guided by the purpose of its usage. • Hazardous Area Classification should be conducted and findings to be implemented. • Active fire protection system should be designed in line with relevant international codes/ standards. • Suitable standard operating procedures and Preventative maintenance programmes should be prepared and implemented. • Site specific Emergency Response Plan shall be prepared.	Operator
Indicator	**Approach**	**Mitigation / control measures**	**Responsibility**
Water	Minimize consumption	• Water usage to be recorded monthly. Opportunities for improved water efficiency during operations to be considered.	Operator
Energy	Minimize consumption	• Electricity usage to be recorded monthly. Opportunities for improved energy efficiency during operations to be considered.	Operator
Septage	Control of transportation movements	• The proponent is responsible for the control and regulation of transportation from the collection point to the facility. Adequate controls need to be enforced to ensure the safety of the environment and neighbours.	Operator and waster transporters
	Use of appropriate vessels	• Only appropriately equipped, well maintained and licensed vessels will be used for transportation of septage.	Operator

		• All deliveries to be coordinated with the facility operator	
Water Quality	Avoidance of hydrocarbon contamination from vehicles	• Regular inspection / maintenance of the oil interceptor (min. twice per year)	Operator
	Avoidance of miscellaneous contamination from storm water system	Sampling and analysis by an accredited test house of storm water discharge from site outfalls (min. twice per year)	Operator
Waste Management	Minimization and disposal of solid wastes	• Quantity and composition of waste to be monitored and records maintained • Waste to be stored in plastic bins, collected and disposed of through the municipal waste system. • If feasible measures to be considered to recycle materials such as plastics and clean paper/cardboard utilizing existing specialist recycling firms in Kenya.	Operator
	Disposal of _domestic' foul effluents	Regular de-sludging of the septic tank (inspections – min. twice per year)	Operator

9.0 CONCLUSION AND RECCOMENDATIONS

The proposed project will have both positive and negative impacts however; the EMP designed has integrated mitigation measures with a view to minimize the envisaged negative impacts while maximizing on the positive ones. This will ensure compliance with all the applicable laws, standards and procedures. The proposed project will be implemented to the approvals by among others, the Physical Planning Department (Turkana City County) and NEMA. During project implementation, Environmental Management Plan (EMP) will be ensured through avoiding inadequate/inappropriate use of natural resources, conserving nature sensitively and guaranteeing a respectful and fair treatment of all people working on the project, the general public and residents of the project area.

It is our recommendation that the project be licensed to proceed provided the outlined mitigation measures are adhered to in order to ensure that the project remains environmentally and technically friendly throughout its course. Major efforts should be focused towards minimizing the occurrence of impacts that would adversely affect the environment, other businesses and local residents.
This will be achieved through implementation of the Environmental Management and Monitoring Plans (EMMPs).

9.1 Recommendation

Recommendations for the prevention and mitigation of adverse impacts are as follows;

1. The proponent must have a dedicated Environmental Health and Safety Officer on-site always.
2. There should be a continuous stakeholder consultations and public awareness creation about the project, its activities and scheduling, and potential impacts in order to prevent conflict with the residents;
3. The proponent should follow the guidelines as set out by relevant lead agencies to safeguard and visualize environmental management principles during construction and operation/occupation phases of the proposed project
4. All solid waste materials and debris resulting from construction activities should be disposed-off at approved dumpsites
5. Once earthworks are complete, restoration of the worked areas should be carried out immediately by backfilling, landscaping/ levelling and planting of suitable native tree species in the project area.
6. The proponent should adopt an onsite recycle/reuse potential of treated water for dust suppression at sites, damping and/or flushing of toilets.
7. Septic tanks at the construction site should be designed in accordance with the relevant EHS standards.
8. Proponent to construct barriers such as acoustic covering to reduce noise pollution.
9. Proponent/contractor should provide protective gadgets to all workers/staff on site.
10. A full offloading and installation methodology should be developed, with supporting engineering design and checks, to ensure the safety of the offloading, delivery and installation operation.
11. The proponent should consider implementing social and community welfare measures aimed at improving infrastructural facilities including road, education, and health in the project area as part of CSR.
12. The proponent should develop and implement a traffic management plan in consultation with the KURA, KeNHA and the Traffic Police to aid the movement of HGV in and from the site to avoid blocking the roads from local use.
13. Proponent should put a waste management plan aimed at minimizing production of hazardous

wastes.

14. All project activities should be restricted from water bodies to prevent damage to aquatic life and quality of water.

