UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MZUMBE UNIVERSITY – MAIN CAMPUS

ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT FOR THE PROPOSED DEVELOPMENT OF TWO UNITS OF WASTEWATER STABILIZATION PONDS AT MZUMBE UNIVERSITY- MAIN CAMPUS, CHANGARAWE VILLAGE, MZUMBE WARD, MVOMERO DISTRICT IN MOROGORO REGION

PROPONENT

MZUMBE UNIVERSITY

P.O.BOX 1

MZUMBE, MOROGORO

MARCH 2024

EXECUTIVE SUMMARY

1. Introduction

Mzumbe University (MU), through the Government of the United Republic of Tanzania (URT) has received financing from the World Bank to implement Higher Education for Economic Transformation (HEET) Project. Under HEET, MU intends to establish two units of wastewater stabilization ponds at Mzumbe University's Main Campus in Changarawe Village, Mvomero District, Morogoro Region. However, the construction and operation of such facilities are expected to have environmental, social and economic impacts, which need to be identified and mitigation measures put in place for ensuring sustainability of the project.

The World Bank Environmental and Social Frameworks (ESF) and Standards (ESSs) as well as the Environmental Management Act of 2004 of Tanzania require project developers to carry out an Environmental and Social Impact assessment (ESIA) prior to project implementation. Through a rigorous ESIA, potential environmental and social impacts will be thoroughly evaluated, and necessary measures will be recommended to ensure the continued harmony between academic growth, infrastructure development, and environmental preservation. Therefore, this study was done in line with Environmental Management Act, Cap 191, the Environmental Impact Assessment and Audit (Amendment) Regulations, 2018, and the World Bank Environment and Social Framework (ESF) as well as the project's Environmental and Social Management Framework (ESMF). In addition, this ESIA has been guided by the Project Appraisal Document (PAD) and Project Operational Manual (POM) both of 2021.

2. Projects Description

The proposed project involves the establishment of two units of wastewater stabilization ponds within Mzumbe University's Main Campus premises, with a capacity of about 7,740m^3/day. The unit include anaerobic pond, facultative pond and maturation pond. This initiative was driven by the need to accommodate the increasing demand on existing infrastructure due to the development of new facilities, including the Directorate of ICT Complex and Innovation Incubation Centre, Cafeteria, and Academic Complex. These new developments have led to a substantial rise in enrollment at MU. Currently, MU has the capacity to cater to approximately 9,154 persons, comprising 546 academic and administrative staff, along with 8,608 students. The entire university community relies on the existing infrastructure, and the wastewater generated is currently treated by a single unit of wastewater stabilization ponds within the university premises.

3. Relevant Policies and Legislation

Some of the National laws, policies, plans, strategies and legislation relevant to this project have been discussed in this report. Furthermore, this ESIA study has also complied with the following tools: World Bank's new Environmental and Social Framework (ESF) and applicable World Bank Environmental and Social Standards (ESSs) to HEET project.

4. Stakeholders Engagement

Stakeholder identification and involvement adhered to guidelines specified in the Environmental Impact Assessment (EIA) and Audit Regulations (2005, as amended in 2018), World Bank Environmental and Social Standards (ESS10), and the Stakeholders Engagement Plan (SEP). Public consultations entailed the sharing of project details, comprehension of stakeholder concerns, and

cultivation of community relationships. Key stakeholders were pinpointed based on their roles, significance, influence, and potential impact on the project. The Stakeholders Engagement Plan (SEP) encompassed both national and sub-national levels, with a particular emphasis on sub-national stakeholders. It delineated the specifics of engagement pertaining to project activities, encompassing stakeholders at regional, district, and village tiers. The project aspired to inclusivity by involving women, vulnerable populations, and individuals with special needs. Consultations occurred throughout the project's duration, and mechanisms were instituted to address issues such as Gender-based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH).
The following are some of issues raised by the consulted stakeholders;

- Potential health risks and odors associated with the WSP process, especially if not managed properly.
- Potential contamination of local water sources and its impact on their access to clean water for domestic use.
- Job opportunities that the project could bring, both during the construction and operational phases should give first priorities for local community around the project area.
- Concerns regarding workplace safety during the construction and maintenance of the WSP.
- The contractor should prepare emergency response procedures and access to the site in case of accidents or incidents involving hazardous materials.

