



MURANG'A SOUTH WATER AND SANITATION COMPANY (MUSWASCO)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF DECENTRALIZED TREATMENT FACILITY AT SABASABA



Consultant



JUNE, 2020

DOCUMENT CONTROL”

DECENTRALIZED TREATMENT FACILITY IMPROVEMENT PROJECT

EMPLOYER:

**MURANG’A SOUTH WATER AND SANITATION COMPANY
(MUSWASCO)**

CONSULTANT

Losai Management Limited

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ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT STUDY REPORT

Final Report

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SUBMISSION DETAILS**Certificate of Declaration and Document Authentication**

This document has been prepared in accordance with the Environmental Management and Coordination Act 1999 amended in 2015 and Environmental (Impact Assessment and Audit) (amendment) Regulations, 2019

This report is prepared for and on behalf of:

LEAD EXPERT	PROPONENT
<p>LOSAI MANAGEMENT LTD P.O BOX 30337-00100 Nairobi Kenya FAX: +254.20.263.2996 TEL: +254.788.352.533, + 254.20.263.2996, +254.718.875.310 Email: info@losaimanagement.com</p> <p>Name : <u>Eng.Lawrence Mwangi</u></p> <p>Designation : <u>Lead Expert</u></p> <p>NEMA Reg. <u>Cert No: 0317</u></p> <p>Signed <u></u></p> <p>Date: <u>09.06.2020</u></p>	<p>MURANG'A SOUTH WATER AND SANITATION COMPANY P.O. Box 87- 01034 Kandara. Kenya TEL: +254.716645345: +254.705385803 / +254.716645343 Email: murangasouthwater@yahoo.com or murangasouth@gmail.com</p> <p>Name: <u>John Macharia W</u></p> <p>Designation: <u>Technical Services Manager</u></p> <p>Signed <u></u></p> <p>Date: <u>09.06.2020</u></p> 

DISCLAIMER:

This Environmental Impact Assessment Study Report is based on literature review and findings from field assessment. It is however, subject to conditions in the Environmental Management and Coordination Act 1999 and amended in 2015 and Environmental (Impact Assessment and Audit) (amendment) Regulations, 2019.

FACT SHEET

Assignment Name	Environmental & Social Impact Assessment for the Proposed Decentralized Treatment Plant at Sabasaba
Lead Implementing Agency	Murang'a South Water and Sanitation Company Ltd (MUSWASCO)
Funding Agencies	Water Sector Trust Fund/WB
Project Components	<ul style="list-style-type: none"> • Receiving bay/balancing tank, • Anaerobic baffled reactor, • Anaerobic filter, • Series of constructed wetlands
Project Location	Murang'a County- Sabasaba, Maragua and their surrounding environment
Client	Murang'a South Water and Sanitation Company Ltd (MUSWASCO)
Lead Expert	Eng. Lawrence Mwangi Reg. Nr. 0317
Associate Experts	Lydia Mbogo-9826 Elam Babu

ABBREVIATIONS & ACRONYMS

CEMMP	Construction Environmental Management and Monitoring Plan
DTF	Decentralized Treatment Facility
EHS	Environment Health and Safety
ESIA	Environmental and Social Impact Assessment
EIA	Environmental Impacts Assessment
EHS	Environmental Health and Safety
GoK	Government of Kenya
HSP	Health and Safety Plan
EMCA	Environmental Management and Coordination Act
EMMP	Environmental Management & Monitoring Plan
ESIA	Environmental and Social Impact Assessment
MoWSI	Ministry Of Water, Sanitation and Irrigation
MUSWASCO	Murang'a South Water and Sanitation Company
NEMA	National Environment Management Authority
NEP	National Environment Policy
OSHA	Occupational Health and Safety Act
PAPs	Project Affected Persons
PPEs	Personal Protective Equipment
TOR	Terms of Reference
UBSUP	Up scaling Basic Sanitation for the Urban Poor
WIBA	Work Injuries and Benefit Act
WRA	Water Resources Authority
WRUA	Water Resource Users Association
WSP	Water Services Provider

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EXECUTIVE SUMMARY

E-1 Project Information

This Report is an Environmental and Social Impact Assessment Study (ESIA) Project Report for the proposed Sewerage Infrastructure for Sabasaba, Maragua and their surrounding areas to be financed by World Bank and implemented through Water Sector Trust Fund (WSTF). This initiative is under the umbrella of Up scaling Basic Sanitation for the Urban Poor (**UBSUP**) and involves Construction of DTF of capacity 50 m³/day in Sabasaba town-Murang'a County. The project will be of benefit to the low-income households in the urban and rural areas in the project area.

The Terms of reference (TOR) to approve undertaking of the study was submitted to the National Environment Management Authority (NEMA) for review on 22nd April 2020 under NEMA /TOR/5/2/89. Upon review of the TOR an approval to subject the project to a Full Study as required by Environment Impact Assessment and Audit Regulations 2003 with 2019 amendments was issued on 14th May 2020. The facility will serve Sabasaba and Maragua towns and their environs.

The Proposed facility will include the following components:

- Receiving bay/balancing tank,
- Anaerobic baffled reactor,
- Anaerobic filter,
- Series of constructed wetlands

The whole system is designed for effluent to be discharged for re-use near the point of origin. The effluent can also be used for aquaculture and irrigation.

The Sabasaba DTF is designed to handle 50m³ of waste per day, this ensures that all waste delivered can be treated for safe standard discharge of effluent into the Sabasaba river.

Table E-1: System components

Section1	Section2	Section3	Section4
Primary treatment	Secondary treatment		Tertiary treatment
Balancing tank (Septic tank)	Baffled reactor	Anaerobic filter	Constructed wetland

This is a Sedimentation Tank which stabilizes settled sludge by anaerobic digestion	Here Anaerobic Degradation of suspended and dissolved solids takes place.	Water passes Through filter media	Open shallow Basin filled with gravel/ pebbles to support growth of plant/reeds with shallow roots
Dissolved and suspended matter leave tank untreated	The structure has 2–5 chambers depending on the treatment required	Enhances digestion of organic matter	Reduces organic contents and acts as filter mechanism– Exposure to UV rays Removes odour and pathogens
The following parameters are removed at the below listed margins. COD by 20-25%, BOD by 15-20%, TSS by 50-55%	The following parameters are removed at the below listed margins. COD by 25-30%, BOD by 30-35%, TSS by 10-15%	The following parameters are removed at the below listed margins. COD by 20-25%, BOD by 15-20%, TSS by 15-20%	The following parameters are removed at the below listed margins. COD by 15-20%, BOD by 20-25%, TSS by 5-10%

E-2 Legal and Regulatory Instruments

This Report has presented the relevant policies, legislation and institutional frameworks that guide preparation of ESIA, National, county level and World Bank Environmental and Social Safeguards Policies as defined in the Bank's Operational Procedures (OPs).

Policy provisions included in this report are; Constitution of Kenya 2010, Kenya Vision 2030, National Environment Policy (NEP) 2013, HIV and AIDS Policy 2009, National Land Policy 2009, Gender Policy 2011, Kenya National Youth Policy 2006, the Sustainable Development Goals (SDGs).

Acts of Parliament applicable that have been detailed in the report include; EMCA 2015, Land Act 2012, Water Act 2016, Physical Planning Act 1996 (286), The Urban Areas and Cities Act 2011, Occupational Health and Safety Act (OSHA 2007), The Public Health Act (Cap.242), HIV and AIDS Prevention and Control Act 2011, Sexual Offences Act 2006, Child Rights Act (Amendment Bill) 2014, Labour Relations Act 2012 and National Gender and Equality Commission Act 2011

The assessment has also made reference to the World Bank Environmental and Social Standards. These operational procedures include:

- OP 4.01 Environmental Assessment;

- OP 4.04 Natural Habitats;
- OP 4.09 Pest Management;
- OP 4.11 Cultural Heritage;
- OP 4.12 Involuntary Resettlement;
- OP 4.10 Indigenous People;
- OP 4.36 Forests;
- OP 4.37 Safety of Dams;
- OP 7.50 Projects on International Waterways;
- OP 7.60 Projects in Disputed Areas.

E-3 Highlights of Stakeholder Consultations

Environmental Impact Assessment/Audit Regulations of 2003 with 2019 amendments require that in the process of conducting Scoping, Environmental Impact Assessment, the proponent shall in consultation with the Authority herein referred to as the National Environment Management Authority (NEMA); seek the views of persons who may be affected by the Project.

To comply with the above discussed statues, consultation at Project Report Stage of the ESIA involved consultations with key stakeholders in Maragua and Sabasaba including Muranga County Government officials.

The method of engagement were limited to one on one interviews and responding to the questionnaire via email (filled questionnaires annexed 3). This was to ensure compliance with GoK Circulars on the ban of public gatherings to curb spread of COVID-19.

E-4 Project Impacts

Assessment of project impacts was based on analysis of the proposed project components and existing environmental conditions. The impacts arising during each of the phases of the proposed development namely construction, operation and decommissioning, can be categorized into:

- Impacts on biophysical environment;
- Health and safety impacts; and
- Social-economic impacts

Sections E.4.1 to E.4.4 below provides a summary of the project impacts both positive and negative discussed in this Report.

E-4.1 Positive Impacts during Construction Phase

The Project is envisaged to have positive impacts after completion of the civil works and commissioning.

A summary of anticipated positive impacts of the Project include:

- Employment opportunities during construction, unskilled labour force to be sourced locally and the earnings from the wages will improve their living standards.
- Creation of Wealth-Provision of ready market for construction materials such as sand, ballast and cement that will be sourced from local market, this will lead to injection of money into the local economy

- The Project will be associated with technological and knowledge transfer to the local sector, this will be through the artisan who will be employed and trained by the Project.
- Reduced cases of water borne diseases associated with pollution of water resources

E-4.2 Positive Impacts during Operation Phase

The Project shall result in both direct and indirect benefits to the residents of Maragua and Sabasaba urban areas and their surrounding as summarized below:

- Reduce cases of water borne diseases associated with pollution of water resources
- Improve Health and Sanitation status of Maragua and Sabasaba urban areas and their surrounding environs
- Reduce pollution of natural river systems which include Sabasaba River and numerous springs within the Project area.
- Trigger development of modern infrastructure within Maragua and Sabasaba urban areas and their surrounding due to availability of sewer infrastructure
- Reduce distances covered by exhausters to sludge discharge points eventually reducing costs.
- Residents will decommission pit latrines which are expensive to construct and unsustainable due to short fill-up duration.
- Improve aesthetic outlook of Maragua and Sabasaba urban areas and their surrounding environs
- Reduce distances covered by exhausters to existing sludge discharge points eventually reducing costs.
- Improve Health and Sanitation status of Maragua and Sabasaba urban areas and their surrounding environs
- Reduce pollution of natural river systems which include Sabasabna River and numerous springs within the project area.
- Trigger development of modern infrastructure within Maragua and Sabasaba urban areas and their surrounding environs due to availability of sewer infrastructure

E-4.3 Negative Impacts and Mitigation Measures during Project Construction Period

Activities during the Construction Phase with potential to trigger negative environment and social impacts include the following;

- i) Manual excavation
 - ii) Temporary stockpiling of soils, sub-soils and rock along the trenches
- Dust

Table E-3 below provides a summary of potential negative impacts and proposed mitigation measures.

Table E-3 Negative Impacts and Proposed Mitigation Measures during Construction Phase

Impact	Summary of Mitigations
Bio-physical Environment	

Impact	Summary of Mitigations
Vegetation clearing , soil erosion and siltation at the DTF site	<ul style="list-style-type: none"> • Re-plant the indigenous vegetation as much as practicably possible once work is completed. • Re-vegetation of exposed areas around the site should be carried out rapidly in order to mitigate against erosion of soil through surface water runoff and wind erosion • Retain all mature trees(>25cm diameter at breast height during this phase of development if possible) • Limit vegetation clearance to absolute necessary for construction activities. • Contain excavated soils so that they will not find their way into nearby water sources; • Cement mixing should be done in a designated area away at a safe distance from storm water drains;
Solid waste generation from construction activities	<ul style="list-style-type: none"> • A site waste management plan should be prepared by the Contractor prior to commencement of construction works. This should include designation of appropriate waste storage areas, collection and removal schedule and identification of approved disposal site; • Ensure that the solid waste collection, segregation, and disposal system is functioning properly at all times during the construction phase; • Proper solid waste receptacles and storage containers should be provided, particularly for the disposal of lunch and drink boxes so as to prevent littering of the site
Water pollution of river Sabasaba and associated springs by construction activities which include solid and effluents waste	<ul style="list-style-type: none"> • Isolate solid wastes disrupted from the works during excavations for safe disposal. The wastes should be collected and disposed in approved sites. • Earth moving and excavations for the construction are carried out considering safety of the river and surface drainage. Control siltation of rivers and other surface drains. • Spilled cement or concrete should be collected and disposed away from natural water ways or storm water drainage feeding into the river • Gabions to be constructed along the river bend to prevent the possibility of unprecedented disposal from construction materials.
Health and Safety Impact	
Air pollution	<ul style="list-style-type: none"> • Maintain construction equipment at high operational conditions such as to control emissions into the air. • Earth moving be done under damp conditions as much as possible to prevent emission of dust into the air, • Similarly, piled materials (sand and aggregate) should be maintained dump to prevent dust emissions, • Ensure all vehicles involved in the transport of construction materials, equipments, staff and machinery involved in the construction are well maintained and serviced to control gas emissions. • Use of dust control methods such as covers, water suppressions or increased moisture content for open materials storage piles, or particular matter controls

Impact	Summary of Mitigations
Excessive vibration and Noise Pollution	<ul style="list-style-type: none"> • Avoid night time construction when noise is loudest; • Conduct periodic noise measuring and monitoring to determine levels and extent of harmful noise; • Clearly label the high noise areas; • Provide personal protective equipment (PPE) including masks, goggles, scarfs, boots and overalls among other protective clothing to persons operating within or visit identified high noise areas.
Occupational health and safety risks associated with the Project	<ul style="list-style-type: none"> • Ensure compliance with OSHA ACT. • There should be safety policy and safety signage clearly displayed on site. • Appoint a trained and equipped health and safety team for the duration of the construction work to monitor and advise appropriately on health and safety matters during the project implementation • Establish a Health and Safety Plan (HASP) for civil works areas ensuring the working hours are controlled and that employees are not allowed to extend the working hours beyond an acceptable limit for purposes of gaining extra pay; • Provide workers with gloves, ear gears, sturdy rubber boots and overalls to protect their skin from the effects of cement; • Provide workers training on safety procedures and emergency response such as fire and sewer pipe bursts;
Spread of communicable diseases and HIV/AIDS infection	<ul style="list-style-type: none"> • Develop appropriate training and awareness materials for Information, Education and • Develop an intervention strategy compatible with the construction programme to address success of the HIV/AIDS prevention and provide peer educators for sustainability in collaboration with other stakeholders; and • Integrate monitoring of HIV/AIDS preventive activities as part of the construction supervision. Basic knowledge, attitude and practices are among the parameters to be monitored, and particularly on provision of condoms, status testing and use of ARVs
Labour Influx to the Project area.	<ul style="list-style-type: none"> • Effective community engagement and strong grievance mechanisms on matters related to labour. • Effective contractual obligations for the contractor to adhere to the mitigation of risks against labour influx • Proper records of labour force on site while avoiding child and forced labour • Fair treatment, non-discrimination and equal opportunity of workers. • Comply to provisions of Labour Relations Act 2012 and Work Place Injuries and Benefits Act (WIBA 2007) <p>The Contractor shall require his employees, sub-contractors, sub-consultants, and any personnel thereof engaged in construction works to individually sign and comply with a Code of Conduct.</p>
Violation of Human Rights, and gender requirement by Contractors	<ul style="list-style-type: none"> • Mainstream Gender Inclusivity in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 gender rule and National Gender and Equality Commission Act 2011

Impact	Summary of Mitigations
	<ul style="list-style-type: none"> Protecting human risk areas associated with, disadvantaged groups, interfering with Participation Rights and Labour Rights The contract will provide provisions that ensures that gender based violence and abuse are not triggered by the Project as provided for by Sexual Offences Act 2006
Violation of children right by contractor and labour force on site.	<ul style="list-style-type: none"> Develop and implement a Children Protection Strategy that will ensures minors are protected against negative impacts associated by the Project. All staff of the contractor must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behaviour Children under the age of 18 years should be hired on site as provided by Child Rights Act (Amendment Bill) 2014

E-4 4 Project Negative Impacts and Mitigation Measures during Operation Phase

The Project once commissioned has the potential of triggering negative impacts associated with operation and maintenance as summarized in **Table E-4.4** below.