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10.0 REFERENCES

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11.0 Apendix

11.1 List of participants during sensitization meeting for the proposed DTF

List of Participants

Activity: **DTF Public Participation meeting)**

Location: **Nayanae Angidapala**

giz

N/B: *By signing you confirm that you provide your data voluntarily and that you have been informed about how your data will be stored and used, for how long and for which purposes.*

#	Name	ID/ passport	Sex	Age	Nationality	Phone	Residence	Disability	08.07.2020 (Signature)
1	APOCHER ASINYEN		F	30	KENYAN	—	Kalobeyei	NO	
2	KERITON EJEM		m	27	KENYAN	—	Kalobeyei	NO	
3	NGIKITOO ELAR	28992529	m	37	KENYAN	0746031129	Nayae angidapala	NO	
4	LOMANAT PETER	31937461	m	26	KENYAN	0198548512	Kalobeyei	NO	
5	EPUA LOKELE KALIMAPUS	12909401	m	45	KENYAN	0715897808	Kalobeyei	No	
6	ABENYO ETHEKON		F	29	KENYAN	—	Kalobeyei	NO	
7	LOMOYA EKUTAN CHILIA	38533151	m	52	KENYAN	0790778555	Kalobeyei	No	
8	GEOFFREY ERAI EMOTON	25573971	m	31	KENYAN	0746444524	Kalobeyei	NO	
9	ALEPER NAPAS KEBEI	9673921	m	57	KENYAN	0794112183	Kalobei	NO	
10	LOBETO JOHN	29780545	M	27	KENYAN	0710955181	Kalobeyei	No	-P.A
11.	ALFRED KAPOKO	0143033	M	56	KENYAN	0728390037	KALOBEYEI	—	-Opini Lead
12.	AROO NAPUA	32197692	f	31		0741383723		—	
13.	SIMON NDIPOO	32163299	m	30		0709379955			
14.	Festus Esuon	25037287				0714009061	Kakuma		

11.2 Minutes for the sensitization meeting for the proposed DTF

MINUTES OF THE COMMUNITY SENSITIZATION MEETINGS HELD ON 08.07.2020
AT THE NEW PROPOSED DTF SITE (NAYANAE ANGIDAPALA)
PREPARED BY EMURIA ESURON (GIZ)

Wednesday, 8 July 2020

Purpose;

As enshrined in the Kenyan constitution, community sensitization and mobilization is to be undertaken before a given project is implemented, much more so when a project may affect the wellbeing of the community living around it.

The main objectives of conducting this event were;

- To create awareness and acknowledge partners supporting the implementation of the project,
- To create awareness and understanding of the project, its advantages to the area; upgrading the Kakuma and Kalobeyei towns into a municipality
- To develop linkages among the community people and the project implementing parties
- Community leaders to rally the community people to accept the DTF project.

Background;

- In 2018, the Turkana County Government (TCG) requested GIZ to construct a decentralized faecal treatment facility (DTF) in Kakuma to allow safe disposal and treatment of faecal sludge. This was subsequently agreed with the TCG and other stakeholders during a planning workshop on 21 March 2018.
- On 3 February 2020, the then CECM, Ministry of Lands, Energy, Housing and Urban Areas Management (Esther Lokwei), allocated 20 acres of land for purposes of liquid and solid waste management in Nayanae-Angitiira, Kalobeyei Ward, Turkana West Sub-County.
- Due to unclear administrative and political belonging of the proposed site, the CECM, Ministry of Lands, Energy, Housing and Urban Areas Management (Jennifer Nawoi) reallocated the site to Nayanae-Angidapala, Kalobeyei Ward, Turkana West Sub-County on 6 July 2020, following a recommendation by the Acting Deputy County Commissioner (Yussuf Salat), the respective Chiefs and community elders. The new site is adjacent to the site initially proposed.

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- On 8 July 2020, GIZ facilitated the Turkana County Government to conduct a community sensitization meeting in compliance with the Kenyan constitution. The CECM requested the Sub-County Lands Administrator (Leonard Kisike) to chair and moderate the meeting. Due to the prevailing COVID-19 pandemic, the number of participants was limited to 15 people. The community living around the site was requested to select representatives.

Participants;

1. Mr. Leonard Kisike, Sub-County Lands Administrator, Turkana West Sub-County (chair)
2. Mr. John Lobenyo, Personal Assistant to the Member of County Assembly (PA), Kalobeyei Ward
3. Mr. Alfred Kapoko, Opinion Leader, Kalobeyei Ward
4. Mr. Emuria Esuron, GIZ (minute taker)
5. Mr. Epua Lokele Kalimapus and Mr. Aleper Napas Kebei, Community Elders (speakers) and 10 other community elders representing the community living around the proposed site

Registration of participants was done through attendance sheet (see attached).