5. Impact Assessment and Proposed Mitigation and Enhancement Measures

The project implementation will have environmental and social consequences at various stages throughout its lifecycle. The construction, operation, and closure phases of the proposed project will generate impacts. One of the most significant and noticeable impacts will be the pollution of the surrounding environment, affecting water, land, air, and vegetation. Despite the project being enclosed within a fence, there is still a possibility of direct or indirect impacts on these elements due to the project implementation.

5.1 Significant environmental impact

Negative environmental impacts

- Contamination and /impaired quality of receiving body – land and water.
- Increased Air pollution and climate change
- Increased generation of solid and hazardous waste
- Generations of Solid and Hazardous Wastes
- Generations of Liquid Wastes
- Storm water generation and overflow
- Increased vibration
- Air pollution due to dust and gases emission.
- Increased Noise level
- Loss of vegetation
- Impact on natural resource (Energy and water)
- Erosion of Exposed Surfaces
- Increase storm water generation and overflow.
- Loss of Visual Aesthetics

Positive environmental impacts

- Improved visual aesthetics of built environment.
- Management of storm water and reduction of environmental pollution
- Proper management of secondary vegetation e.g. trees

5.2 Significant Social Impacts

Positive social impacts

- Job creation and employment opportunities
- Increase in market for local construction materials.
- Increase skills and impart knowledge to local communities.
- Reduce noise level; this may happen due to the removal of heavy machinery at the project site this will reduce the amount of noise from project area.
- Increase of commercial and social activities around project locations
- Growth of trade and increase investment.
- Production of skilled labour force for implementing various development policies, plans, and goals for sustainable social and economic growth of the Nation.
- The growth of Banking activities within the project area.
- Occupational Safety and Health impacts
- Community Health, Safety and Security
- Gender discrimination

Negative social impacts

- Child labor
- Food Insecurity
- Increase level of crimes
- Loss of employment and revenues
- Loss of revenue to institutions and the government
- Loss of business opportunity

6 Mitigation and Enhancement Measures

The ESIA report recommends a set of mitigation and enhancement measures to minimize any adverse effects identified during the assessment. These measures include proper waste management practices, regular monitoring, and community engagement to ensure that the project aligns with sustainable practices. The developed Environmental and Social Management Plan (ESMP) outlined in this report outlines the schedule for implementing the proposed strategies to mitigate these impacts, as well as plans for ongoing monitoring. It clearly defines the roles and responsibilities of various parties involved in mitigating and monitoring the adverse environmental and social effects. Mitigation and enhancement measures for the ESIA of the proposed establishment of new buildings at MU-Main Campus should be carefully planned and implemented throughout the project's lifecycle. Here are measures for each phase:

a. Potential mitigation and enhancement measures associated with Construction phase.

Mitigation measures

- Implement erosion control measures to prevent soil erosion and sedimentation in nearby water bodies.
- Monitor construction activities to minimize noise and dust pollution.
- Schedule construction activities to minimize disruption to the campus and nearby communities.

Enhancement Measures

- Employ local labor and contractors to stimulate the local economy.
- Provide training to workers on environmental and safety practices.
- Establish a complaints mechanism for addressing construction-related issues promptly.

b. Potential mitigation measures associated with Demobilization phase.

Mitigation Measures

- Remove all construction equipment and materials from the site.
- Conduct a final site inspection to ensure compliance with environmental standards.

Enhancement Measures

- Restore any temporarily impacted areas to their original state or as agreed upon with relevant stakeholders.
- Hold a community engagement session to inform residents of the completion of construction activities.

c. Potential mitigation measures associated with Operation and Maintenance phase.

Mitigation Measures

- Implement regular water quality monitoring to ensure the ponds are functioning as intended.
- Establish a maintenance schedule to prevent equipment failures.
- Regular maintenance of the pond infrastructure should be conducted to ensure its efficient operation and to prevent any leaks or breaches that could lead to water contamination.
- Ensure proper disposal of sludge and waste generated during operation.
- A well-defined emergency response plan will be in place to address any accidental spills or contamination events promptly.
- Adequate buffer zones will be maintained around the pond to prevent contamination and to act as a natural filter for any runoff water.