Table E-4.4 Negative Impacts and Mitigation Measures during Project Operation Phase

Issue	Summary of Mitigation
Odour Menace from Wastewater Treatment Works	<ul style="list-style-type: none"> Ensure appropriate covering/ventilation of the pre-treatment unit; Ensure appropriate handling and removal of grit/grease;-Storage of screenings and grit in closed containers (dumpsters) instead of on the ground and ensuring all waste is hauled off-site on a scheduled and timely basis. The design of the DTF to incorporate short residence time, minimization of sediments deposition by flushing wastes as part of maintenance to remove settled solids and adoption of corrosion resistant construction materials. Ensure proper sizing and alignment of the chambers; Ensure scum is appropriately disposed off or properly stabilized;
Flooding	<ul style="list-style-type: none"> Site drainage system should be made to recommended standards and maintained
Waste Generation and Disposal	<ul style="list-style-type: none"> 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 or landfill.
Transportation/Traffic	<ul style="list-style-type: none"> Limit sepatage 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.

Septage Disposal	<ul style="list-style-type: none"> • 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.
Emergency Response	<ul style="list-style-type: none"> • 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 organizations/agencies i.e. St. John's Ambulance, Red Cross to prepare for any eventuality
Inversion of Birds and Reptiles to the Waste Water Treatment Works	<ul style="list-style-type: none"> • The sewage treatment plants should be protected from wildlife encroachments by providing secure barriers to keep off the animals from interfering with the plant operations and safety. This will also ensure safety of the residents, • The quality of the discharging sewage into the river will be an important parameter on the regional control of the river eutrophication. Continuous generation and sharing of sewage quality data on pre-scheduled monitoring programmes will be necessary

E-5 Findings and Conclusion

The Main Findings from the assessment described in the Report are as follows:

- a) The project design has ensured that the project is constructed within Public reserves and no private land will be acquired, therefore OP 4.12 will not be triggered
- b) The Environmental and Social Scoping undertaken for the project indicate that the investment will result in low impact on biological environment; however, the Project triggers World Bank Operation Policy (OP) 4.01 on Environmental Assessment.
- c) Provisional Budget is required for implementation of mitigation measures of potential negative environmental impacts identified in the report.
- d) The overall objective of project is to improve the health and safety of people of Sabasaba through provision sanitation services by control of septage.

The Environmental and Social Impact Assessment undertaken for the Project indicates that the Project will have the following impacts:

- (i) The Project area is located Maragua constituency, Kamahuha ward kaharati sub location, the project area is away from any sensitive environment ecosystems. The assessment identified that there will be no direct interaction of the Project activities at the time of construction with the natural sensitive ecosystems.
- (ii) The Environment impacts will be less significant impacts as discussed in Chapter 7 of this assessment. However, it could result to significant water pollution impacts to Sabasaba River if not appropriately operated and maintained.

The proposed project will benefit the urban poor in Sabasaba, Maragua and environs. The importance of

the proposed project to the national development and the local community cannot be emphasized. The project is technically feasible, financially and economically viable, with important social economic benefits as well as being environmentally sustainable and will support the government goal of providing the people of the project area with improved sanitation services. This will drastically improve the general hygiene of the project population.

E-6 Recommendations

This assessment recommends the following provisions:

- (i) The Bid documents prepared for the Project incorporate the Environment, Social Health and Safety Provisions discussed under Chapter 7 (Environment and Social Impact Assessment and Mitigation Measures).
- (ii) The proponent to be given all the available support to implement this noble project.
- (iii) The licensing authority to issue the necessary licenses so that the work can commence
- (iv) Contractor will be required to commit to implementing the Environment, Social Health and Safety (ESHS) Provisions by developing site-specific (ESHS) plans.
- (v) At Project implementation stage, the Contractor to report to the Project management team comprising of the Consultant and the Project proponent on a monthly basis on how ESHS provision detailed in this ESIA are addressed at each Project Site.
- (vi) On completion of the Civil Works, MUSWASCO to commission an independent Consultant to undertake an initial Environment, Social, Health and Safety Audit as required by Environment Impact Assessment and Audit Regulations of 2003. The audit will identify nonconformities which the Contractor together with MUSWASCO will address through the defects liability period of the Project. This audit will also form basis of annual Project self-audits by MUSWASCO.

On the basis of the above discussions, it can be concluded that the proposed project is environmentally, legally and socially acceptable. The potential significant environmental impacts can be adequately mitigated by the proposed measures and it is the responsibility of the proponent and all other actors to see to it that the measures are implemented. This way, the environmental threats will be downscaled to acceptable levels.

It is on the basis of the above, that it is recommended that the project be issued with the necessary clearance for the project to commence implementation.

CHAPTER 1 : INTRODUCTION

1.1 General Background

Murang'a South Water & Sanitation Company (MUSWASCO) is a Water Service Provider licensed by WASREB to provide water and sanitation services in Kandara, Kigumo and Murang'a South Sub-Counties within Murang'a County. The MUSWASCO's service area is approximately 1000 km² and has an estimated population of 456,269. On the other hand, Water Sector Trust Fund (WSTF), a State Corporation under the Ministry of Water and Sanitation (MoWS) and established under the Water Act, 2016 has been supporting utilities to take up the mandate of sanitation management in urban areas. It is in this regard that MUSWASCO has benefited with funds to construct the Decentralized Treatment Facility (DTF) in Sabasaba Town.

The facility will serve Sabasaba and Maragua towns and their environs. Septage will be collected from latrines and septic tanks by exhausters and then treated at the treatment plant. This initiative is pro-poor and will be of benefit to the low-income households in the urban and rural areas in the project area.

1.2 Water Service Provider

Murang'a South Water & Sanitation Company (MUSWASCO) is one of the Water Service Providers incorporated under the Companies Act (Cap. 486) and licensed by WASREB to provide water and sanitation services in Kandara, Kigumo and Murang'a South Sub-Counties within Murang'a County.

1.3 Objectives of the Project

The general objective of the proposed construction of a Decentralized Treatment Facility is to provide sanitation services to serve Sabasaba, Maragua and their surrounding environs. This is in consistent with activities that Water Sector Trust Fund (WSTF) has been undertaking to support utilities to take up sanitation management in urban areas.

1.4 Scope of the Project

The scope of the works for the project is as follows:

- construction of a receiving bay/balancing tank,
- construction of Anaerobic baffled reactor,
- construction of anaerobic filter and
- construction of a Series of constructed wetlands

1.5 Project Justification

Sabasaba and Maragua towns are low income peri-urban settlement situated along the Kenol –Muranga road. The more urbanized parts of Saba Saba and Maragua are settled by low income communities largely consisting of labourers and low income earners who depend on trade in the town and the adjacent towns. The outer parts of Saba Saba are mainly rural in nature settled by small scale agricultural farmers and agricultural workers. Sabasaba area is noted to be experiencing high rate of growth.

Currently, Sabasaba, Maragua and their surrounding environs have no water borne sewerage system. Residents rely entirely on onsite sanitation that includes septic tanks and pit latrines which are expensive to construct and unsustainable due to short fill-up duration. In addition those with septic tanks rely on private exhausters that are expensive.

1.6 Significance of the Project

The project will contribute towards solving the wastewater related problems in Sabasaba, Maragua and their surrounding areas and this will go far in reducing cases of water related diseases.

The project will also lead to realization of the Sustainable Development Goal (6) which is the new 2030 agenda and expands Millennium Development Goal as guided by resolutions of Rio+20 conference. The goal focuses more on investment in adequate infrastructure in water sanitation, Hygiene, water quality, waste Water Management, water scarcity and use efficiency, integrated water resource management and protection of water related ecosystems

1.7 Objectives of ESIA Assessment

1.7.1 General Objective

The purpose of an environmental assessment (EA) is to aid decision making and to ensure that the project under consideration is environmentally and socially sound and sustainable.

This ESIA assessment has been conducted in compliance with the Environmental Impact Assessment Regulation as outlined under the Gazette Notice No. 56 of 2003 amended in 2019 established under the Environmental Management and Coordination Act (EMCA), 1999 (Amended in 2015)

1.7.2 Specific Objectives of ESIA Investigations

This Environmental & Social Impact Assessment (ESIA) is expected to achieve the following objectives:

- i) To present existing environmental, social and cultural setting of the target project area
- ii) To identify potential environmental and social impacts (direct and indirect), including opportunities for enhancement; this includes the cumulative impact of the proposed project and other developments which are anticipated;

- iii) To generate feasible alternative investments, sites, technologies, and designs,
- iv) To provide preventive, mitigating, and compensatory measures
- v) To provide detailed results of the public consultation and
- vi) To prepare an Environmental and Social Management and monitoring Plan to mitigate the identified impacts so as to ensure sustainability of the proposed Projects.
- vii) To recommend cost effective measures to be implemented to mitigate against the expected impacts

1.8 ESIA Approach and Methodology

The ESIA was carried out in line with the provisions of the Environmental Management and Coordination Act, 1999 and the Amendment Act of 2015 and the Environmental (Impact Assessment and Audit) Regulations 2003 emended in 2019

1.8.1 Literature Review

The Consultant reviewed literature related to the proposed project and the project area. These included project drawings ,project description for the DTF, and other studies on physiography, geology, hydrogeology, water resources and socio-economics of the project area. Legislation, policies and procedures in social and environmental management were also reviewed.

1.8.2 Scoping

A scoping exercise was carried out to determine the range of issues to be addressed in the ESIA, the significant issues that would need detailed study and those that were not significant. Determination of the boundaries of the ESIA in terms of the geographical extent and timing was also done. The outcome of the scoping exercise was a Terms of Reference (ToR) which was prepared and submitted to NEMA on 24th April 2020 for approval in accordance with the Regulations. The ToR was approved on 14th May (annex 2) enabling progress to detailed ESIA study.

1.8.3 Baseline Data Collection

Baseline data was collected on the proposed project site and the immediate neighbourhood. The data collection begun in April 2020 during field reconnaissance and continued through the detailed ESIA study phase.

The data collected was on aspects such as: topography; local flora and fauna; soils and geology; socioeconomic, existing and past activities including human settlements; local surface and ground water resources; ambient air quality and noise levels (qualitative); waste management practices; and natural resources and cultural heritage aspects of the project areas.

1.8.4 Identification, Prediction and Determination of Environmental Impacts

A systematic approach was used to rank identified impacts according to their significance determined by consideration of project activity **event magnitude** and **receptor sensitivity**. The expected significance of environmental impacts was assessed considering:

- **Extent:** An area of influence covered by the impact. In this sense, if the action produces a much-localized effect within the space, it is considered that the impact is low (1). If, however, the effect does not support a precise location within the project environment, having a pervasive influence beyond the project footprint, the impact will be at location level (3) or could be County (5)
- **Timing:** Refers to the moment of occurrence, the time lag between the onset of action and effect on the appearance of the corresponding factor. We consider five categories according to this time period is zero, up to 1 year (short term), or more than two years, which are called respectively medium term (3), long-term (4), and permanent (5).
- **Intensity:** refers to the degree of impact on the factor, in the specific area in which it operates, ranked from low (1) to high (5).
- **Probability:** Refers to the likelihood of the impact occurring during the project implementation, this is also ranked as Probable (1) to highly probable.

Receptor Sensitivity determined by:

- **Presence** – whether biological species present are unique, threatened, protected or not vulnerable and are present during a period of high sensitivity (e.g. breeding, spawning or nesting). For human receptors, whether they are permanently present to uncommon in the area of impact and for physical features whether those present are highly valued or of limited or no value. For physical receptors/features, whether they are national or international value (e.g. state protected monument), local or regional value and is sensitive to disturbance or none of the above; and
- **Resilience** – how vulnerable people and/or species and/or features are to the change or disturbance associated with the environmental interaction with reference to existing baseline conditions and trends (such as trends in ecological abundance/diversity/status, ambient air quality etc.) and their capacity to absorb or adapt to the change. For physical receptors/features, highly vulnerable, undergoes moderate but sustainable change which stabilizes under constant presence of impact source or unaffected or marginally affected.

1.8.5 Stakeholder Consultations

Stakeholder consultations were carried out to: inform project stakeholders of the proposed project; to explain the likely impacts (positive/negative) of implementing the project; and to obtain views, concerns, comments and suggestions from interested and affected parties regarding the proposed project.

Stakeholder identification and analysis was carried to determine who the project affected people were and the most appropriate means of engagement. In compliance with GoK rules on ban of public gatherings to curb spread of COVID-19, the method of engagement were limited to one on one interviews and responding to the questionnaire via email (filled questionnaires annexed 3). Detailed outcome of consultation including stakeholders interviewed is discussed in chapter 6 of this report.

CHAPTER 2 : PROJECT DESCRIPTION

2.1 Project Location and Coverage

The proposed treatment plant will be located at Sabasaba, Kaharati at coordinates 0°51'52"S, 37°08'24"E. The proposed site is a defunct pumping station for water supply that is no longer used due to high operational cost that is not sustainable.

The facility will serve Sabasaba and Maragua towns and their environs.

2.2 Operation of a Decentralized Treatment Facility (DTF)

The DTF will be used to treat the waste water from residential dwellings and institutions in Sabasaba, Maragua town and the environs. Septage will be collected from latrines and septic tanks by exhausters, transported to the DTF, treated and effluent discharged to Sabasaba River after treatment to meet the WHO standard while sludge will be used as fertilizer. This initiative is pro-poor and will be of benefit to the low income households in the urban and rural areas in the project area.

Table 2-1 : Guidelines on Water Quality and Effluent Monitoring

Schedule 6 Guideline values for discharge into public Sewers [The Environmental Management and Co-ordination (Water Quality) Regulations, 2006]

Parameter	Unit	Guideline value
pH	pH	6.0-9.0
BOD (5 days at 20°C) max	mgO ₂ /l	500
COD max	mgO ₂ /l	1000
Colour	Hazen units	<40
Temperature, max	°C	20-35
Total suspended solids	mg/l	250
Total non-volatile solids, max	mg/l	2000
Phenols, max	mg/l	10
Detergents	mg/l	15
Oils/Grease, max – where conventional treatment shall be used	mg/l	10
Oils/Grease, max – where ponds is the final treatment	mg/l	5
Ammonia Nitrogen	mg/l	20
Substances that will be obnoxious to smell		Shall not be discharged into the sewer
Arsenic (As), max	mg/l	0.02
Cadmium (Cd), max	mg/l	0.5
Cyanide, max	mg/l	2.0
Total Cyanide, max	mg/l	2.0
Cobalt (Co), max	mg/l	1.0
Chromium VI (Cr ^{VI}), max	mg/l	0.05
Total Chromium (Cr), max	mg/l	2.0
Copper (Cu), max	mg/l	1.0
Mercury (Hg), max	mg/l	0.05
Alkyl Mercury	mg/l	Not Detectable
Phosphates	mg/l	30
Free and saline Ammonia as Nitrogen (N-N ₂ /NH ₃), max	mg/l	4.0
Nickel (Ni), max	mg/l	3.0
Nitrates (NO ₃), max	mg/l	20
Lead (Pb), max	mg/l	1.0
Sulphide (S ²⁻), max	mg/l	2.0
Phenols	mg/l	10
Selenium (Se), max	mg/l	0.2
Zinc (Zn), max	mg/l	5.0
Total non ferrous metal, max	mg/l	10
Chlorides (Cl), max	mg/l	1000

The following chemicals should not be discharged into sewers: Calcium Carbide, Chloroform, Condensing water, Degreasing solvents, radioactive residues, Inflammable solvents and substances likely to interfere with sewers

A Decentralized Treatment Facility has the following key advantages;

- Allows for source separation of waste water
- Offers provisional solution to wastewater treatment especially for developing urban centres before centralized wastewater treatment infrastructure is constructed.
- Requires relatively small-scale investment.
- Occupies relatively smaller space
- Reduces environmental pollution by sewers

It consists of the following key functional components:

2.2.1 Primary treatment -Receiving bay/balancing tank

- This is a sedimentation tank which stabilizes sludge by anaerobic digestion
- Dissolved suspended matter leave tank untreated
- The following parameters are removed at the below listed margin.
 - COD by 20-25%
 - BOD by 15-20%#
 - TSS by 50-55%

2.2.2 Secondary treatment

It consist of the baffle reactor and anaerobic filter

i) Baffle reactor

- Anaerobic degradation of suspended and dissolved solids takes place here
- The structure has 2-5 chambers depending on the treatment required
- The following parameters are removed at the below listed margins
 - COD by 25-30%
 - BOD by 30-35%#
 - TSS by 10-15%

ii) Anaerobic filter

- Water passes through filter media
- Enhances digestion of organic matter
- The following parameters are removed at the below listed margins
 - COD by 20-25%
 - BOD by 15-20%#
 - TSS by 15-20%

2.2.3 Tertiary treatment –constructed wetland

- Open shallow basin filled with gravel/ pebbles to support growth of plant/ reeds with shallow roots
- Reduces organic content and acts as filter mechanic- exposure to UV rays
- The following parameters are removed at the below listed margins
 - COD by 15-20%
 - BOD by 20-25%#
 - TSS by 5-10%

CHAPTER 3 : ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

3.1 Project Location

The proposed treatment plant will be located in Maragua constituency, Kamahuha ward Kaharati sub location at coordinates 0°51'52"S, 37°08'24"E. The location identified for the construction of the DTF is a defunct pumping station for water supply. The site is close to services such as water and electricity and can be accessed via Sabasaba Murang'a road.