Discussions & Decisions;

Item	Presentations	Decision	Task	Who	When
Development of the DTF	**Mr. Alfred Kapoko, Opinion Leader, Kalobeyei Ward** 1. 20-acre piece of land was allocated by the TCG for the development of both liquid and solid waste management plants. The TCG has requested GIZ to develop parts of the land (1.5 acres) and construct a DTF. 2. The DTF is a requirement to upgrade Kakuma and Kalobeyei into a municipality. 3. The DTF will be a small-scale sewage treatment plant. There will be no open dumping. The	After the deliberations, the community accepted the project to be installed and brought forward the following requests: • The DTF should not produce any odour or affect the health condition of the community in any other negative	Survey and demarcate the land. Shae report with the TCG for them to prepare a map. Conduct the full Environmental Impact Assessment and seek approval of the site by the National Environmental Management Authority (NEMA).	GIZ GIZ	14 July 2020 Tbc, depends on movement restrictions

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	effluent discharged after treatment will not be harmful to the environment. 4. The DTF will help to improve sanitation hence improving the public health system in Turkana West Sub-County. It does not cause any harm to communities living around the site. 5. The DTF might open up the area and attract other new developments. 6. The site is appropriate as it is rocky without much vegetation. Preliminary findings of an Environmental Impact Assessment confirm that. 7. The community surrounding the site was advised to fully accept and participate. 8. Where ever possible, casual workers should be recruited locally (e.g. for site clearance). Similarly, sand and ballast should be sourced from the surrounding area and not from Kakuma.	way. Response: This will be assured through appropriate design and construction. • The project should attract other amenities such as boreholes, cemetery, schools. Response: This is a possibility but difficult to foresee. GIZ does not have funding for further developments besides the DTF.			
	Mr. Leonard Kisike, Sub-County Lands Administrator, Turkana West Sub-County 1. Informed the community about his visit of the land with the CECM, Ministry of Lands, Energy, Housing and Urban Areas Management (Jennifer Nawoi) and the CO, same ministry (Joshua Lemuya) 2. The land (a total of 20 acre) was allocated by the CECM, Ministry of Lands, Energy, Housing and	The community handed over the land to the TCG to be allocated for the purpose of liquid and waste management site.	Share the map of the proposed project to the community for clear understanding. Write an official letter to GIZ confirming that all relevant public participation process	TCG TCG	Tbc, depends on the receipt of the surveyor's report Immediately

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	Urban Areas Management for the development of the liquid and solid waste management site following. 3. The TCG has requested GIZ to parts of the land (1.5 acres) and construct a DTF. 4. The development of the DTF is meant for the good of the residents in the Kakuma, Kalobeyei and Lopur Wards. 5. Explained that the land was allocated as it was not owned by an individual and fulfils the relevant safety criteria (e.g. appropriate soils). 6. He further explained that the purpose of identifying the land was to unite the people of the three wards, i.e. Kakuma, Kalobeyei and Lopur.		have been completed and that the land has been formally handed over to the TCG to develop a liquid and solid waste management site.		
	Mr. Epua Lokele Kalimapus and Mr. Aleper Napas Kebei, Community Elders 1. Stated that the identified land is their ancestral livestock grazing corridor. 2. Mentioned that they will accept the project but the safety of the community must be assured. The site should not affect the health of the community or it will be closed immediately. 3. Insisted that the site should not be the source of any odour.	The community to be provided with further explanations on the extent of the land and the type of development, incl. through pictures. Response: The PA assured the community that while the proposed liquid and solid waste management site may take a small portion of the grazing land, plans are in place to ensure the livestock, water sources and	Photos of the DTF to be show cased in the TCG and GIZ Offices to any community elder who may visit. Inform the selected contractor about the interest of the community to be engaged in the construction process. Inform the selected contractor about the interest of the community to supply building materials.	TCG/ GIZ GIZ GIZ	Immediately When the construction kicks off.

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	4. Sought an understanding of the benefits that may come along with the development of the land, especially to those living around the site.	vegetation are not affected by the effluent. Where ever possible, community members should be engaged in the construction process (e.g. clearing of the site). This also includes sourcing of building materials. Response: While the final decision is with the contractor, the TCG and GIZ will advocate for this idea. However, the community needs to be ready for (tiresome) casual works (e.g. clearing of the site, digging) at rates set by the contractor. Neither the TCG nor GIZ have control over that.			