Enhancement Measures

- Develop a community outreach program focused on wastewater management and sanitation education.
- Engage with local schools and institutions for educational programs on environmental conservation.
- Promote water conservation and sustainable practices within the university community.

d. Potential mitigation measures associated with Decommissioning phase.

Mitigation Measures

- Develop a decommissioning plan in accordance with regulatory requirements.
- Safely remove and dispose of any hazardous materials or equipment.
- Remediate the site to its original or agreed-upon condition.

Enhancement Measures

- Engage with stakeholders to determine the future use of the site and its assets.
- Explore opportunities for repurposing infrastructure for community benefit, if feasible.
- Conduct a final community meeting to inform stakeholders about the decommissioning process and outcomes.

7 Environmental and Social Management Plan (ESMP)

An Environmental and Social Management Plan (ESMP) serves as a tool to guarantee that any unnecessary or reasonably avoidable adverse effects during the construction, demobilization, operation, and decommissioning phases of a project's life cycle are prevented. ESMPs are, therefore, crucial instruments for ensuring that the management actions resulting from the ESIA processes are precisely outlined and carried out throughout all stages of the project's life cycle. Contractors and subcontractors awarded the project contract must adhere to the prescribed procedures for construction and commissioning of the proposed development. In terms of reporting arrangements, the project proponent and the Consultant's responsible for Environmental Management will collaborate with experts from various government authorities, such as NEMC and OSHA, to oversee and produce progress reports, as well as weekly, monthly, quarterly, or annual environmental monitoring reports.

8 Environmental and Social Monitoring Plan (ESMoP)

Continuous monitoring of the WSP is an enduring process, commencing during construction and persisting throughout the project's lifespan. This monitoring entails the ongoing or periodic assessment of mitigation measures to gauge their effectiveness. Consequently, it enables the identification of trends in environmental degradation or recovery and the detection of unforeseen impacts for timely resolution throughout the project's duration. In accordance with the Environmental and Social Monitoring Plan outlined in this report, the project contractor will formulate an Environmental and Social Monitoring Plan, encompassing the mobilization, construction, demobilization, operation, and decommissioning phases. Throughout the project's operational phase, MU will handle the responsibility for monitoring environmental and social impacts. Oversight of environmental and social monitoring related to the proposed WSP compliance with statutory requirements will be managed by MU's Estate officer and MU Management.

9 Cost Benefit Analysis

The Environmental Impact Statement (EIS) evaluates the project by considering its negative impacts in relation to the socioeconomic benefits that would be missed if the project were not carried out. The analysis of the environmental cost-benefit assesses the ratio between the negative and positive impacts. The project offers significant potential financial and social benefits, while the environmental impacts can be adequately mitigated. The financial resources required for mitigating the negative impacts are relatively small compared to the overall investment needed.

10 Decommissioning Plan

The project is anticipated to last for 100 years, and this document outlines an initial decommissioning plan. The plan aims to establish practical decommissioning approaches that can be executed safely, without endangering the public's health and safety, decommissioning personnel, or causing harm to the environment. It adheres to the guidelines and regulations set by relevant regulatory agencies. The purpose of this preliminary decommissioning plan is to ensure that the decommissioning and final

disposition of the project though it's not expected to happen are taken into account during the project's initial design phase.

Conclusion

The ESIA report concludes that the proposed WSP project at MU Main Campus is environmentally and socially viable. The potential negative impacts identified can be effectively mitigated through the recommended measures, ensuring sustainable wastewater stabilization ponds and contributing to improved water quality in the region. By involving relevant stakeholders in the decision-making process, the project can be implemented with broad support from the community and university stakeholders. The findings and recommendations of this ESIA report provide a solid foundation for responsible project development and environmental stewardship, safeguarding the ecosystem and the well-being of those who will benefit from this vital infrastructure.

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ACKNOWLEDGMENT

This Environmental Impact Statement Report was produced for the Mzumbe University (MU). The report was written based on filed work and secondary data from other various reports and documents which are cited in the report. MU would like to recognize in a special way the support rendered by Management and Staff of National Management Council (NEMC), Occupational Safety and Health Authority (OSHA), Fire and Rescue Force, Morogoro Municipal Council, Local community leaders and their community members for their invaluable comments, information and data that they provided during the ESIA process.