The location identified for the construction of the DTF is a defunct pumping station for water supply. The site is close to services such as water and electricity and can be accessed via Sabasaba Murang'a road. This site satisfies almost all of the essential requirements for a treatment site.

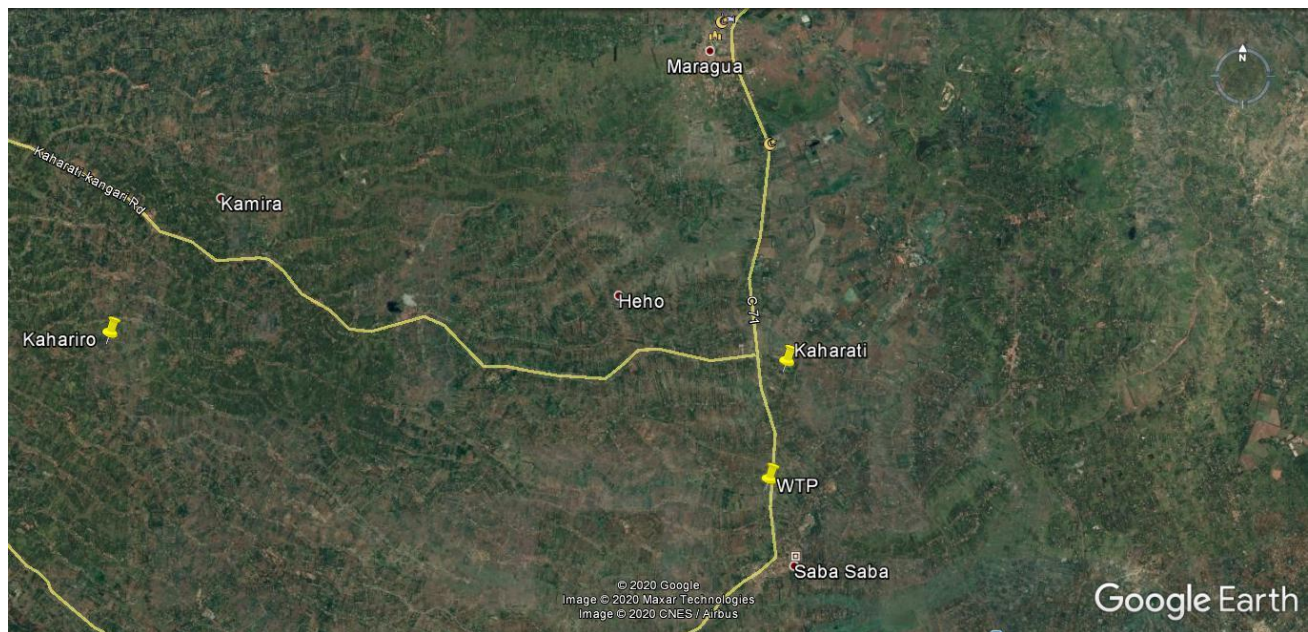


Figure 3-1: Project location

3.2 Physical Environment

3.2.1 Climate

There are two rainfall seasons in the county i.e. long rains (March –May) and short rains (October - November). The highest potential areas receive an average annual rainfall of between 1400mm and 1600mm. Low potential receive rainfall less than 900mm per annum. Rainfall in high and medium potential areas is reliable and well distributed throughout the year and is adequate for cultivation. However on low potential areas rainfall is unevenly distributed and therefore unsuitable for cash crop production. Temperatures vary with altitude. The mean annual temperature ranges from 13⁰ C -28⁰ C, minimum annual

temperatures range between 14°C and 18°C and the mean maximum temperature ranges from 26-30°C ideal conditions for rearing of livestock and farming.

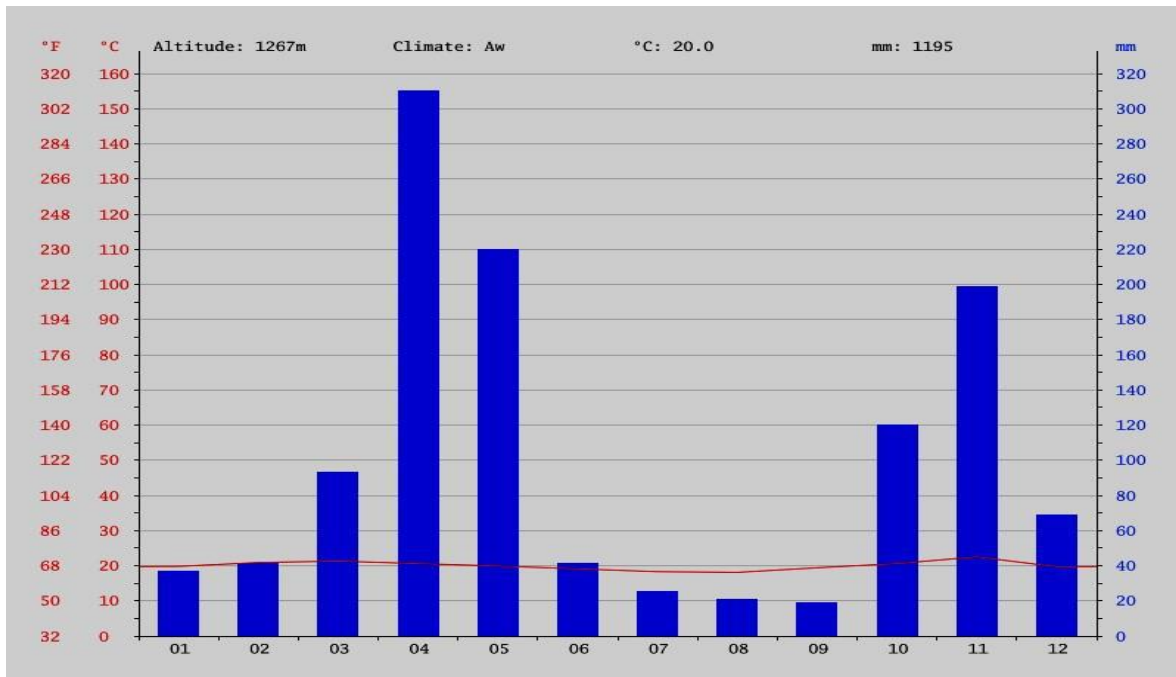


Figure 3-2: Murang'a climate data graph (source; Climate-Data.org)

3.2.2 Geology and Soils

The geology of the project area consists of volcanic rocks of the Pleistocene age and basement system rock of Achaean type. The predominant soils in the project area are the deep and well-drained red/brown soils. These soils are loose and combined with the hilly terrain are easily eroded and sometimes are responsible for landslides which are common in the area.

3.2.3 Topography

The project area lies on the eastern, southern slopes of the Aberdares ranges. The land in Sabasaba generally rises from East to West and is well drained by several rivers the major ones being River Sabasaba, Kabuku, Makindi, Thugi, Thamuru and Thika. The project area's high altitude areas are at the foot of the Aberdare Ranges which starts at about 1800m asl and terminates at about 1350m asl, the land then slopes towards the east and is characterised by numerous hills and steep valleys. Streams and small rivers run through the valleys which even out at about 1500m asl.

The area has deep valleys and steep hills. Landscape is generally mountainous. The area is quite well drained since there are rivers flowing in the deep valleys but the major rivers are Maragua and Sabasaba. Both rivers flow from the Aberdare ranges to the West, South Eastward to join Tana River.

3.2.4 Water Resources

3.2.4.1 Surface Water

Maragua and Sabasaba areas have a lot of water resources. Surface water is the main source of water especially rivers Irati and Maragua. Swamps and wetlands are also used though scarcely. Water is used for multiple purposes among them being domestic, livestock, agriculture (irrigation minor) and industry (tea processing). Water has been tapped from the rivers, springs and streams using pipes. Others practise roof harvesting while others source water from shallow wells. Some homesteads get piped water from water service providers within the area while others have laid pipes tapping water from nearby springs. However, there are others who rely on water taken directly from the rivers and seasonal streams. There are two water service providers in areas namely Murang'a Urban Water and Sanitation Company and Murang'a South Water & Sanitation Company.

3.2.4.2 Groundwater

Ground water is also a common water source in the area especially wells and springs. Available quantitative information on the area's groundwater reviewed is old (National Environment and Human Settlements Secretariat, 1982) and indicates that most boreholes in Murang'a County are located in the lower altitude areas to the east. The average borehole yields in the area is 7.13 m³/hr but ranges from nil to 50m³/hr. The average borehole depth is 117.0 m but water is commonly struck at a depth of 84.4m with average water resting level of 42.8m.

3.3 Biological Environment

Natural vegetation is very minimal in the area due to significant changes in the farming methods and technology. However, artificial trees are notable in the area especially due to the numerous tree nurseries that have been set up in the study areas. Tree planting is done throughout the year as long as the plants can survive. Birds are common in the area, both domestic and wild however domestic birds stand out.

3.4 Social Set up

3.4.1 Population

The areas of Maragua and Sabasaba are mainly habited by the Kikuyu community with traces of other tribes especially in the town centres. The population of the two areas as per the 2019 Census are as shown below.

Area	Total	Male	Female	Household	Density
Maragua	57,252	28,505	28,747	17,668	129.1
Sabasaba	6,336	3,040	3,296	2,050	950

*Source: 2019 Kenya Population and Housing Census

3.4.2 Land and Land Use

Land tenure in Kenya is classified into three categories, namely; – public land, community land and private land. Most of the people own the land in which they live on while the land tenants were notably few. A bigger population considers subdividing the land in the future. The Project area has a wide land use because of its wide Agro Ecological Zone range; from Tropical Alpine Zone (TA) on the highlands to LM4. The neighbouring areas to the proposed site are agricultural land used for horticultural crops, maize and beans and bananas. The people are predominantly farmers and apart from crops, they also practice animal husbandry. The animals reared include dairy animals, poultry, and pigs on a smaller scale.

3.4.3 Source of Energy

The availability of cheap and reliable energy ensures economic and social development and improved quality of life. Energy is needed for cooking, heating and lighting of households. Energy sources in the project area include is firewood, charcoal and Liquid Petroleum Gas. Electric cookers are scarcely used in the two areas. It can be concluded that the main sources of energy in both areas are electricity, firewood and kerosene. Thus implying that most of the income is spent in purchasing of the energy sources and little is invested in water.

3.4.4 Infrastructure

The proposed project area can be accessed from Thika - Sagana highway along the Muranga exit road. Not all the roads are all weather since some sections of the road are tarmacked while others are graded earth roads and have sections in dilapidated conditions. Some sections are very steep but they are regularly maintained to facilitate transport in the two area.

3.4.5 HIV and AIDs, Malaria and other Diseases

HIV and AIDS is considered a threat to the development of Kenya. The prevalence rate stands at 3.7per cent. AIDS related deaths are common and those mainly affected are within the productive age group of 15-49 years of age. It was also noted that the number of HIV/AIDS orphans is on the increase. Poverty is viewed as a major cause of HIV/AIDS. Poverty increases vulnerability of people with HIV, hence there is need to redirect resources towards support services to poor households.

The situation is further aggravated by the fact that HIV/AIDS mostly affects people in the productive age leaving minors and the elderly people to take care of households. Progressive gains on poverty reduction may be reversed if concerted efforts are not urgently put in place to bring the HIV/AIDS pandemic under control. Implementation of the project thus needs to create comprehensive HIV/AIDS awareness among the workers along the project area

CHAPTER 4 : ANALYSIS OF PROJECT ALTERNATIVES

4.1 Overview

The purpose of this section of the ESIA is to examine feasible alternatives to the project and, highlight the benefits of and general rationale for the project that need to be considered against any potential environmental cost. The general principle involved in identifying option(s) to the proposed development is to ensure that the option chosen, which indeed may be the 'non development' option, would result in optimal returns in social and environmental capital: In effect, the option chosen should bode well not only for the developer, but also for the environment and stakeholders in the area.

This section is a requirement of the National Environment Management Authority (NEMA), and is critical in consideration of the ideal development with minimal environmental disturbance.

4.2 Land Use Options

Feasible land use options are compared in terms of lowest costs and most benefits criteria: environmental impacts, social acceptability, economics (including productivity of land use) and design feasibility. The following land use options detailed below are considered:

- The "No-Action" Alternative
- The proposed development as described in the ESIA
- The proposed development as described but with alternative location
- EIA With/Without an EMP

4.3 "No-action" Alternative

The No action alternative in respect to the proposed project implies that the status quo is maintained. Forgoing development of the sewerage infrastructure project implies that all potential environmental and social impacts associated with the implementation of the project are forgone.

Without adequate sanitation system(s) coupled with an increase in waste generation, the following issues are most likely to continue affecting residents of Maragua and Sabasaba urban areas and their surrounding environs

- Increased pollution of the water sources (local rivers which include river Sabasaba, boreholes and wells) from untreated waste water.
- Water borne diseases are likely to become prevalent due to consumption of contaminated water
- No improved Health and Sanitation within the target beneficiaries
- No improved living standards, employment and local economy to the target beneficiaries
- Limited opportunities for future growth of Maragua and Sabasaba urban areas and their surrounding environs

The expected environmental impacts are not extreme and can be managed to reduce negative impacts on

the environment. The No project option was therefore discounted on the basis that sanitation and proper sanitary facilities are critical for population health and prevention of environmental pollution.

4.4 The Proposed Development as described in the EIA

The impacts and mitigation measures for this alternative are discussed in detail throughout this report. The positive impacts have been identified as social and economic opportunities for the local area, as well as a positive impact on the national economy.

This alternative will have minimal impact on the physical environment and has considered the necessary measures to almost eliminate the identified issues of sanitation and water pollution. Implementing the proposed Sabasaba DTF was considered to be the most feasible scenario because of the following reasons

- Reduce cases of water borne diseases associated with pollution of water resources
- Improve Health and Sanitation status of Maragua and Sabasaba urban areas and their surrounding environs
- Reduce pollution of natural river systems which include Sabasaba River and numerous springs within the Project area.
- Trigger development of modern infrastructure within Maragua and Sabasaba urban areas and their surrounding due to availability of sewer infrastructure
- Reduce distances covered by exhausters to sludge discharge points eventually reducing costs.
- Residents will decommission pit latrines which are expensive to construct and unsustainable due to short fill-up duration.
- Improve aesthetic outlook of Maragua and Sabasaba urban areas and their surrounding environs
- The Project will be associated with technological and knowledge transfer to the local sector, this will be through the artisans employed and trained by the Project
- Provision of ready market for construction materials such as sand, ballast and cement that will be sourced from local market, this will lead to injection of money into the local economy
- Employment opportunities during construction especial on unskilled labour force.