Conclusion

- The community agreed to handover the proposed 20-acres land at Nayanae-Angidapala, Kalobeyei Ward, Turkana West Sub-County to the TCG for developing a liquid and solid waste management site. GIZ supports the TCG to develop parts of it into a DTF. Surveying of the land to proceed.
- The DTF must be constructed in a way to minimize obstruction of the surrounding community (e.g. due to bad odour). To this end, an Environmental Impact Assessment will be conducted so that the site can be approved by NEMA. The community will be involved in this process.

Minute prepared by: Emmigo Esuron

Minutes confirmed as true reflection of the meeting discussions by;

Name	Title	Signature
ALFRED KAPOKO KIMAT	OPINION LEADER - KALOBEYEI	
EPUA LOKEELE KALIMAPUS	COMMUNITY ELDER	
ALEPER NAPAS KEBE	COMMUNITY ELDER	
LEONARD KISIKE	Sub-county Land Administrator	

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11.3 List of participants during the EIA public participation forum for the proposed DTF

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PUBLIC CONSULTATION PARTICIPANTS FOR THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF FAECAL SLUDGE TREATMENT FACILITY IN KAKUMA FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

We the undersigned confirm participation in the said meeting and that the comments recorded and read by the environmental consultant are a reflection of the opinion of this community in relation to the impacts of proposed construction of faecal sludge treatment facility.

LIST OF MEMBERS PRESENT

No.	Name	ID No.	Contact/Phone No.	Signature
1.	Kapochori alokitode lopotio	12908592	—	
2.	Samwel Emesa	33850753	0700684423	
3.	Cosmas Nakayaa E	12909203	071760094	
4.	ESA OPANDA	—	0720933512	
5.	Alfred Kapoko Kimat	0143033	0728390037	
6.	Nancy Nalula	332452340	0723183545	
7.	Kibet Jackson	31712988	0704922379	
8	Geoffrey Simatwa	25356951	0729814388	
9.	Haggai Nangon	—	0704408587	
10.	Samwel Kamau	—	0791233618	
11.	Maiyo Elphas	2461488	0725303130	

Sub-county: Turkana West Sub-County **Location:** Kalobeyei

Sub-location: Lomyuduk **Village:** Nayanae - angidapal

Division — Oropoi

The meeting ended (Time): 1500hrs **Community representative:** Area chief / village elder / Opinion Leader

Environmental consultant representative: Jekson Kibet & Geoffrey Simatwa

Date: 17/07/2020

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11.4 Questionnaires for public consultation session held at Nayanae Angidapala area

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QUESTIONNAIRE FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF FAECAL SLUDGE TREATMENT FACILITY IN KAKUMA FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

A. RESPONDENTS VIEW

Kindly answer the questions bellow

1. Land Use

a) Characterize present land use where the proposed project would be located.

☐ Urban ☐ Industrial ☐ Commercial ☐ Agricultural

☐ Suburban ☐ Rural ☐ Residential ☐ Research Facilities

☐ Forest ☐ University Campus ☐ Other: Grazing Land.

b) Would the proposed project be located in or near local, state or county parks; forests; monuments; scenic waterways; wilderness; recreation facilities?

☑ No ☐ Yes (Describe)

_____

_____

2. Construction Activities and/or Operation

a) Would the proposed project affect any existing body of water? ☑ No ☐ Yes (Describe)

_____

_____

b) Would the proposed project impact a floodplain or wetland? ☑ No ☐ Yes(Describe)

_____

_____

c) Would the proposed project cause any sedimentation or soil erosion? ☑ No ☐ Yes(Describe)

_____

_____

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3. Vegetation and Wildlife Resources

a) Identity any National or County-Listed endangered or threatened plant or animal species that will be affected by the proposed project. ☑None **(if none skip to part 3c)**

b) Would any threatened or endangered species habitat be affected by the proposed project?

☑No ☐ Yes (Describe)

c) Would any migratory animal corridors be impacted or disrupted by the proposed project?