The final report is the result of a collaborative process which drew on the effort, knowledge, expertise and patience of Registered Environmental experts (Cassian Lushinge and Pendo Nassary), Mariam Emmanuel, Hamduni Hamza, Henry Muya, Tatu Nyange, Maureen Mumba, Elihuruma Mlay and Francis Magesa from Earth Environmental Experts (3Es) (T) Limited. The guidance provided by these officials is very appreciated as it assisted the consultant to prepare this report.

LIST OF ABBREVIATION

AIDS	Acquired Immune Deficiency Syndrome
CSO	Civil Society Organisation
CSR	Community Social Responsibility
CRDB	Cooperative and Rural Development Bank
DED	District Executive Director
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
ESMoP	Environmental and Social Monitoring Plan
ESMP	Environmental and Social Management Plan
ESMF	Environmental and Social Management Framework
ESF	Environmental and Social Framework
GBV	Gender Based Violence
GRM	Grievance Redress Mechanism
HEET	Higher Education for Economic Transformation
HIV	Human Immunodeficiency Virus
HSE	Health, Safety and Environment
ILO	International Labour Organisation
MoEST	Ministry of Education, Science and Technology
MORUWASA	Morogoro Water Supply and Sanitation Authority
MU	Mzumbe University
NEMC	National Environment Management Council
NGOs	Non – Government Organisation
OSHA	Occupational Safety and Health Authority
OIPs	Other Interested Parties
PAD	Project Appraisal Documents
PAPs	Project Affected Person
POM	Project Operational Manual
PIU	Project Implementation Unit
RUWASA	Rural Water Supply
SEA	Sexual Exploitation and Abuse
SEP	Stakeholders Engagement Plan
TANESCO	Tanzania Electricity Supply Company
ToR	Terms of Reference
TTCL	Tanzania Telecommunications Company Limited
TIN	Tax Identification Number
TZS	Tanzanian Shillings
UPIU	University Project Implementation Team
URT	United Republic of Tanzania
VEO	Village Executive Officer
WB	World Bank
WEO	Ward Executive Officer
WSP	Wastewater Stabilization Pond

CHAPTER 1: INTRODUCTION

1.1 Background Information

Mzumbe University (MU), through the Government of the United Republic of Tanzania (URT) has received financing from the World Bank to implement Higher Education for Economic Transformation (HEET) Project. Under HEET, MU is planning to use part of the funds to construct two (2) units of wastewater stabilization ponds and other infrastructure. These plants will be constructed within MU premises located at Mzumbe University's Main Campus in Changarawe Village, Mvomero District, Morogoro Region. However, the construction and operation of such facilities are expected to have environmental, social and economic impacts, which need to be identified and mitigation measures put in place for ensuring sustainability of the project.

The World Bank Environmental and Social Frameworks (ESF) and Standards (ESSs) as well as the Environmental Management Act of 2004 of Tanzania require project developers to carry out an Environmental and Social Impact assessment (ESIA) prior to project implementation. Through a rigorous ESIA, potential environmental and social impacts will be thoroughly evaluated, and necessary measures will be recommended to ensure the continued harmony between academic growth, infrastructure development, and environmental preservation. Therefore, this study was done in line with Environmental Management Act, Cap 191, the Environmental Impact Assessment and Audit (Amendment) Regulations, 2018, and the World Bank Environment and Social Framework (ESF) as well as the project's Environmental and Social Management Framework (ESMF). In addition, this ESIA has been guided by the Project Appraisal Document (PAD) and Project Operational Manual (POM) both of 2021.

1.2 Rationale and Objective of the HEET Project

1.2.1 Objective

The objective of the project is to increase enrolment capacity in degree programmes in priority disciplines and to promote applied research and innovation capacity and develop options for self-generating income. This objective should be achieved through establishment of wastewater stabilization ponds which help to treat wastewater generated from MU facilities and keep environmental clean. Therefore, when construction activities are completed, MU will be strengthening the learning environments, labor market orientation in priority disciplines and environment through management of wastewater.