4.5 The Development but Alternative Location

This is a no option because residents at the target area not yet connected to sewer system despite having developed their existing property to deserving standards. The population has already invested in their current land of occupancy. There is good potential for local growth in the area if the project is maintained to serve the target population as planned.

Selection of a new site means the current community would be ignored and the sanitation challenge in the area would continue. .

4.6 ESIA With/Without ESMMP

4.6.1 Without

This scenario was based on the assumption that the proposed development would go ahead without any environmental management options being implemented. The total project impact for the scenario is on the appreciably adverse side. This shows that if the project goes ahead without ESMMP, the adverse impact on the existing environment would be several times that of the impact without the project. Thus, the ESMMP described in Chapter 8 will have to be implemented to minimize the potential negative impact due to the proposed activity.

4.6.2 With

If the environmental management strategies discussed in Chapter 8 is fully implemented, the adverse impact of the project would be reduced, and there will be an overall improvement in physical, chemical, biological and socioeconomic environment of the proposed project area. Therefore, the proposed activity will be beneficial for the environment of the area, provided the ESMMP is in place.

Conclusion: It is clear from the above, that the proposed sanitation project would have negative affect without implementing certain environmental management strategies. If ESMMP, as discussed in Chapter 8, is adopted and implemented, the adverse impacts will be reduced and the overall environmental quality of the area would improve.

CHAPTER 5 : POLICY AND LEGAL FRAMEWORK AND INSTITUTIONAL FRAMEWORK

5.1 Introduction

Development of infrastructure projects is dealt with under several laws, by-laws, regulations, Acts of Parliament as well as policy documents and it is not possible to bring all those statutes under one heading. This section is therefore aimed at assessing the existing policies and legislative framework, economic tools and enforcement mechanisms for the management of infrastructure projects at different stages. In so doing, the discussion will be based on the following legislations and policy provision

5.2 Policy Provision

The proposed investments will be implemented within provisions of various government policies as summarized in **Table 5-1** below:

Table 5-1: Policy Framework

No	Policy	Applicability
1	Constitution of Kenya 2010	The CoK at Article 43 (1) provides that every person has the right – (b) to accessible and adequate housing, to reasonable standards or sanitation; and, (d) to clean and safe water in adequate quantities. These provisions cover oblige state organs and bind them to provide not just high quality or clean and safe water but also adequate quantities to all people that they will serve. Also, the Constitution of Kenya provides for sound management and sustainable development of all of Kenya’s Projects, both public and private investments. It also calls for the duty given to the Project proponent to cooperate with State organs and other persons to protect and conserve the environment as mentioned in Part II.
2	Kenya Vision 2030	This is the current national development blueprint for period 2008 to 2030. The vision has three pillars – economic, social and political. It is recognized that Kenya is a water scarce Country but stated (Kenya, 2007: 115) that the Vision for the water and sanitation sector is “to ensure water and improved sanitation services availability. The Project will directly contribute towards achievement of objectives of vision under the environment and social pillar through provision of the planned sanitation investments under the Master Plan.
3	National Climate Change Response Strategy, 2010	The strategy paper recognizes that Kenya is a water scarce Country and offers a variety of strategies for ensuring that the resource is utilized in ways that recognize that it is a finite resource. The paper also argues that interventions in the water sector should take a participatory approach involving different water users including gender groups, socioeconomic groups, planners and policy makers in water resource management (Kenya, 2010: 53). These principles will also apply to the sanitation initiatives discussed in this ESIA.

No	Policy	Applicability
4	The National Environment Policy, 2013	<p>The goal of the policy is to ensure a better quality of life for present and future generations through sustainable management and use of the environment and natural resources.</p> <p>The objectives of the Policy are <i>inter alia</i> to:</p> <ul style="list-style-type: none"> • Provide a framework for an integrated approach to planning and sustainable management of Kenya’s environment and natural resources; • Strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources; and • Ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods. <p>Some of the guiding principles in the implementation of the policy include:</p> <ul style="list-style-type: none"> • Environmental Right: Every person in Kenya has a right to a clean and healthy environment and a duty to safeguard and enhance the environment; • Right to Development: The right to development will be exercised taking into consideration sustainability, resource efficiency and economic, social and environmental needs; • Sustainable Resource Use: Environmental resources will be utilized in a manner that does not compromise the quality and value of the resource or decrease the carrying capacity of supporting ecosystems; and • Public Participation: A coordinated and participatory approach to environmental protection and management will be enhanced to ensure that the relevant government agencies, county governments, private sector, civil society and communities are involved in planning, implementation and decision making processes. <p>Relevance</p> <p>In chapter 8 an ESMMP is provided, the proponent and contractor should ensure it is implemented in order to ensure that the ecosystems are not destabilized by the subsequent Project activities.</p>
5	The Sustainable Development Goals (SDGs)	<p>The concept of the SDGs was born at the United Nations Conference on Sustainable Development, Rio+20, in 2012. The objective was to produce a set of universally applicable goals that balances the three dimensions of sustainable development: environmental, social and economic. The Investments will therefore contribute towards achieving this goal through the proposed sanitation Projects.</p>
6	Kenya National Youth Policy 2006	<p>This Policy aims at ensuring that the youth play their role alongside adults in the development of the Country. The National Youth Policy visualizes a society where youth have an equal opportunity as other citizens to realize their fullest potential. Proposed Sanitation Projects will provide direct employment to the youth as required by the Policy.</p>

No	Policy	Applicability
7	The National Environmental Sanitation and Hygiene Policy- July 2007	The Policy is devoted to environmental sanitation and hygiene in Kenya as a major contribution to the dignity, health, welfare, social well-being and prosperity of all Kenyan residents. The Policy recognizes that healthy and hygienic behaviour and practices begin with the individual. The implementation of the Policy will greatly increase the demand for sanitation, hygiene, food safety, improved housing, use of safe drinking water, waste management, vector control at the household level and encourage communities to take responsibility for improving the sanitary conditions of their immediate environment. Implementing the Project will directly contribute to achievement of the Policy

5.3 Kenyan Legislations

The proposed investment will be implemented within provisions of various Acts of Parliament and Local Legislations as summarized in **Table 5-2** below:

Table 5-2: Acts of Parliament

No	Policy	Applicability
1	EMCA 2015 with 2015 amendments	The Act provides for the establishment of a legal and institutional framework for the management of the environment. This is achieved through various regulations. For Sanitation Projects proposed in Sabasaba, the following EMCA Regulations will be applicable: EMCA (Waste Management) Regulations, 2006 Legal Notice No. 121; EMCA (Water Quality) Regulations, 2006 Legal Notice No. 120; EMCA (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 Legal Notice No. 61; EMCA (Air Quality Regulations 2014)
2	The Environmental (Impact Assessment and Audit) Regulations, 2003	The regulation provides a framework under which Environment and Social Impact Assessment for the Project will be prepared, Regulation 4(1) further states that: (a)“no Proponent shall implement a project: likely to have a negative environmental impact. (b) for which an environmental impact assessment is required under the Act or these Regulations, unless an environmental impact assessment has been concluded and approved in accordance with these Regulations...”
3	Environmental Management and Coordination (Water Quality) Regulations, 2006	Regulation 9 of these regulations provides for water quality monitoring. It states that the “Authority in consultation with the relevant lead agency, shall maintain water quality monitoring for sources of domestic water at least twice every calendar year and such monitoring records shall be in the prescribed form as set out in the second schedule to these regulations”.
4	(Waste Management Regulations, 2006	Regulation 4 (1) states that “no person shall dispose of any waste on a public highway, street, road, recreational area or in any place except in a designated receptacle”. Regulation 4 (2) further states that “a waste generator shall collect, segregate and dispose such waste in the manner

No	Policy	Applicability
		provided for under these regulations". The proponent will use provisions of this regulation to ensure that waste is handled, stored, transported and disposed as per this regulation.
5	Noise and Excessive Vibration Pollution (Control) Regulations, 2009	The Contractor will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the Construction Phase. This shall include regular inspection and maintenance of equipment and prohibition of unnecessary hooting by vehicles. The regulations provides for a maximum of 60 dcl during the day and 35 dcl during the night for a construction site.
6	The Environmental Management and Coordination (Air Quality Regulations 2014)	These regulations provide a framework for management of plant and equipment emissions of hydrocarbons on site. The regulations require that all plant and equipment on site should be well serviced to manufacturers specifications to avoid air pollution, the regulation also require monitoring of baseline air quality within construction site and implementation of correction action where the standards are not complied to. Water spray will be used at all times when working in dry areas to avoid risks associated with dust menace.
8	Land Act, 2012	It is the substantive law governing land in Kenya and provides legal regime over administration of public and private lands. It also provides for the acquisition of land for public benefit. The government has the powers under this Act to acquire land for projects, which are intended to benefit the general public. The Project proposed will be implemented within MUSWASO's land and along riparian reserve
9	Water Act, 2016	The Water Act, 2002 was amended in the year 2016 to align to the Kenyan Constitution 2010. The Act vests the responsibility of developing water and sanitation infrastructure (sewerage and water supply services) in Sabasaba and Maragua to Murang'a South Water and Sanitation Company (MUSWASCO). The ESIA Teams have adequately involved MUSWASCO in the undertaking of the ESIA.
10	County Government Act No. 17 of 2012	The proposed Project will be implemented within Sabasaba Kaharati Project area. Part II of the Act empowers the County Government to be in charge of function described in Article 186 of the Constitution, (county roads, water and sanitation, health). The Project once complete will be managed by MUSWASCO
13	Occupational Health and Safety Act (OSHA 2007)	The Act provides EHS Guidelines which shall be followed by both the Contractor and Supervising Consultant during implementation of the Project to avoid injuries and even loss of life to workers and neighboring community.
14	The Public Health Act (Cap.242)	The Act provides Guidelines to the Contractor on how he shall manage all wastes (Liquid and Solid Wastes) emanating from the Project in a way not to cause nuisance to the community. This Act, during construction shall be read alongside the Waste Management Regulations of EMCA 2015 for utmost compliance.

No	Policy	Applicability
15	HIV and AIDS Prevention and Control Act 2011	The object and purpose of this Act is to (a) promote public awareness about the causes, modes of transmission, consequences, means of prevention and control of HIV and AIDS; (b) extend to every person suspected or known to be infected with HIV and AIDS full protection of his human rights and civil liberties. The Act provisions will be applied during Project implementation phase where the contractor will be required to create awareness among workers and community at large
16	Sexual Offences Act 2006	An Act of Parliament that makes provision about sexual offences aims at prevention and the protection of all persons from harm from unlawful sexual acts and for connected purposes. Section 15, 17 and 18 focuses mainly on sexual offenses on minor (children).
17	Child Rights Act (Amendment Bill) 2014	This Act of Parliament makes provision for parental responsibility, fostering, adoption, custody, maintenance, guardianship, care and protection of children. It also makes provision for the administration of children's institutions, gives effect to the principles of the Convention on the Rights of the Child and the African Charter on the Rights and Welfare of the Child. The contractor under this Project will be required to comply to provisions of the Act during Project implementation
18	Labour Relations Act 2012	An Act of Parliament to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratization of trade unions and employers organizations or federations, to promote sound labour relations through the protection and promotion of freedom of association. This act will be applied by labour force on site in addressing disputes related to working conditions.
19	National Gender and Equality Commission Act 2011	The over-arching goal for NGEAC is to contribute to the reduction of gender inequalities and the discrimination against all; women, men, persons with disabilities, the youth, children, the elderly, minorities and marginalized communities. This Act will be applied during hiring of workforce on site
20	Public Participation Bill of 2016	The Bill is an Act of Parliament that provides a general framework for effective public participation and to give effect for the constitutional principles of democracy. The purpose of the act includes promotion of democracy and public participation of the people according to Article 10 of the Constitution, promote community ownership for public decisions and promote public participation and collaboration in governance processes. In adherence to the Bill, two main stakeholder workshops and public consultation, though interviews were carried out during Project ESIA study and in the full ESIA study.
20	Permits and Licenses	The Proponent should demonstrate compliance to the legislation through acquisition of the appropriate licenses and permits. Furthermore, all contractors and consultants who will be engaged during the planning and design, construction, operation and maintenance and decommissioning should demonstrate compliance to the necessary pieces of legislation. These

No	Policy	Applicability
		includes: NEMA registration certificates, collection of waste by a NEMA licensed handler. MUSWASCO will before project operation apply for license to discharge into the environment. .

Table 5-3: Analysis of potential impacts to World Bank Safeguards Policies

OP	Title	Comments/Impact
4.01	Environmental Assessment	Applicable. As a result of environmental and social screening, the project was identified as a Category A project because of the development of the DTF.
4.04	Natural Habitats	Not applicable.
4.09	Pest Management	Not applicable.
4.10	Indigenous Peoples	Not applicable.
4.11	Physical Cultural Resources	Not applicable. Site visit on April, 2020 have not indicated the presence of any cultural (historical, archaeological) sites in the construction area. However, to manage "chance finds" an appropriate procedure is included in this ESIA. Such procedure to be followed by contractors during the construction phase.
4.12	Involuntary Resettlement	Not applicable. The area is an open field without any economic activity going on. Therefore no one will be required to relocate
4.36	Forests	Not applicable.
4.37	Safety of Dams	Not applicable because the project will not involve construction of dams.
7.50	Projects on International Waters (OP 7.50)	Not applicable.
7.60	Projects in Disputed Areas	The site is not classified as disputed in the project area.

CHAPTER 6 : PUBLIC PARTICIPATION AND CONSULTATION

6.1 Introduction

Public consultation is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plans.

Public consultation process for the Sabasaba Decentralized Facility took place at the scoping stage and the ESIA stage. The main objective for the consultation process was to involve the community at the very early stages so as to identify likely negative impacts and find ways to minimise negative impacts and enhance positive impacts of the project.

6.1.1 Objectives of the Public Consultations

The overall goal of the consultation process is to disseminate project information and to incorporate the views of the project beneficiaries and Project Affected Persons (PAPs) in the design of the mitigation measures and a management plan.

The specific aims of the consultation process are to:

- Improve Project design and, thereby, minimize conflicts and delays in implementation;
- Facilitate the development of appropriate and acceptable entitlement options;
- Increase long term project sustainability and ownership;
- Reduce problems of institutional coordination;
- Make the resettlement process transparent; and
- Increase the effectiveness and sustainability of income restoration strategies, and improve coping mechanisms.

An important element in the process of impact assessment is consulting with stakeholders to gather the information needed to complete the assessment. The main objectives of community consultations were to:

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

6.2 Public Consultations during the Scoping Stage

Public participation was done through administration of an open ended questionnaire aimed at introducing the project to the Sabasaba and Maragua residents, gathering their views and concerns related to the project and incorporating their views into the project. The completion of such questionnaires subsequently allowed for the synthesis and analysis of issues that arose which provided basis upon which the social aspect of the ESIA was undertaken.

6.3 Consultations during the Full ESIA Stage

Both key informant stakeholder and public consultations were held during the full ESIA stage via one and one interviews using standard questionnaires.

6.3.1 Stakeholder Consultations

Key informant interviews were held in **April 2020** with several senior Government officers/ institution heads within Maragua Sub-county. A summary of the discussions are as shown in **Table 6-1** below. The consultation-filled questionnaires are annexed in appendix **3**.