☑No ☑ Yes (Describe)

4. Socioeconomic Conditions

a) In your opinion, what kind of impacts that will be caused by the proposed project on economic development and people who live in this area? **(Tick appropriately)**

1) It will have benefit to the economic development and improvement of people's health in this area.
2) ✓ It will benefit the economic development but will have little benefit to the improvement of people's health in this area.
3) It will benefit the improvement of people's health in this area but will have little benefit to the economic development in this area.
4) It will have little benefit to the improvement of people's health in this area and economic development in this area

b) Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas? ☑No ☐ Yes (Describe)

5. Historical/Cultural Resources

1. Describe any historical, archaeological, or cultural sites in the vicinity of the proposed project. ☑None
2. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites? NO

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☐No planned construction ☐No historic sites ☐Yes (describe) ☐No Impact (discuss)

6. **Hydrologic Conditions/ water Quality**

a) What is the closest body of water to the proposed project area and what is its distance from the project site?

15 KM [KAKUMA TOWN]

b) What sources would supply potable and process water for the proposed project?

SINK BOREHOLE AROUND SITE

7. **Environmental/Social Impact**

a) As for environmental protection, what do you think will be the positive impacts and the negative impacts that will be caused by the proposed project? Whether the advantages of the project are more than the disadvantages or vice versa?

Positive Impacts: (Tick appropriately)

a) De-congest traffic
b) ✓ Create employment
c) ✓ Generate revenue
d) ✓ Increased land value and investment
e) ✓ Improve security in the area
f) ✓ Improved drainage
g) Improve hygiene in the area
h) Reduce soil erosion
i) Increased social interaction and cohesion
j) ✓ Reduction of water borne diseases

Other, (specify) _____

Negative Impacts: (Tick appropriately)

a) Land degradation
b) Soil erosion
c) Water depletion
d) ✓ Air quality impacts

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e) Noise pollution

f) Destruction of vegetation

Other (Please specify/state

b) Relationship between advantage and disadvantage: **(Tick appropriately)**

i. Advantage is more than disadvantage
ii. Disadvantage is more than advantage
iii. Advantage is equal to disadvantage

c) Besides the questions listed in this questionnaire, what do you think are the kind of environmental problem(s) might occur during the construction and operation phase of the project?

Movement of people to Site, Machine vibrations, public health hazard by ppl defecating in open, Noise

h) What kind of requirements and suggestions on environmental protection you may propose for the proposed project?

Fencing site, waste treatment to minimize odour Smell. Sprinkling of water during construction to minize dust and planting trees

B. RESPONDENT'S DETAILS

Name ALFRED KAPOKO KIMAT Date 17/7/2020

ID: 0143033 Phone No. 0728390037

COMMUNITY OPINION LEADER

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QUESTIONNAIRE FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF FAECAL SLUDGE TREATMENT FACILITY IN KAKUMA FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

A. RESPONDENTS VIEW

Kindly answer the questions bellow

1. Land Use

a) Characterize present land use where the proposed project would be located.

☐ Urban ☐ Industrial ☐ Commercial ☑ Agricultural

☐ Suburban ☐ Rural ☐ Residential ☐ Research Facilities

☐ Forest ☐ University Campus ☐ Other: GRAZING AREA

b) Would the proposed project be located in or near local, state or county parks; forests; monuments; scenic waterways; wilderness; recreation facilities?

☑ No ☐ Yes (Describe)

_____

_____

2. Construction Activities and/or Operation

a) Would the proposed project affect any existing body of water? ☑ No ☐ Yes (Describe)

_____

_____

b) Would the proposed project impact a floodplain or wetland? ☑ No ☐ Yes(Describe)

_____

_____

c) Would the proposed project cause any sedimentation or soil erosion? ☑ No ☐ Yes(Describe)

_____

_____

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3. Vegetation and Wildlife Resources

a) Identity any National or County-Listed endangered or threatened plant or animal species that will be affected by the proposed project. ☑ None **(if none skip to part 3c)**

b) Would any threatened or endangered species habitat be affected by the proposed project?

☑ No ☐ Yes (Describe)

c) Would any migratory animal corridors be impacted or disrupted by the proposed project?

☑ No ☐ Yes (Describe)

4. Socioeconomic Conditions

a) In your opinion, what kind of impacts that will be caused by the proposed project on economic development and people who live in this area? **(Tick appropriately)**

1) It will have benefit to the economic development and improvement of people's health in this area. ✓
2) It will benefit the economic development but will have little benefit to the improvement of people's health in this area.
3) It will benefit the improvement of people's health in this area but will have little benefit to the economic development in this area.
4) It will have little benefit to the improvement of people's health in this area and economic development in this area

b) Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas? ☑ No ☐ Yes (Describe)

5. Historical/Cultural Resources

1. Describe any historical, archaeological, or cultural sites in the vicinity of the proposed project. ☑ None
2. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites?