Table 6-1: Summary of findings from key stakeholders consultations

No	Name	Designation	Comments
1	Charles Wachira	Sub county development officer (DDO)	<ul style="list-style-type: none"> • There is poor sanitation in the project area • Concern on pollution of the surrounding area during project implementation • Concern on sustainability of the project • Anticipated youth employment hence increased income during project implementation
2	Irene Mucheru	Sabasaba Sub county Hospital	<ul style="list-style-type: none"> • Community involvement during entire project implementation period • The project will lead to better management of sewerage waste
3	Stephen Mwangi	County Economic Planner	<ul style="list-style-type: none"> • Concern on pollution of the surrounding area during project implementation • Concern on sustainability of the project • Project will protect the environment from human waste pollution • Need to create community awareness on prevention of HIV and AIDs
4	Dorothy Njoki	Public Health Officer	<ul style="list-style-type: none"> • Affordability of the project to the community • The project will create employment opportunities • Improved sanitation • Reduced faecal related diseases

No	Name	Designation	Comments
			<ul style="list-style-type: none"> Improved environment with reduced odor from pit latrines and flies Use of water borne sanitation facilities will increase hand washing facilities hence reduced water related infections due to reduced ground water contamination The project can benefit from future project on recycling of human waste to manure
5	Stephen Munania	Assistant County Commissioner	<ul style="list-style-type: none"> Concern on Sustainability of the project Project will lead to safe working environment for businesses The project structures constructed should be environmentally sustainable
6	Robinson M Kimari	Sub project manager WRA	<ul style="list-style-type: none"> Discharge of waste into nearby waters bodies may result into water pollution Treatment of domestic waste from both formal and informal settlement hence improved sanitation services Creation of employment to locals both during construction and operation of the facility Ensure the effluent meet the required standards before being directed to the River Ensure acquisition of effluent discharge control permit from WRA before discharging effluent to the river Ensure monthly analysis of effluent discharged into the river and submit the report to WRA Ensure the treatment is not within the riparian -50m distance from river Ensure an effluent discharge plan is put in place
7	Joseph FIC Nyamu	Chairman Sabasaba WRUA	<ul style="list-style-type: none"> There is poor sanitation in the project area Pollution of the water body Create employment opportunities Adhere to NEMA regulation during and after project implementation
8	Kamahuha Girls High School	Chairman BOM	<ul style="list-style-type: none"> Fear on interfering with the school sewerage system –ponds Reduced cost of exhausting services Need for continuous effluent Need to fence the DT
9	Assistant chief	David Mwangi	<ul style="list-style-type: none"> Fear pollution of the River Improved sanitation

No	Name	Designation	Comments
			<ul style="list-style-type: none"> Use of sludge as fertilize

6.3.2 Outcomes of the Public Consultations

6.3.2.1 Project awareness and acceptance

All the interviewees were aware of the proposed project, its location and activities. They also supported the project activities to proceed.

6.3.2.2 State of current sanitation in the project area

Majority of the respondents (48%) felt that the project area has poor sanitation services, 35% of the respondents felt that sanitation services are fair while the rest (17%) felt that the sanitation services are good as shown in Figure 6-1 below.

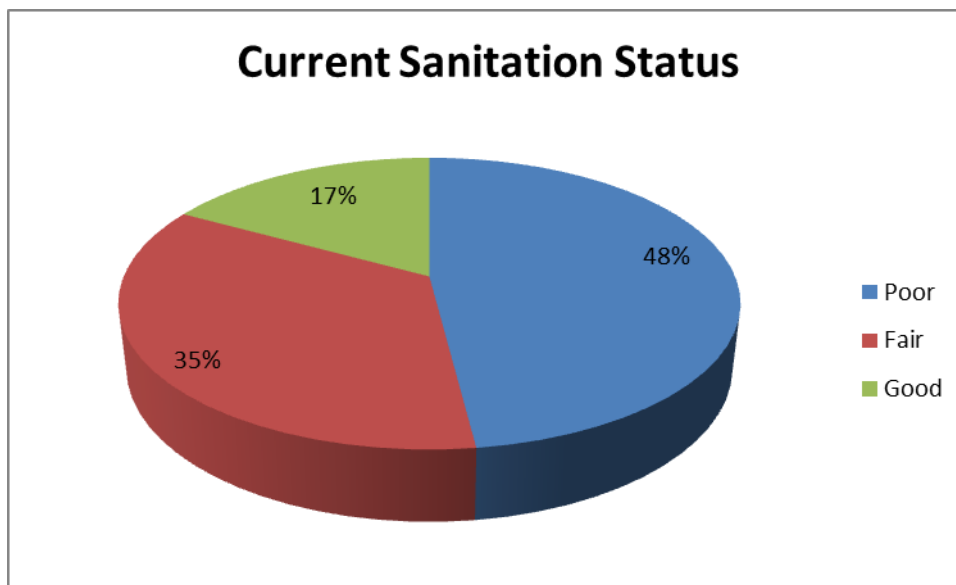


Figure 6-1: Status of Current Sanitation services

6.3.2.3 Concerns Regarding Project Implementation

Figure 6-2 below show the concerns raised by the respondents regarding project implementation. Respondents 43% of the respondents did not have any concern regarding implementation of the project, 42% felt that discharging the effluent to Sabasaba River will result to pollution of the river; they indicated the importance of the provision of portable water since some community members rely on Sabasaba River for domestic water supply. This was backed up by 10% of the respondents who felt the need of provision of domestic water in the project area. % of the respondents felt that recruitment of labour might not be fair as labourer may be recruited outside the project area

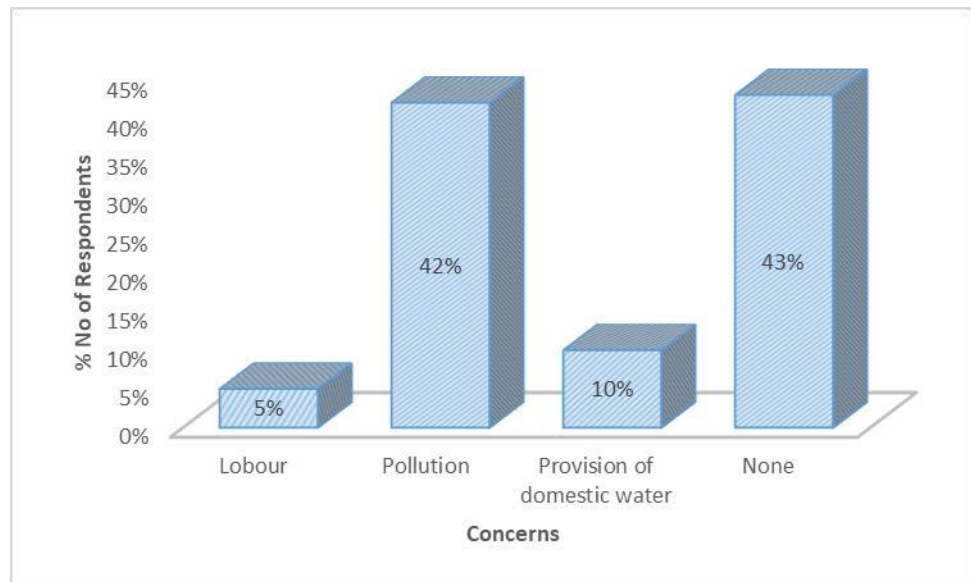


Figure 6-2: Project concerns

6.3.2.4 Expected Positive Impacts

Creation of employment and especially to the youth in the project area, improved sanitation, and use of sludge as fertilizer and reduced cost of associated with constructing pit latrines when they fill up were the positive impacts that were associated with the proposed project by 80%, 65%, 35% and 20% of the respondent respectively as shown in Figure 6-3 below.

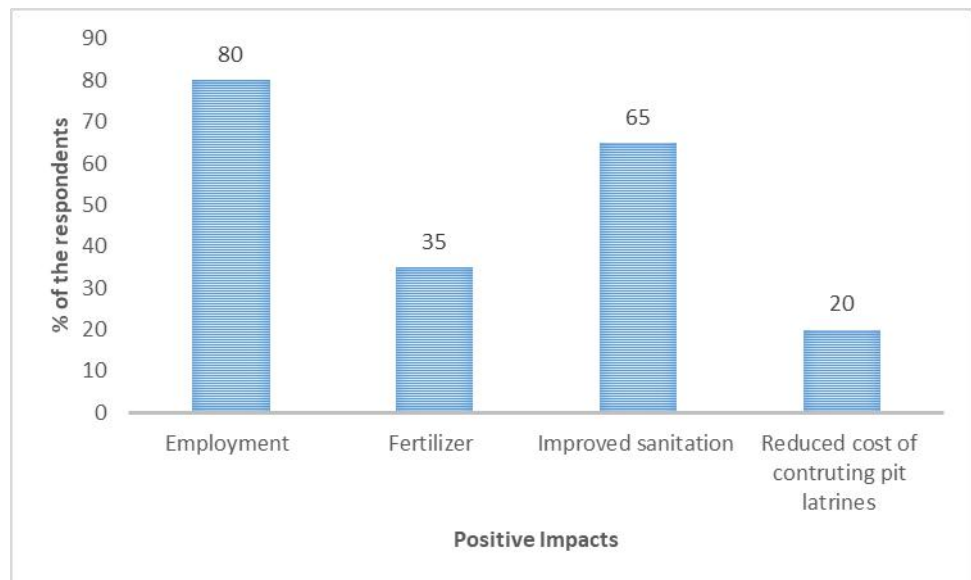


Figure 6-3: Expected Positive Impacts

6.3.2.5 Anticipated negative impacts and suggested mitigation measures

Table 6-2: Summary of anticipated negative impacts raised by community members

	Impact	Suggested mitigation measures
1.	Pollution of aquatic life	<ul style="list-style-type: none">• Ensure effluent discharged to the River is safe for aquatic life
2.	Water pollution	<ul style="list-style-type: none">• Ensure treatment of effluent to WHO standards before discharging to the river• Increase household connectivity to piped water supply
3.	Air pollution	<ul style="list-style-type: none">• Proper management of the system to avoid odour

CHAPTER 7 : ENVIRONMENTAL AND SOCIAL IMPACTS & MITIGATION MEASURES

7.1 Introduction

This ESIA assessment has been systematically conducted to determine whether the proposed Project will have a diverse impact on the environment. The Environmental Management and Co- ordination Act (EMCA) No .8 of 2015 provide the legal and statutory guideline for the Environment and Social Impact Assessment process in Kenya.

The impacts in this Chapter have been generated based on the analysis of the proposed environment in relation to the proposed project. The impacts arising during each of the phases of the proposed development namely construction, operation and decommissioning, can be categorized into:

- Impacts on biophysical environment;
- Health and safety impacts
- Social-economic impacts

7.2 Definition and Classification of Environment Impact

An environmental impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts may be:

- Positive (beneficial) or negative (adverse);
- Direct or indirect, long-term or short-term in duration, and wide-spread or local in the extent of their effect.

Impacts are termed cumulative when they add incrementally to existing impacts. In the case of the project, potential environmental impacts would arise during the construction and the operations phases of the Project and at both stages, positive and negative impacts would occur.

7.2.1 Impact Assessment and Scoring

The impact analysis were done using the Leopold matrix which is a grid that is used to identify the interaction between project activities, which are displayed along one axis, and environmental characteristics, which are displayed along the other axis. For the identification of impacts a breakdown of the environment into elements or factors that may be affected and a breakdown of the various actions or activities of the project under study were done.

The potential impacts associated with the proposed development have been assessed as presented in **Table 7-1**. Precautionary principle was used to establish the significance of impacts and their management and mitigation i.e. information, the Environmentalist erred on the side of caution.

Table 7-1: Impact Rating Criteria for Environment and Social Risks

Extent		Duration		Intensity		Probability		Weighting Factor (WF)		Significance Rating (SR)		Mitigation efficiency		Significance following Mitigation (SFM)	
Foot print	1	Short term	1	Low	1	Probable	1	Low	1	Low	0-19	High	0,2	High	0-19
Site (1 km radius)	2	Short to medium	2			Possible	2	Low to Medium	2	Low to Medium	20-30	Medium to High	0,4	Medium to High	20-30
Location	3	Medium term	3	Medium	3	Likely	3	medium	3	medium	40-59	medium	0,6	medium	40-59
Sub County	4	Long term	4			Highly likely	4	Medium to high	4	Medium to high	60-79	Low to medium	0,8	Low to medium	60-79
County	5	Permanent	5	High	5	High	5	High	5	High	80-100	low	1,0	low	80-100

Definition of Terms

Extent: An area of influence covered by the impact. In this sense, if the action produces a much localized effect within the space, it is considered that the impact is low (1). If, however, the effect does not support a precise location within the project environment, having a pervasive influence beyond the project footprint, the impact will be at location level (3) or could be County (5)

Timing: Refers to the moment of occurrence, the time lag between the onset of action and effect on the appearance of the corresponding factor. We consider five categories according to this time period is zero, up to 1 year (short term), or more than two years, which are called respectively medium term (3), long-term (4), and permanent (5).

Intensity: refers to the degree of impact on the factor, in the specific area in which it operates, ranked from low (1) to high (5).

Probability: Refers to the likelihood of the impact occurring during the project implementation, this is also ranked as Probable (1) to highly probable

7.3 Positive Impacts during Construction Phase

Construction Phase normally includes Pre-Construction Phase and Construction Phase. Construction period depends on the nature of the project activities and normally vary from one year to three years. The positive impacts are summarized below:

- Employment opportunities during construction, unskilled labour will be sourced from the local market.
- Provision of ready market for construction materials such as sand, ballast and cement that will be sourced from local market, this will lead to injection of money into the local economy
- The Project will be associated with technological and knowledge transfer to the local sector, this will be through the artisan who will be employed and trained by the Project.

7.4 Negative Impacts during Construction Phase

The following negative impacts are associated with the Construction Phase of the Project:

7.4.1 Vegetation Clearing, Soil Erosion and Sedimentation

The assessment identified that construction activities lead to clearance of vegetation and consequently disruption of soil structure within the Project corridor. The loose soils eventually are washed down into the lower areas (streams and valleys). Also, soil quality degradation is also likely to occur during construction as a result of disposal of construction materials on the adjacent lands, this can be significant near the base of the valleys. Table 7-2 below illustrates Impacts on vegetation Cover.

Table 7-2: Project Impacts on Vegetation Cover

Impact Sources	Clearing of vegetation cover along the Sewer pipeline identified for the Project		Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> • Clearing of vegetation cover exposes soils to agents of soil erosion such as wind and runoff, this could lead to soil degradation. • Soil structure disruption along the excavated areas , could result to mud flow and land slides • Triggers sedimentation in nearby rivers such as Sabasaba, this increases river turbidity, could also lead to flooding. 		High
Reversibility of impact	yes		
Affected stakeholders /areas	Fauna and flora, business persons Farmers		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	

	<i>Duration</i>	Short to medium-2	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability) x WF (2+3+2+3) x3= 30 (Low-Medium)	Low to Medium

Mitigation Measures

The following is proposed to mitigate against soil erosion and its effects and enhance vegetation cover:

- Re-plant the indigenous vegetation as much as practicably possible once work is completed.
- Limit vegetation clearance unless where unavoidable circumstances appear
- Contain excavated soils so that they will not find their way into nearby water sources;
- Cement mixing should be done in a designated area away at a safe distance from storm water drains;
- Spilled cement or concrete should be collected and disposed away from natural water ways or storm water drainage;
- Sensitize workers and enable them to properly handle concrete spillages or waste cement;
- Re-vegetation of exposed areas around the site should be carried out rapidly in order to mitigate against erosion of soil through surface water runoff and wind erosion.

7.4.2 Air Quality Pollution

Potential air pollution caused by emissions from construction equipment (carbon, hydrocarbons, particulate matter,) earth movers and excavators, vehicles, concrete and cement batching plants and trucks, Emission of dust from trucks and vehicles accessing the construction areas and camp sites as well as material piling (sand and aggregate).

Odour from temporary disruption of accumulated solid waste materials at locations of construction, such impacts may affect the immediate residential houses and commercial premises as illustrated in **Table 7-3** below.

Table 7-3: Air Quality Impacts Rating

Impact Sources	Impact trigger from Construction activities involving excavations and plant movement on site	Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> • Removal of top soils during excavation • High traffic flows the project alignment • Emissions During off loading and on-loading of materials including sand, concrete. • Hydro carbons exhausts from plant and equipment on site. • Sensitive receptors that might be impacted by poor air quality 	High

	include: <i>residents near the proposed DTF site</i>	
Reversibility of impact	Yes (Air quality Regulations of 2014)	
Affected parties	Community, workers	
Magnitude	<i>Extent</i>	Site-2
	<i>Intensity</i>	High-5
	<i>Duration</i>	Medium-4
	<i>Probability</i>	High-5
Significance	Weighting (Extent+ Intensity +Duration + Probability) x WF (2+5+4+5) x 3= 48 (high)	medium

Mitigation Measures

- Maintain construction equipment at high operational conditions such as to control emissions into the air.
- Earth moving be done under damp conditions as much as possible to prevent emission of dust into the air,
- Similarly, piled materials (sand and aggregate) should be maintained damp to prevent dust emissions,
- It will be necessary to notify the immediate neighborhoods on the potential odours during the excavations. The period should, however, be kept as short as possible (odour generation may not be fully eliminated during the period)
- Use of sprinklers to regularly water construction site, this suppresses the dust menace at construction sites
- People working in the sites with dust emissions to use dust masks to prevent respiratory infections.

7.4.3 Excessive Vibration and Noise Pollution

Construction Phase for the proposed project will most likely result in noise emissions as a result of the machines that will be used (excavation equipment among others) and construction vehicles delivering materials to site. Noise and excessive vibration can be a nuisance to the local community if construction works begin too early in the day and continues into the night as indicated in **Table 7-5** on Noise generating activities such as equipment operations and the workers themselves could be a public nuisance to nearby settlements and commercial centres, health centres and schools especially those within 200m of the project site. As required, OSHA 2007 and EMCA 2015 Noise and Excessive Vibration 2009 should be adhered to. **Table 7-4** below provides permissible noise levels for a residential and construction sites

Table 7-4-: Permissible Noise levels

MAXIMUM PERMISSIBLE NOISE LEVELS FOR CONSTRUCTION SITES (Measurement taken within the facility)			
		Day	Night
i.	Health facilities, educational institutions, homes for disabled etc.	60	35
ii.	Residential	60	35
iii.	Areas other than those prescribed in (i) and (ii)	75	65

Table 7-5: Impacts Associated with Noise and Vibrations

Impact Sources	Construction activities that may cause excessive vibration and noise pollution		Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> Hearing impairments to construction workers, neighboring communities and institutions including schools near project working areas. 		Medium
Reversibility of impact	No		
Affected stakeholders / areas	Workers, persons living or working near project site		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	
	<i>Duration</i>	Short to medium-2	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability)x WF(2+3+2+3) x3= 30 (Low-Medium)	Low to Medium

Mitigation Measures

To control noise pollution:

- Avoid night time construction when noise is loudest;
- Conduct periodic noise measuring and monitoring to determine levels and extent of harmful noise;
- Clearly label the high noise areas;
- Provide PPE personal protective equipment (PPE) including masks, goggles, scarfs, boots and overalls among other protective clothing to persons operating within or visit identified high noise areas.
- In order to meet noise level requirements, the equipment should be equipped with standard noise attenuation features. Machines that exceed acceptable noise limits should be equipped with silencers or lagging materials or specially designed acoustic enclosures;

- Inform local residents when construction activities are likely to generate excessive noise in order to minimize disruption to local residents through posters along construction sites.
- Sensitize truck drivers to avoid hooting especially when passing through sensitive areas such as churches, residential areas and hospitals

7.4.4 Water Resources Pollution

The Project excavation activities will trigger limited discharge of silt into rivers and other local drainage systems from earth moving during construction, potential discharge of oil residuals into the same rivers and open drains from the construction equipment and disruption of accumulated solid wastes from work areas washed down into the river and other drains as indicated in **Table 7-6** below. For Proposed Decentralized treatment facility Project, the focus will be on the quality of effluent that will be released into river Sabasaba, EMCA 2015 water Quality Regulations provide that BOD for treated effluent should be less than 30mg/litre. The treatment method proposed “Decentralized Treatment Facility” will ensure the effluent is treated to the required BOD levels; the measure will be adhered to so that the quality of water is guaranteed for downstream users and aquatic ecosystem.

Table 7-6: Water Pollution Impacts Rating

Impact Sources	Discharge of silt and oils into rivers and water bodies leading to pollution		Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> • Erosion of soils that are washed off into water sources • Discharge of oil spills into water bodies • Washing off of solid wastes from project sites into drains and water sources • Could lead to contamination of aquifers and underground water sources • Release of effluent into Sabasaba River that does not meet the requires BOD levels (Water quality regulation 2006). • Could lead destruction of aquatic ecosystem downstream river v after effluent discharge Point. • Pollution of Sabasaba River downstream effluent discharge point posing health sanitation risk to people downstream. 		Medium
Reversibility of impact	Yes		
Affected stakeholders /areas	Fauna and flora, rivers and streams		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	
	<i>Duration</i>	Medium-3	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability) x WF (2+3+3+3) x3= (Low to	Low to Medium

		Medium)	
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Mitigation Measures

- Isolate solid waste disrupted from the works during excavations for safe disposal. The wastes should be collected and disposed in approved sites.
- Earth moving and excavations for the construction are carried out considering safety of the river and surface drainage.
- Control siltation of rivers and other surface drains
- Ensure spilt oil does not discharge into water sources
- Provide oil spill containment including concrete platform for servicing of construction equipment and holding of scrap oil drums.

7.4.5 Waste Generation Impacts (Liquid and Solid)

During construction, solid waste will be generated from a wide range of project activities. Some of the waste includes earth spoils, wrapping materials discarded by the workers on site, food waste from kitchens, waste from the workshops and offices consisting of waste papers, and containers, steel, timber, etc.

Also, during construction various types of liquid waste will be produced such as concrete washings, and runoff from workshops. Just as with solid waste, liquid waste can attract wildlife especially for meeting their drinking water needs. This can affect wildlife especially primates.

To minimize pollution and visual intrusion, the waste will have to be managed appropriately as provided by Waste Management Regulation of 2006. **Table 7-7 on** provides impact scoring for waste generation on site.

Table 7-7: Waste Generation Impacts

Impact Sources	Adverse Impact associated with Health and Safety		Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> - Impact involves pollution of the environment caused by construction generated solid and liquid waste which include waste water, fuels, oils, hazardous substances and other liquid pollutants. - These waste could pose health and sanitation risks when washed away into water bodies 		High
Reversibility of impact	Yes		
Affected stakeholders /areas	Workers and Community		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-5	
	<i>Duration</i>	Medium term-4	
	<i>Probability</i>	Likely – 4	

Significance	Weighting	(Extent+ Intensity +Duration + Probability)x WF(2+5+4+4) x4=60 (Medium to High)	Medium to high
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Waste Management Mitigation measures are summarized below.

Solid Wastes Impacts Mitigation Measures

- (i) The contractor shall develop a comprehensive waste management plan prior to commencement of works
- (ii) Properly labelled and strategically placed waste disposal containers shall be provided at all places of work
- (iii) Litter bins should have secured lids to prevent animals and birds from scavenging
- (iv) All personnel shall be instructed to dispose of all waste in a proper manner
- (v) Recycling of construction material shall be practiced where feasible e.g. containers and cartons
- (vi) Earth spoils shall be disposed of in pre identified sites

Liquids Wastes Impacts Mitigation Measures

- (i) Water containing pollutants such as concrete or chemicals should be directed to a conservancy tank for removal from the site where applicable
- (ii) Potential pollutants of any kind and form shall be kept, stored and used in such a manner that any escape can be contained
- (iii) In case of any form of pollution the contractor should notify the Supervising Engineer
- (iv) Wash areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas including groundwater are not polluted
- (v) No grey water runoff or uncontrolled discharges from the site or working areas to any

Hazardous wastes Impacts Mitigation Measures

- (i) The contractor shall ensure that the machines and equipment are in good condition
- (ii) Ensure proper handling of lubricants, fuels and solvents while maintaining the equipment
- (iii) Any chemical or fuel spills shall be cleaned up immediately. The spilt liquid and clean-up material shall be removed, treated and transported to an appropriate site licensed for its disposal.
- (iv) A safety and emergency response plan will need to be developed for all operations with emphasis on the protection of the environment prior to start up.
- (v) Any chemical or fuel spills shall be cleaned up immediately. The spilt liquid and clean-

- up material shall be removed, treated and transported to an appropriate site licensed for its disposal;
- (vi) Storm water shall be diverted away from the fuel handling and storage areas. An oil water interceptor shall be provided to treat any rainwater from fuel storage and handling areas;
- (vii) Measures should be taken to ensure proper storage of fuel, oil and bitumen. Oil-water interceptors or sumps should be constructed to capture discharge of oils, fats and other polluting liquids from maintenance workshops, vehicle and equipment washing bays and kitchen drains;
- (viii) At the work sites the contractor will be expected to maintain strict surveillance particularly when working within the vicinity of water supply points and the rivers within the project area;
- (ix) Tank equipment such as dispensing hoses, valves, meters, pumps, and gauges shall be located within the containment or provided with own containment

7.4.6 Project Social Risks

The Project activities as described in the report have the potential of triggering various social risks both at Project Construction Phase and Operation Phase. This assessment has identified potential social risks associated with the Project as listed below and analyzed in **Table 7-8** below.

- (i) Project Impacts to Vulnerable and Marginalized Groups (VMGs)
- (ii) Labour Influx Impacts
- (iii) Human Rights and gender inclusivity
- (iv) Increased Transmission of communicable diseases including HIV/AIDS

Table 7-8: Impacts on Social Setting

Impact Sources	Project Impacts to social setting of the Project area		Mitigation Efficiency
Nature of impact	(i) Labour Influx Impacts (ii) Human Rights and gender inclusivity (iii) Child protection (iv) Increased Transmission of communicable diseases including HIV/AIDS		
Reversibility of impact	Yes		
Mitigation Measures	As detailed below		
Affected stakeholders	Workers and Community		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-5	
	<i>Duration</i>	Medium term-4	

	<i>Probability</i>	Likely – 4	
Significance	Weighting	(Extent+ Intensity +Duration + Probability)x WF(2+3+3+3) x1=11 (Low)	Low

Labour Influx Effects

This impact is triggered during Project Construction Phase due to the Project attracting various categories of workers from local, national and international markets. This therefore leads to concentration of people in one area drawn from diverse social and cultural backgrounds often resulting to a number of issues as listed below;

- (i) Strain on various resources especially water resources for road works
- (ii) Grievances from local community members over job opportunities.
- (iii) Sexual Offences
- (iv) Teenage Pregnancies

Mitigation Measures to Labour Influx Impacts

- (i) Effective community engagement and strong grievance mechanisms on matters related to labour
- (ii) Effective contractual obligations for the contractor to adhere to the mitigation of risks against labour influx, the contractor should engage a local community liaison person as provided for in chapter 6
- (iii) Proper records of labour force on site while avoiding child and forced labour
- (iv) Comply to provisions of WIBA 2007
- (v) Develop and implement a children Protection Strategy, this strategy will ensure that no child under the legal age of 18 years in employed to the Project.

Human Right and Gender Inclusivity

This impact is triggered during Project Construction Phase due to the potential of the Contractor's failure to comply with the following provisions;

- (i) Gender Inclusivity requirements in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 gender rule.
- (ii) failure to protect Human Risk areas Associated with, Disadvantaged Groups, Interfering with Participation Rights, and interfering with Labour Rights

Mitigation Measures of Human Rights and Gender Requirements

- (i) Mainstream Gender Inclusivity in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 Gender Rule.
- (ii) The existing community structures headed by location chiefs should be involved in local labour hire, emphasize the requirement of hiring women, youth and people with disability.

- (iii) Protecting Human Risk areas Associated with, Disadvantaged Groups, Interfering with Participation Rights and interfering with Labour Rights

Child Protection

The possibility of contractor children abuse is through hiring of child labour, also labour force on site might abuse children within the Project area through sexual advance that could lead to early pregnancies and school dropout including exposure to communicable diseases such as HIV and AIDS. The contractor will undertake the below listed mitigation measures.

Mitigation Measures to child protection

- (i) Develop and implement a Children Protection Strategy that will ensures minors are protected against negative impacts associated by the Project.
- (ii) All staff of the contractor must sign, committing themselves towards protecting children, which clearly defines what is and is not acceptable behaviour
- (iii) Children under the age of 18 years should be hired on site as provided by Child Rights Act (Amendment Bill) 2014

Increase in Prevalence of Communicable Diseases

This impact is triggered during Project Construction Phase due to the Project attracting various categories of workers from local, national and international markets. This therefore leads to concentration of people in one area drawn from diverse social and cultural backgrounds often resulting to people engaging in risky sexual activities.

Mitigation Measures to Risk of Communicable Diseases

- (i) COVID 19 and HIV/AIDS Awareness Program and other communicable diseases to be instituted and implemented as part of the Contractor's Health and Safety Management Plan to be enforced by the Supervising Engineer.
- (ii) Strict compliance to WHO and GoK mitigation measures fo fight against Covid -19 that include Maintaining the social distancing and Personeel hygiene which include frequent washing of hands
- (iii) Periodic COVID 19 and HIV/AIDS and other communicable diseases Awareness Workshops for Contractor's Staff
- (iv) Access to Contractor's Workforce Camps by outsiders to be controlled
- (v) Contractor to provide standard quality condoms to personnel on site

7.5 Positive Impacts during Operational Phase

The Project main objective is to improve the quality of life of people within Sabasaba, Maragua and their surrounding environs through provision of improved Sewerage Services. The positive impacts associated with the Project operation phase are summarized below.

- Reduced cases of water borne diseases associated with pollution of water resources

- Improved Health and Sanitation status of Sabasaba, Maragua Towns and their surrounding environs
- Reduced pollution of natural river systems which include Sabasaba River and numerous springs within the Project area.
- Trigger development of modern infrastructure within Sabasaba, Maragua urban areas and their surrounding environs due to availability of sewage treatment infrastructure
- Reduce distances covered by exhausters to sludge discharge points eventually reducing costs.
- Residents will decommission pit latrines which are expensive to construct and unsustainable due to short fill-up duration.
- Improve aesthetic outlook of Sabasaba, Maragua towns and their surrounding environs

7.6 Negative Impacts during Operation Phase

The project operation phase will have potential negative impacts which are less significant and can easily be mitigated as described in **sub-sections 7.6.1 to 7.6.7**.

7.6.1 Odour Menace from Wastewater Treatment Works

The process of wastewater collection, conveying or treatment has the potential to generate and release odours to the surrounding area. Most odour problems occur in the collection system, in primary treatment facilities and in solid handling facilities as well as the sludge drying beds.

The most frequently reported symptoms attributed to odours from treatment plants include headache, nausea, hoarseness, cough, nasal congestion, palpitations shortness of breath, stress, drowsiness, alterations in mood, and eye, nose, and throat irritation. Hydrogen Sulphide (H₂S) is the most prevalent gas associated with domestic wastewater collection and treatment.

The conditions leading to H₂S formation usually favour the production of other odorous gases such as ammonia which may have considerably higher detectable odour thresholds, and consequently H₂S may be an indicator of their presence. Exposure of receptors to levels of hydrogen sulphide above 5ppb can lead to odour nuisance.

Table 7-9: Impact on Odour Menace from Wastewater Treatment Works

Impact Sources	Odour Menace from Wastewater Treatment Works	Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> • Odour may result from wastewater collection, conveying or treatment 	Medium
Reversibility of impact	Yes	
Affected stakeholders /areas	the immediate residents and commercial premises	

Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	
	<i>Duration</i>	Medium-3	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability) x WF (2+3+3+3) x3= (Low to Medium)	Low to Medium

Mitigation measures

- Ensure appropriate covering/ventilation of the pre-treatment unit;
- Ensure appropriate handling and removal of grit/grease;
- Ensure proper sizing and alignment of the plant;
- Ensure scum is appropriately disposed off or properly stabilized;
- Ensure adequate water flow through the plant to reduce the potential of odour formation;
- The perimeter of the proposed site should be vegetated with trees and plants of varying heights thereby forming windbreaker and reduce dispersion of odour;
- Repair the roofs of the sludge drying beds to ensure quick drying of sludge and appropriate disposal to reduce odour emanating from wet sludge.

7.6.2 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 treatment ponds. 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.