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☐ No planned construction ☐ No historic sites ☐ Yes (describe) ☐ No Impact (discuss)

_____

_____

6. **Hydrologic Conditions/ water Quality**

a) What is the closest body of water to the proposed project area and what is its distance from the project site?

_____

_____

b) What sources would supply potable and process water for the proposed project?

_____

_____

7. **Environmental/Social Impact**

a) As for environmental protection, what do you think will be the positive impacts and the negative impacts that will be caused by the proposed project? Whether the advantages of the project are more than the disadvantages or vice versa?

Positive Impacts: (Tick appropriately)

a) De-congest traffic
b) Create employment ✓
c) Generate revenue ✓
d) Increased land value and investment
e) Improve security in the area
f) Improved drainage ✓
g) Improve hygiene in the area ✓
h) Reduce soil erosion
i) Increased social interaction and cohesion
j) Reduction of water borne diseases

Other, (specify) _____

Negative Impacts: (Tick appropriately)

a) Land degradation
b) Soil erosion
c) Water depletion
d) Air quality impacts ✓

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e) Noise pollution

f) Destruction of vegetation

Other (Please specify/state

b) Relationship between advantage and disadvantage: **(Tick appropriately)**

i. Advantage is more than disadvantage ✓
ii. Disadvantage is more than advantage
iii. Advantage is equal to disadvantage

c) Besides the questions listed in this questionnaire, what do you think are the kind of environmental problem(s) might occur during the construction and operation phase of the project?

None

h) What kind of requirements and suggestions on environmental protection you may propose for the proposed project?

Fencing the Project to prevent intrusion

B. RESPONDENT'S DETAILS

Name ESA OPANDA Date 17/07/2020

ID: _____ Phone No. 0720933512

HEAD OF MAINTANCE DEPARTMENT
LODWAR MISSION HOSPITAL

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QUESTIONNAIRE FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF FAECAL SLUDGE TREATMENT FACILITY IN KAKUMA FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

A. RESPONDENTS VIEW

Kindly answer the questions bellow

1. Land Use

a) Characterize present land use where the proposed project would be located.

☐ Urban ☐ Industrial ☐ Commercial ☐ Agricultural

☐ Suburban ☑ Rural ☐ Residential ☐ Research Facilities

☐ Forest ☐ University Campus ☐ Other: _____

b) Would the proposed project be located in or near local, state or county parks; forests; monuments; scenic waterways; wilderness; recreation facilities?

☐ No ☑ Yes (Describe)

TURKANA County.

2. Construction Activities and/or Operation

a) Would the proposed project affect any existing body of water? ☑ No ☐ Yes (Describe)

b) Would the proposed project impact a floodplain or wetland? ☑ No ☐ Yes(Describe)

c) Would the proposed project cause any sedimentation or soil erosion? ☑ No ☐ Yes(Describe)

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3. Vegetation and Wildlife Resources

a) Identity any National or County-Listed endangered or threatened plant or animal species that will be affected by the proposed project. ☐None **(if none skip to part 3c)**

b) Would any threatened or endangered species habitat be affected by the proposed project?

☑No ☐ Yes (Describe)

c) Would any migratory animal corridors be impacted or disrupted by the proposed project?

☑No ☐ Yes (Describe)

4. Socioeconomic Conditions

a) In your opinion, what kind of impacts that will be caused by the proposed project on economic development and people who live in this area? **(Tick appropriately)**

1) It will have benefit to the economic development and improvement of people's health in this area.

✓2) It will benefit the economic development but will have little benefit to the improvement of people's health in this area.

3) It will benefit the improvement of people's health in this area but will have little benefit to the economic development in this area.

4) It will have little benefit to the improvement of people's health in this area and economic development in this area

b) Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas?☑No ☐ Yes (Describe)

5. Historical/Cultural Resources

1. Describe any historical, archaeological, or cultural sites in the vicinity of the proposed project. ☑None

2. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites?

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☐ No planned construction ☑ No historic sites ☐ Yes (describe) ☐ No Impact (discuss)

6. **Hydrologic Conditions/ water Quality**

a) What is the closest body of water to the proposed project area and what is its distance from the project site?

NAKOYO 10 Km.

b) What sources would supply potable and process water for the proposed project?

7. **Environmental/Social Impact**

a) As for environmental protection, what do you think will be the positive impacts and the negative impacts that will be caused by the proposed project? Whether the advantages of the project are more than the disadvantages or vice versa?

Positive Impacts: (Tick appropriately)

a) De-congest traffic
✓ b) Create employment
✓ c) Generate revenue
d) Increased land value and investment
e) Improve security in the area
f) Improved drainage
✓ g) Improve hygiene in the area
h) Reduce soil erosion
i) Increased social interaction and cohesion
j) Reduction of water borne diseases

Other, (specify) _____

Negative Impacts: (Tick appropriately)

a) Land degradation
b) Soil erosion
c) Water depletion
d) Air quality impacts

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e) Noise pollution

f) Destruction of vegetation

Other (Please specify/state air pollution if not treated well.

b) Relationship between advantage and disadvantage: **(Tick appropriately)**

✓ i. Advantage is more than disadvantage

ii. Disadvantage is more than advantage

iii. Advantage is equal to disadvantage

c) Besides the questions listed in this questionnaire, what do you think are the kind of environmental problem(s) might occur during the construction and operation phase of the project?

May be dust effect during construction of the project.

h) What kind of requirements and suggestions on environmental protection you may propose for the proposed project?

Controlling of odour smell in the constructed project.
plant trees around the site.

B. RESPONDENT'S DETAILS

Name COSMAS NAKA'AA 'E. Date 17/07/2020

ID: 12909203 Phone No. 0717600094

Area chief -17/07/2020

CHIEF KAKUMA LOCATION

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QUESTIONNAIRE FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF FAECAL SLUDGE TREATMENT FACILITY IN KAKUMA FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

A. RESPONDENTS VIEW

Kindly answer the questions bellow

1. Land Use

a) Characterize present land use where the proposed project would be located.

☐ Urban ☐ Industrial ☐ Commercial ☑ Agricultural

☐ Suburban ☐ Rural ☐ Residential ☐ Research Facilities

☐ Forest ☐ University Campus ☐ Other:_____

b) Would the proposed project be located in or near local, state or county parks; forests; monuments; scenic waterways; wilderness; recreation facilities?

☑ No ☐ Yes (Describe)

_____

_____

2. Construction Activities and/or Operation

a) Would the proposed project affect any existing body of water? ☑ No ☐ Yes (Describe)

_____

_____

b) Would the proposed project impact a floodplain or wetland? ☑ No ☐ Yes(Describe)

_____

_____

c) Would the proposed project cause any sedimentation or soil erosion? ☑ No ☐ Yes(Describe)

_____

_____

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3. Vegetation and Wildlife Resources

a) Identity any National or County-Listed endangered or threatened plant or animal species that will be affected by the proposed project. ☑ None **(if none skip to part 3c)**

b) Would any threatened or endangered species habitat be affected by the proposed project?

☑ No ☐ Yes (Describe)

c) Would any migratory animal corridors be impacted or disrupted by the proposed project?

☑ No ☐ Yes (Describe)

4. Socioeconomic Conditions

a) In your opinion, what kind of impacts that will be caused by the proposed project on economic development and people who live in this area? **(Tick appropriately)**

1) It will have benefit to the economic development and improvement of people's health in this area.
2) It will benefit the economic development but will have little benefit to the improvement of people's health in this area.
3) It will benefit the improvement of people's health in this area but will have little benefit to the economic development in this area.
4) ✓ It will have little benefit to the improvement of people's health in this area and economic development in this area

b) Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas? ☑ No ☐ Yes (Describe)

5. Historical/Cultural Resources

1. Describe any historical, archaeological, or cultural sites in the vicinity of the proposed project. ☑ None
2. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites?

☐ No planned construction ☑ No historic sites ☐ Yes (describe) ☐ No Impact (discuss)

6. Hydrologic Conditions/ water Quality

a) What is the closest body of water to the proposed project area and what is its distance from the project site?

15 Kilometres

b) What sources would supply potable and process water for the proposed project?

No

7. Environmental/Social Impact

a) As for environmental protection, what do you think will be the positive impacts and the negative impacts that will be caused by the proposed project? Whether the advantages of the project are more than the disadvantages or vice versa?

Positive Impacts: (Tick appropriately)

a) ✓ De-congest traffic
b) ✓ Create employment
c) ✓ Generate revenue
d) ✓ Increased land value and investment
e) ✓ Improve security in the area
f) ✓ Improved drainage
g) ✓ Improve hygiene in the area
h) ✓ Reduce soil erosion
i) ✓ Increased social interaction and cohesion
j) ✓ Reduction of water borne diseases

Other, (specify) _____

Negative Impacts: (Tick appropriately)

a) Land degradation
b) Soil erosion
c) Water depletion
d) ✓ Air quality impacts

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e) Noise pollution

f) Destruction of vegetation

Other (Please specify/state

b) Relationship between advantage and disadvantage: **(Tick appropriately)**

i. Advantage is more than disadvantage
ii. Disadvantage is more than advantage
iii. Advantage is equal to disadvantage

c) Besides the questions listed in this questionnaire, what do you think are the kind of environmental problem(s) might occur during the construction and operation phase of the project?