Table 7-10: Flooding Impacts

Impact Sources	Flooding	Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> • Washing off of solid wastes from project sites into drains and water sources • Could lead to contamination of aquifers and underground water sources • Release of effluent into river Sabasaba that does not meet the requires BOD levels (Water quality regulation 2006). 	Medium

Reversibility of impact	Yes		
Affected stakeholders /areas	Fauna and flora, rivers and streams		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	
	<i>Duration</i>	Medium-3	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability) x WF (2+3+3+3) x3= (Low to Medium)	Low to Medium

Mitigation Measures

- Site drainage system should be made to recommended standards and maintained

7.6.3 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 county solid waste and should be carried to the designated dumpsite for proper disposal. The volume of solid waste is anticipated to be medium; hence, it must be well disposed or used as fertilizer. The removal of sludge from the system will require that sludge be removed frequently on schedule.

Table 7-11: Waste Generation and Disposal Impacts

Impact Sources	Waste Generation and disposal		Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> • Impact involves pollution of the environment caused by grit. • These waste could pose health and sanitation risks when washed away into water bodies 		Medium
Reversibility of impact	Yes		
Affected stakeholders /areas	Fauna and flora, rivers and streams, the immediate residents and commercial premises		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	
	<i>Duration</i>	Medium-3	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability) x WF (2+3+3+3) x3= (Low to Medium)	Low to Medium

		Medium)	
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Mitigation Measures

- 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 or landfill.

7.6.4 Transportation/Traffic

The project is expected to increase the traffic along the access roads marginally, as there will be trucks driving to the site each day.

Table 7-12: Transportation/Traffic impacts

Impact Sources	Transportation/ traffic		Mitigation Efficiency
Nature of impact	• Increase of traffic along the road as truck drive to the site to offload and leave the site.		Medium
Reversibility of impact	Yes		
Affected stakeholders /areas	the immediate residents and commercial premises		
Magnitude	Site – 2	Site – 2	
	Medium-5	Medium-5	
	Medium term-4	Medium term-4	
	Likely – 4	Likely – 4	
Significance	(Extent+ Intensity +Duration + Probability)x WF(2+3+3+3) x1=11 (Low)	Low	(Extent+ Intensity +Duration + Probability)x WF(2+3+3+3) x1=11 (Low)

Mitigation Measures

- 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.

7.6.5 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 empties 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.

Table 7-13: Septage Disposal impacts

Impact Sources	Seepage disposal		Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> Release of effluent into river Sabasaba that does not meet the requires BOD levels- 500 mgO 2/l (Water quality regulation 2006). 		Medium
Reversibility of impact	Yes		
Affected stakeholders /areas	Fauna and flora, rivers and streams		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-3	
	<i>Duration</i>	Medium-3	
	<i>Probability</i>	Likely-3	
Significance	Weighting	(Extent+ Intensity +Duration + Probability) x WF (2+3+3+3) x3= (Low to Medium)	Low to Medium

Mitigation Measures

- 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.
- Any operational failures on DTF should be reported to Muswaco management team and repaired without delay to prevent pollution of River Sabasaba

7.6.6 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.

Table 7-14: Emergency Response Impacts

Impact Sources	Emergency response	Mitigation Efficiency
Nature of impact	<ul style="list-style-type: none"> The construction of the facility could lead to disasters such as, floods and drowning 	Medium
Reversibility of impact	Yes	
Affected stakeholders /areas	Workers	
Magnitude	<i>Extent</i>	Site – 2
	<i>Intensity</i>	Medium-5
	<i>Duration</i>	Medium term-4
	<i>Probability</i>	Likely – 4
Significance	Weighting	(Extent+ Intensity +Duration + Probability)x WF(2+3+3+3) x1=11 (Low)
		Low

Mitigation Measures

- 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 organizations/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

7.6.7 Inversion of Birds and Reptiles to the Waste Water Treatment Works

There is a possibility of birds’ attraction to the sewage treatment plants arising from proliferation of insects and aquatic flora suitable for birds’ food. Certain species and population of birds at Sewage treatment plant could become a safety risk to aviation sector; however, no flight corridor was identified within the vicinity. Certain animals including crocodiles and hippos may encroach the sewage treatment plants and other areas arising from overgrown vegetation. This will not only be a nuisance to the plants’ operations but also pose safety threats to the immediate residents and commercial premises.

The sewage discharging from the treatment plants (as well as other discharges from sources) are a determinant of the macro and micro flora and fauna in rivers. Excessive nutrients will lead into increased eutrophication of the river waters while chemical and organic loading will reduce the capacity for the river waters to support life (low oxygen levels and toxic conditions).

Table 7-15: Inversion of Birds and Reptiles to the Waste Water Treatment Works impacts

Impact Sources	Inversion of Birds and Reptiles to the Waste Water Treatment Works	Mitigation Efficiency	High
Nature of impact	<ul style="list-style-type: none"> • safety risk to aviation sector • safety threats to the immediate residents and commercial premises 		
Reversibility of impact	Yes		
Mitigation Measures	As detailed below		
Affected stakeholders	Workers and Community		
Magnitude	<i>Extent</i>	Site – 2	
	<i>Intensity</i>	Medium-5	
	<i>Duration</i>	Medium term-4	
	<i>Probability</i>	Likely – 4	
Significance	Weighting	(Extent+ Intensity +Duration + Probability)x WF(2+3+3+3) x1=11 (Low)	Low

Mitigation Measures

- The sewage treatment plants should be protected from wildlife encroachments by providing secure barriers to keep off the animals from interfering with the plant operations and safety. This will also ensure safety of the residents,
- The quality of the discharging sewage into the river will be an important parameter on the regional control of the river eutrophication. Continuous generation and sharing of sewage quality data on pre-scheduled monitoring programmes will be necessary

CHAPTER 8 : ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

8.1 Purpose and Objectives of ESMMP

The specific objectives of the ESMMP are to:

- Serve as a commitment and reference for the contractor to implement the ESMMP including conditions of approval from NEMA.
- Serve as a guiding document for the environmental and social monitoring activities for the supervising consultant, contractor and the client management including requisite progress reports.
- Provide detailed specifications for the management and mitigation of activities that have the potential to impact negatively on the environment.
- Provide instructions to relevant Project personnel regarding procedures for protecting the environment and minimizing environmental effects, thereby supporting the Project goal of minimal or zero incidents.
- Document environmental concerns and appropriate protection measures; while ensuring that corrective actions are completed in a timely manner.

8.2 Auditing of ESMMP

MUSWASCO and the Contractor shall conduct regular audits to the ESMMP to ensure that the system for implementation of the ESMMP is operating effectively. The audit shall check that a procedure is in place to ensure that:

- The ESMMP being used is the up to date version;
- Variations to the ESMMP and non-compliance and corrective action are documented;
- Appropriate environmental training of personnel is undertaken;
- Emergency procedures are in place and effectively communicated to personnel;
- A register of major incidents (spills, injuries, complaints) is in place and other documentation related to the ESMMP
- Ensure that appropriate corrective and preventive action is taken by the Contractor once instructions have been issued

8.3 Management Responsibility of ESMMP

In order to ensure the sound development and effective implementation of the ESMMP, it will be necessary to identify and define the responsibilities and authority of the various persons and Organizations that will be involved in the project. The following entities should be involved in the implementation of this ESMMP:

- MUSWASCO
- NEMA;
- Contractor;
- Supervising Engineer;
- County Government of Murang'a

8.3.1 Muranga South Water and Sanitation Company (MUSWASCO)

MUSWASCO is the project proponent, will be charged with the responsibility of ensuring that the proposed development has been put up in an environmentally sound manner. This can be achieved by inclusion of environmental specifications in the tender documents, selection of renowned environmentally conscious contractors and supervision to ensure that the objectives of this ESMMP are met.

8.3.2 National Environment Management Authority (NEMA)

The responsibility of NEMA is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government of Kenya in the implementation of all policies relating to the environment.

8.3.3 The Contractor

The persons/firms contracted to put up the proposed decentralized Treatment Facility will be required to comply with the requirements of the ESMMP within this report. To ensure strict compliance environmental specifications of this ESMMP should form part of the contract documents.

8.3.4 Consultant

The sourced consultant will have to ensure that the proposed ESMMP is up to date and is being used by the contractor. Periodic audits of the ESMMP will have to be done to ensure that its performance is as expected.

8.3.5 County Government of Murang'a

The relevant departmental officers in the above local authorities should be called upon where necessary during Project implementation to provide the necessary permits and advisory services to

the Project implementers.

Tables 8-1 and 8-2 present the ESMMP for the proposed Project during construction, operation and decommissioning phases respectively. Wastes and debris holding sites will be cleared with maximum re-use of the debris either on surfacing the passageways or other grounds such as schools and church compound.

Table 8-1: Construction Phase: Environmental and Social Management and Monitoring Plan

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas & Responsibilities	Monitoring Indicator	Budget
Seeking approvals from NEMA for ESIA and Approval of plans from County and National Government	Delay in implementation of the Project due to objections and stop orders	Low	<ul style="list-style-type: none"> ▪ The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to; ▪ The Contractor shall maintain a database of all pertinent permits and licenses required for the contract as a whole and for pertinent activities for the duration of the contract 	All the Project components <u>Responsibility</u> MUSWASCO & Contractor	<ul style="list-style-type: none"> • Number of approvals / permits issued 	~KShs.1M
Access to construction sites	Environmental degradation risks	Medium	<ul style="list-style-type: none"> ▪ Utilize to the extent possible the existing public roads to avoid social and economic disruption ▪ Ensure road safety measures for the construction vehicles to the extent possible by observing all traffic regulations 	Access Roads <u>Responsibility</u> Contractor(s)	<ul style="list-style-type: none"> • Cases of private land required • Accidents occurrence incidences 	No direct cost associated
Environmental and Social Training and Awareness	Risks of Environmental and Social degradation risks and occupational health and safety related accidents	High	<ul style="list-style-type: none"> ▪ The Contractor and sub-contractors shall be aware of the environmental requirements and constraints on construction activities contained in the provisions of the ESMMP ▪ The Contractor will be required to provide for the appropriate Environmental Training and Awareness as described in this ESMMP in his costs and programming ▪ An initial environmental awareness training session shall be held prior to any work commencing on site, with the target audience 	All Workers <u>Responsibility</u> Contractor(s)	<ul style="list-style-type: none"> • Number of Trainings Held • Availability of Training reports • Attendance list of participants during the trainings 	KShs. 0.5M

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
			being all project		sessions	
HIV/AIDS awareness and prevention campaign	Risks of Increased HIV and Aids transmission in the area	Medium	<ul style="list-style-type: none"> ▪ The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract, contracting and implementing organization, with preference for an organization already working on this issue in the Project area; ▪ The campaign shall include the training of facilitators within the workers, information posters in more frequented areas in the campsite and public areas, availability of promotional material (T-shirts and caps), availability of condoms (free), and theatre groups 	All Workers <u>Responsibility</u> Contractor(s)	<ul style="list-style-type: none"> • Number of Trainings Held • Availability of Training reports • Attendance list of participants during the training sessions 	KShs. 0.5M
Local Labour / Employment	Delay in Project implementation due to opposition from aggrieved community members	Medium	<ul style="list-style-type: none"> ▪ Wherever possible, the Contractor shall use local labour, and women must be encouraged to be involved in construction work ▪ The contractor shall ensure compliance to the gender balance as required by the 2/3 gender rule 	All the Project Lots <u>Responsibility</u> Contractor	<ul style="list-style-type: none"> • Number of workforce employed from the local community • Number of female employed 	No direct costs associated
EMP Management Records	Risks of non-conforming to ISO 9001 on QMS and ISO 14001 on EMS	Medium	<ul style="list-style-type: none"> ▪ The updated version of the EMP should be kept on site ▪ Copies of all necessary permits and licenses should be kept on site ▪ All site specific plans prepared as part of the 	All the Project Components <u>Responsibility</u> Contractor	<ul style="list-style-type: none"> • Number of available permits on site • ISO audit 	No direct associated costs

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
			updated ESMMP <ul style="list-style-type: none"> All related environmental, social, health and safety management registers and correspondence, including any complaints A register of audit non-conformance reports and corrective actions 		report on non-conformities <ul style="list-style-type: none"> Number of corrective measure adopted 	
Earth moving and excavations (Vegetation clearance, channeling and site preparations)	<ul style="list-style-type: none"> Health and Safety risks Air pollution Social nuisance 	Medium	<ul style="list-style-type: none"> Provide notices, signage and information to the public for their safety at all locations Install barriers along walkways, crossings and public places affected by the works for public safety Where there are potential for nuisance from dust generation, ensure earth moving is under dump conditions (consider watering where necessary) Inform immediate communities or stakeholders of the activities. 	All work areas <u>Responsibility</u> Contractor(s)	<ul style="list-style-type: none"> Accidents occurrence incidences Cases of respiratory complication at nearby health center 	~KShs. 0.5M
	<ul style="list-style-type: none"> Vegetation Cover destruction Loss of biodiversity 	Low	<ul style="list-style-type: none"> Construction activities will be limited to Project sites / routes which already exist therefore limited destruction to vegetation cover 	All work areas <u>Responsibility</u> Contractor(s)	<ul style="list-style-type: none"> Soil erosion extend and intensity on site 	No direct cost
	<ul style="list-style-type: none"> loss of top soil 	Low	<ul style="list-style-type: none"> Stock piling of top soil, construction material and wastes should be done only at designated sites approved by the supervising engineer, erosion prevention through berming of loose soil sites should be done in all areas susceptible to agents 	All work areas <u>Responsibility</u> Contractor(s)	<ul style="list-style-type: none"> Soil erosion extend and intensity on site 	No direct cost

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
			of erosion			
	<ul style="list-style-type: none"> ▪ Public Health and safety risks ▪ Worker Occupational safety risks 	Medium	<ul style="list-style-type: none"> ▪ Notify public the intent to cut sections of the road for safety precautions ▪ Provide signage and safety information in all work areas ▪ Ensure compliance by workers with safety safeguards including the OHS, provision of safety gear and enforcement of application 	civil works areas <u>Responsibility</u> Contractor(s) Supervision	<ul style="list-style-type: none"> • Accidents occurrence incidences 	KShs.0.5M
	<ul style="list-style-type: none"> ▪ Disruption of amenities ▪ (access roads, services lines and driveways) causing inconveniences to the community 	Medium	<ul style="list-style-type: none"> ▪ Notify other services providers and ▪ Open small sections that can be reinstated within the shortest period to avoid public disruption ▪ Mark the lines to avoid conflicts with other activities 	civil works areas <u>Responsibility</u> Contractor(s) Supervision	<ul style="list-style-type: none"> • Number of complaints from community due to lack of certain services 	No direct costs
Wastes generation and disposal	Risks of contaminating surface and underground water resources	High	<ul style="list-style-type: none"> ▪ Construction wastes (residual earth, debris and scrap materials) to be removed for safe disposal ▪ Encourage recycling where possible (concrete debris for access road surfacing), ▪ Contaminated organic matter in the work areas to be isolated for safe disposal ▪ Material residuals to be disposed off in accordance with established regulations 	Construction areas <u>Responsibility</u> Contractor(s) Supervision	<ul style="list-style-type: none"> • Number of complaints from community not happy with waste management of the contractor 	KShs. 0.5M

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
Spoil Storage site	Risks of solid waste mismanagement leading to pollution	Medium	<ul style="list-style-type: none"> ▪ Preferably to be located on land already cleared wherever possible. Communities shall be involved in the site location to avoid conflict ▪ The need to be more than 20 meters from water courses and in a position that will facilitate the prevention of storm-water runoff from the site from entering the watercourse ▪ Contouring of spoil site to approximate natural topography and drainage and/or reduce erosion impacts on the site ▪ The Contractor shall ensure that the placement of spoil is done in such a manner to minimize the spread of materials and the impact on surrounding vegetation and that no materials' creep' into' no-go' areas 	Construction areas <u>Responsibility</u> Contractor(s) Supervision	<ul style="list-style-type: none"> • Number of complaints from community not happy with waste management of spoil material 	Contractor best management practice
Occupational Health and Safety	Risks of Accidents, Injuries or death of workers or community member	High	<ul style="list-style-type: none"> ▪ Provide construction workers with personal protective gear (gloves, gum boots, overalls and helmets), ▪ Provide temporary toilets and bathrooms for the construction workers at the work sites ▪ Provide onsite first aid kit accessible by the workers on need, ▪ Isolate the site for access by the local communities during the construction for their safety and health Contractor to provide a Healthy and Safety Plan	All work areas <u>Responsibility</u> Contractor(s) Supervision	Accidents occurrence incidences	KShs.0.5M

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
			prior to the commencement of works to be approved by the resident engineer.			
Storage of fuel oils, lubricants, chemicals and flammable materials	Hazards of fire outbreak, oil and chemical spills.	High	<ul style="list-style-type: none"> Follow specifications of the Occupational Health and Safety Act, EMCA1999 and others in the development and operation of stores. 	All work areas <u>Responsibility</u> Contractor(s) Supervision	Incidence of reported cases of fuel leaks and fire incidences	No direct cost associated
Sanitation issues resulting from both solid and liquid wastes on site.	Risks associated with water borne diseases exposed to community and workforce	Medium	<ul style="list-style-type: none"> The Contractor shall -laws relating to public health and sanitation All temporary/ portable toilets or pit latrines shall be secured to the ground to the satisfaction of the RE to prevent them from toppling over A wash basin with adequate clean water and soap shall be provided alongside each toilet. Staff shall be encouraged to wash their hands after use of the toilet, in order to minimize the spread of possible disease 	All work areas <u>Responsibility</u> Contractor(s) Supervision	Incidence of reported cases of water related diseases among the workforce and neighbor community	No direct cost associated
Noise and Vibration control from plant and equipment	Risk to health and safety of community and workers	Medium	<ul style="list-style-type: none"> The Contractor shall keep noise level within acceptable limits and construction activities shall, where possible, be confined to normal working hours in the residential areas hospitals and other noise sensitive areas shall be notified by the Contractor at least 5 days before construction is due to commence in their vicinity Any complaints received by the Contractor regarding noise will be recorded and 	civil works areas and access roads <u>Responsibility</u> Contractor(s) Supervision engineer	Reported complaints from neighbor community and institutions	No direct cost associated

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
			<p>communicated to the RE</p> <ul style="list-style-type: none"> The Contractor must adhere to Noise Prevention and Control Rules of April 2005 			
Traffic management on site	Risks of Accidents, Injuries or death of workers or community member	high	<ul style="list-style-type: none"> Strict use of warning signage and tapes where the trenches are open and active sites Employ and train road safety Marshalls who will be responsible for management of traffic on site Contractor to provide a traffic management plan during construction to be approved by the resident engineer 	<p>.civil works areas and access roads</p> <p><u>Responsibility</u> Contractor(s) Supervision engineer</p>	Accidents occurrence incidences	KShs. 0.5M
Air Quality Control	Air pollution causing respiratory disorders to human	High	<ul style="list-style-type: none"> Workers shall be trained on management of air pollution from vehicles and machinery. All construction machinery shall be maintained and serviced in accordance with the contractor’s specifications The removal of vegetation shall be avoided until such time as clearance is required and exposed surfaces shall be re-vegetated or stabilized as soon as practically possible The contractor shall not carry out dust generating activities (excavation, handling and transport of soils) during times of strong winds Vehicles delivering soil materials shall be covered to reduce spills and windblown dust Water sprays shall be used on all earthworks areas 	<p>All work areas</p> <p><u>Responsibility</u> Contractor(s) Supervision</p>	Cases of respiratory complication at nearby health centre	No direct costs (integrated in the works costs)

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas& Responsibilities	Monitoring Indicator	Budget
			within 200metres of human settlement.			
Contractor de-mobilization and site reinstatement	Associated risks of environmental degradation	High	<ul style="list-style-type: none"> ▪ The site is to be cleared of all construction materials, including litter prior to hand over ▪ Fences, barriers and demarcations associated with the construction phase must be removed from the site ▪ Fences, barriers and demarcations associated with the construction phase must be removed from the site ▪ Rehabilitation Activities of Environmental Cases identified must continue throughout the defect liability period 	All work areas <u>Responsibility</u> Contractor(s) Supervision	Closeout audit report findings	No direct costs
Total Estimated Cost for ESMMP					EMP	KES 5.5 M
*						

Table 8-2: Operational Phase: Environmental and Social Management and Monitoring Plan

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas & Responsibilities	Monitoring Indicator	Budget
Solid Waste Generation and Disposal	Increase in solid waste on site	•	<ul style="list-style-type: none"> ▪ 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 	<p><u>MUSWASCO</u> <u>WRMA</u> <u>NEMA</u></p>	Waste bins Onsite Disposal of grit/sludge in licensed dump sites	30,000
Transportation/Traffic	Increase in traffic along the access road	•	<ul style="list-style-type: none"> ▪ Limit septage delivery to the site between the hours of 8 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. 	MUSWASCO	Regulated transport hours and times Noise levels generated en route by vehicles minimization Signs posted En route	No direct costs
Septage Disposal	Poor depositing of septage by cess pool emptier	•	<ul style="list-style-type: none"> ▪ Institute and maintain a ticketing system for cesspool emptiers, where upon successful disposal, the WWTP 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. 	MUSWASCO County Government	Tickets issued by the MUSWASCO	No direct costs

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas & Responsibilities	Monitoring Indicator	Budget
			<ul style="list-style-type: none"> ▪ Ensure that septage is only accepted at the site by authorization 			
Emergency Response	Accidents occurrence and sicknesses	•	<ul style="list-style-type: none"> ▪ Install safety valves on gas conveyance system ▪ Reduce distances for conveying gas to neighbors ▪ 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 organizations/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 	MUSWASCO	Sickness and Accident records Safety valves on gas conveyance system installed	20,000
Foul Odours	Generation of foul smell at the site	•	<ul style="list-style-type: none"> ▪ 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. 	MUSWASCO	Periodic Water quality tests	20,000/per test
Future environmental protection	Any impact arising	•	<ul style="list-style-type: none"> ▪ Involve all stakeholders and let them play their roles in monitoring activities 	MUSWASCO	Documented procedures	100,000
Project maintenance / impacts on the local stream and the neighbourhood	Leakage · Visual impacts; · Health and safety; · Water quality	•	<ul style="list-style-type: none"> ▪ 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 	MUSWASCO	Monthly reporting Once a year water quality tests in an approved lab	6,000 per test

Activity	Associated Impacts	Impact Levels	Management Actions	Target Areas & Responsibilities	Monitoring Indicator	Budget
Wastewater Disposal/Water Pollution	Pollution of local stream	•	<ul style="list-style-type: none"> ▪ Follow the NEMA waste water quality guidelines strictly ▪ The quality of the discharging sewage into the river will be an important parameter on the regional control of the river eutrophication. Continuous generation and sharing of sewage quality data on pre-scheduled monitoring programmes will be necessary 	MUSWASCO		40,000
Risk of inversion of birds, rodents, mammals and associated reptiles		•	<ul style="list-style-type: none"> ▪ Keep the sewer treatment plant clean to limit the attraction of birds which scavenge for insects and maggots from the ponds and sludge beds ▪ The sewage treatment plants should be protected from wildlife encroachments by providing secure barriers to keep off the animals from interfering with the plant operations and safety. This will also ensure safety of the residents, ▪ In the event of larger wildlife e.g. hippos and crocodiles, MUSWASCO will ensure appropriate consultations with the Kenya Wildlife Services (KWS) on appropriate management actions, 	MUSWASCO	No of cases reported related to wildlife in security	To be established at operation phase and included in the operation of the projects

CHAPTER 9 : CONCLUSION AND RECOMMENDATION

9.1 Conclusion

The Environmental and Social Impact Assessment undertaken for the Project indicates that the Project will have the following impacts:

- (i) The Project area is located in Maragua constituency, Kamahuha ward kaharati sub location the project area is away from any sensitive environment ecosystems. The assessment identified that there will be no direct interaction of the Project activities at the time of construction with the natural sensitive ecosystems.
- (ii) The Environment impacts will be but not limited to loss of vegetation cover and other less significant impacts discussed in Chapter 7 of this assessment. However, it could result to significant water pollution impacts to Sabasaba River if not appropriately operated and maintained.

8.4 Recommendations

This assessment recommends the following provisions:

- (i) The bid documents prepared for the Project incorporates the Environment, Social Health and Safety Provisions discussed under Chapter 7 (Environment and Social Impact Assessment and Mitigation Measures).
- (ii) Contractor be required to commit to implementing the Environment, Social Health and Safety (ESHS) Provisions by developing site specific (ESHS) plans.
- (iii) At Project implementation stage, the Contractor to report to the Project management team comprising of the Consultant and the Project proponent on a monthly basis on how ESHS provision detailed in this ESIA are addressed at each Project Site.
- (iv) On completion of the Civil Works, MUSWASCO to commission an independent Consultant to undertake an initial Environment, Social, Health and Safety Audit as required by Environment Impact Assessment and Audit Regulations of 2003 with 2019 amendments . The audit will identify nonconformities which the Contractor together with MUSWASCO will address through the defects liability period of the Project. This audit will also form basis of annual Project self audits by MUSWASCO

ANNEXES

Annex 1: Lead Expert Nema License

FORM 7 (c.15(2))



nema
nāgōgō yōu | otai wote | wājūka wote

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/11732
Application Reference No: NEMA/EIA/EL/15832

M/S **LAWRENCE W. MWANGI**
(individual or firm) of address
P.O. Box 8584-00200, Nairobi

is licensed to practice in the
capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **0317**
in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: 1/27/2020 Expiry Date: 12/31/2020


Signature.....
(Seal)
Director-General
The National Environment Management
Authority

P.T.O.



ISO 9001: 2008 Certified

Annex 2: Approved Acknowledgement and Approval of the TOR



NEMA/TOR/5/2/189 Date: 14/12/2020

Mwingi South Water & Sanitation
Company (MUSWASCO)

P.O. Box 87-01034


Kandara

**RE: ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE
(TOR) FOR ENVIRONMENTAL 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 a Decentralized
Treatment Facility at Sabasaba, Mwingi 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



MARRIAN KIOKO
EIA SECTION HEAD

Scanned with CamScanner

Annex 3: Land Ownership Document

MURANG'A COUNTY GOVERNMENT

ALL CORRESPONDENCE TO BE ADDRESSED
THE COUNTY SECRETARY



Growing together

County Hall,
P.O Box 52—10200,
Murang'a,
Kenya
Telephone 060-2030271
E-mail: info@muranga.go.ke
Web: muranga.go.ke

REF:-MCG/MUS/MWS/VOL 1/23 DATE:19TH SEPT 2018

**MANAGING DIRECTOR,
MURANG'A SOUTH WATER & SANITATION COMPANY,
P.O BOX 87-01034
KANDARA.**

REF: LETTER OF NO OBJECTION FOR PROPOSED UBSUP DTF50 PROJECT BY MUSWASCO

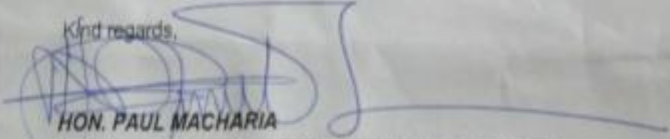
Proposed DTF50 Construction Project in PLOT NO.TWSB/MWSC/SABWS/02/LD/02- (0.3Ha)

Murang'a County has no objection in MUSWASCO constructing the proposed DTF50 in the said plot which is a water company preserved Plot in Sabasaba area currently under the county government for the sake of improving Basic Sanitation for the Urban Poor (UBSUP) which is a six-year programme (2011-2017) which aims at improving living conditions by offering access to sustainable sanitation to residents of urban low-income areas. The UBSUP programme was developed and is being implemented by the Water Sector Trust Fund (WSTF) with technical support from GIZ.

The said towns which are to benefit from the UBSUP Project are low income and require a sustainable approaches to address sanitation through innovative approaches in capacity building, technology, and infrastructure improvement. The overall objective of this project is to improve the living standards of the Murang'a citizens in terms of proper sanitation services. The proposed project is expected to cost approximately **KShs. 11,000,000.00** over a construction period of 6 months. The project will treat **50m³ per day of effluent** and this will go a long way in improving the sanitation status in the urban centres of Kenol, Kabati, Sabasaba and Maragua.

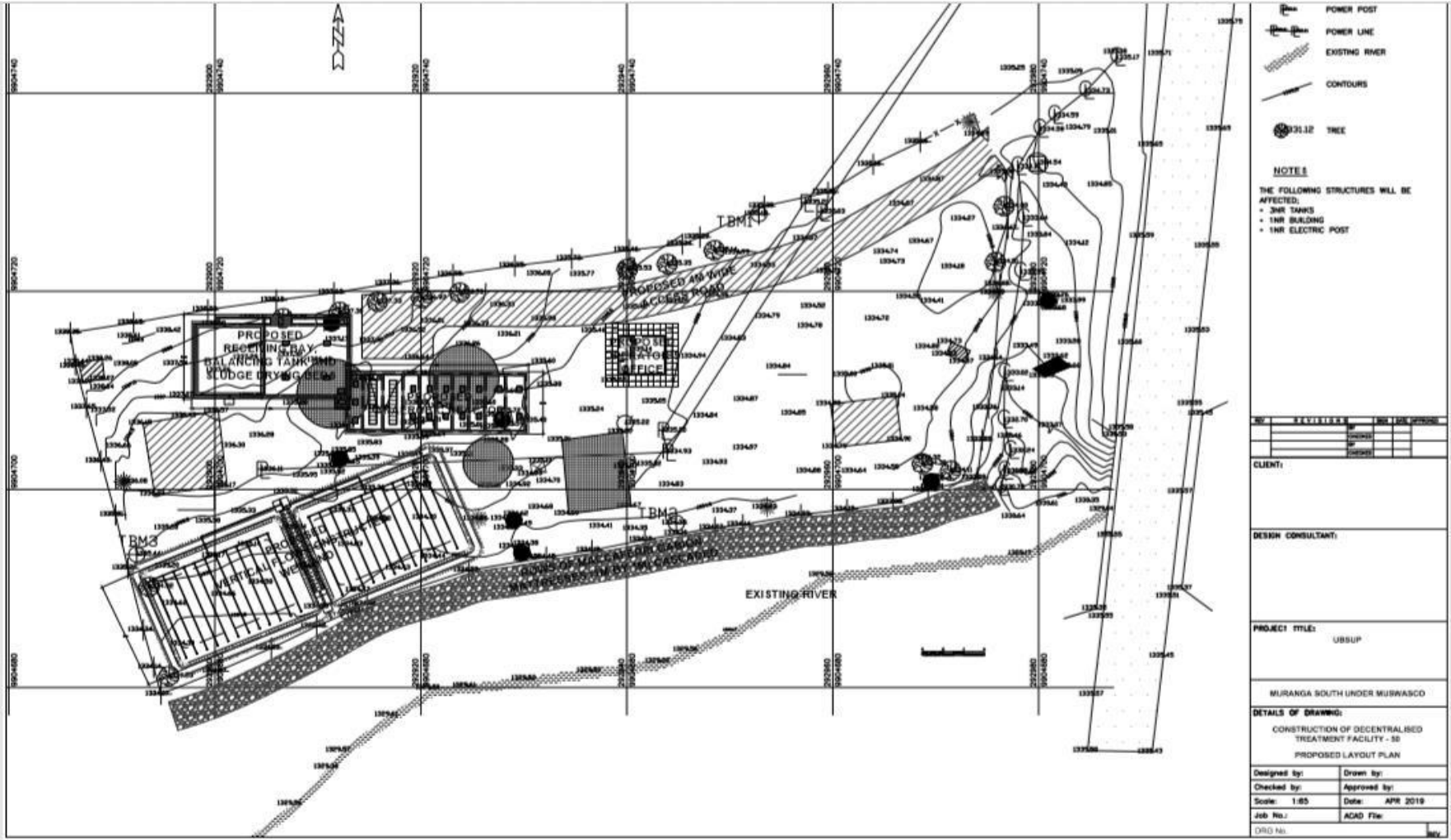
With this letter, the County Government of Murang'a fully undertakes to support this innovative initiative and will ensure that the project is implemented in accordance to the agreed rules and regulations governing the UBSUP contract to the benefit of the residents of Kenol, Kabati, Sabasaba and Maragua.

Kind regards,



HON. PAUL MACHARIA
CEC: WATER AND IRRIGATION, MURANG'A COUNTY

Annex 4: Design Layout Plan



Annex 5: Filled Questionnaires