N/a

h) What kind of requirements and suggestions on environmental protection you may propose for the proposed project?

It will improved water

B. RESPONDENT'S DETAILS

Name SAMUEL EMOJA Date 11/7/2020

ID: 33350753 Phone No. 0700684423

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QUESTIONNAIRE FOR ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED CONSTRUCTION OF FAECAL SLUDGE TREATMENT FACILITY IN KAKUMA FOR REFUGEE AND HOST COMMUNITIES IN KAKUMA, TURKANA WEST SUB COUNTY, KENYA

A. RESPONDENTS VIEW

Kindly answer the questions bellow

1. Land Use

a) Characterize present land use where the proposed project would be located.

☐ Urban ☐ Industrial ☐ Commercial ☐ Agricultural

☐ Suburban ☑ Rural ☐ Residential ☐ Research Facilities

☐ Forest ☐ University Campus ☐ Other: _____

b) Would the proposed project be located in or near local, state or county parks; forests; monuments; scenic waterways; wilderness; recreation facilities?

☑ No ☐ Yes (Describe)

_____

_____

2. Construction Activities and/or Operation

a) Would the proposed project affect any existing body of water? ☑ No ☐ Yes (Describe)

_____

_____

b) Would the proposed project impact a floodplain or wetland? ☑ No ☐ Yes(Describe)

_____

_____

c) Would the proposed project cause any sedimentation or soil erosion? ☑ No ☐ Yes(Describe)

_____

_____

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3. Vegetation and Wildlife Resources

a) Identity any National or County-Listed endangered or threatened plant or animal species that will be affected by the proposed project. ☑ None **(if none skip to part 3c)**

b) Would any threatened or endangered species habitat be affected by the proposed project?

☐ No ☐ Yes (Describe)

c) Would any migratory animal corridors be impacted or disrupted by the proposed project?

☑ No ☐ Yes (Describe)

4. Socioeconomic Conditions

a) In your opinion, what kind of impacts that will be caused by the proposed project on economic development and people who live in this area? **(Tick appropriately)**

1) It will have benefit to the economic development and improvement of people's health in this area.
2) It will benefit the economic development but will have little benefit to the improvement of people's health in this area.
3) It will benefit the improvement of people's health in this area but will have little benefit to the economic development in this area.
4) It will have little benefit to the improvement of people's health in this area and economic development in this area

b) Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas? ☑ No ☐ Yes (Describe)

5. Historical/Cultural Resources

1. Is/are any historical, archaeological, or cultural sites in the vicinity of the proposed project.

☑ No

2. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites?

No

4) It will have little benefit to the improvement of people's health in this area and economic

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e) Noise pollution

f) Destruction of vegetation

Other (Please specify/state

b) Relationship between advantage and disadvantage: **(Tick appropriately)**

i. Advantage is more than disadvantage
ii. Disadvantage is more than advantage
iii. Advantage is equal to disadvantage

c) Besides the questions listed in this questionnaire, what do you think are the kind of environmental problem(s) might occur during the construction and operation phase of the project?

Air pollution (dust during excavation

h) What kind of requirements and suggestions on environmental protection you may propose for the proposed project?

- Environmental protection - planting of trees around the project area.
- Generation of waste by products eg fertilizer from the human waste.

F. RESPONDENT'S DETAILS

(1)

Name: MAITO ELPHAS Date: 28/07/2020

ID: 24614888 Phone No. 0725303130

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11.5 EIA practicing licensing for Ecowest (K) General Supply Consultancy and Construction Services

FORM 7 (r.15(2))

nema
mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)
THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

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

License No : NEMA/EIA/ERPL/11806
Application Reference No: NEMA/EIA/EL/15897

M/S **ECOWEST (K) GENERAL SUPPLY CONSULTANCY AND CONSTRUCTION...**
(individual or firm) of address

P.O. Box 370-50205, WEBUYE

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Firm of Experts**
registration number **11290**

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

Issued Date: **2/17/2020** Expiry Date: **12/31/2020**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified

11.6 Land ownership documents

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