1.2.2 Rationale of the project

The decision to establish these WSP at MU, Main campus follows the realization that there is generally development of modern and adequate students' hostels, libraries, ICT building, cafeterias and other facilities which result into higher population within the campus which will led to higher generation of wastewater, such that the existing WSP for MU will fail to accommodate the generated wastewater from the whole population. It is therefore anticipated that the project will assist to facilitate wastewater management within the University and generally will keep environment safe from pollution. Considering that construction activities for the project obviously will generate a number of impacts on the bio-physical and socio-economic environment in the project area and beyond, an Environmental and Social Impact Assessment (ESIA) study was undertaken in order to prepare an Environmental and Social Impact Assessment report and the associated Environmental and Social Management Plan and the Environmental and Social Monitoring Plan for the project. The Environmental and Social Impact Assessment study identified potential environmental and social impacts related to the activities of the project; assessed the extent and significance of both positive and negative impacts and came up with

measures to enhance the positive impacts and measures to mitigate the negative impacts. The proposed project development is therefore in line with the national development agenda and its operation will potentially enhance economic and employment gains as it will increase the opportunities for large and small business entrepreneurs and revenue for the government.

1.3 Objectives of ESIA Study

The objective of the ESIA study is to ensure that environmental concerns are integrated in all the project activities in order to contribute to sustainable development. The specific objectives of conducting the Environment and Social Impact Assessment study with respect to the project was:

i. To carry out environmental screening and scooping study to identify social and environmental risks and impacts in the project site and nearby environment.
ii. To identify, analyse and assess environmental and social risks and impacts of the proposed construction project.
iii. To describe the pertinent regulations and standards governing, environmental quality, health and safety, protection of sensitive areas, protections of endangered species and land use control at international, national regional and local levels.
iv. To ensure that the project comply with key relevant policy, legal and institutional frameworks; and Environmental and social frameworks-Environmental and social standards.
v. To recommend cost-effective measures for minimizing or eliminating adverse impacts of the proposed design, construction, operation, and maintenance of the project; and
vi. To prepare Environmental and Social Management Plan (ESMP), including Health and Safety Management for design, construction, operation, and maintenance phases of the Project.
vii. To identify key stakeholders, the roles, and responsibilities of the project implementation entity, implementing agencies and other stakeholders, legislative and regulatory requirements for the implementation of the ESMP.
viii. To inform statutory and public stakeholders about the potential impacts as well as risks and opportunities of the project and about the proposed mitigation measures.

1.4 Potential Users of the ESIA report

The ESIA and the associated ESMP are prepared for the use by different stakeholders to be involved in the planning, implementation, management, and monitoring of the project activities. Some of the users will include the World Bank, Developer (MU), Consultant, Contractor, Mvomero District Council, and local government. The report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of the project activities.

1.5 Methodology and ESIA Team

The ESIA study applied different participatory methods to involve all the concerned stakeholders. The methodology used in this study is commensurate with the Environmental Management Act, Cap 191 and the Environment Impact Assessment and Audit (Amendment) Regulations, 2018). A multi-disciplinary team of experienced scientists and environmental professionals was assembled to carry out the required resource assessment, generation of baseline data, determination of potential impacts and recommendation of mitigation measures. These include EIA Expert (Team Leader), Environmental Engineer, Civil Engineer, Sociologist & GBV Specialist, Biodiversity expert, Occupational Health and Safety Specialist and GIS experts, Municipal and Civil services engineer who worked in close collaboration with the relevant stakeholders in Mvomero district council, and Mzumbe ward officials. An interactive approach was adopted among the environmental team members and other project

professionals. The team utilized the checklist for data gathering, analysis, and presentation. The team members conducted the reconnaissance investigations to determine the critical elements for analysis and the issues highlighted for the design and planning process. Team meetings were held to discuss the progress of investigations and analyses and facilitate data integration toward an understanding of the systems at work in both the natural and built environment. Baseline data for the study area were collected using a combination of:

i) Site Reconnaissance
ii) Analysis of Maps and Plans
iii) Review of Reports and background documents
iv) Checklists
v) Field Studies
vi) Public Consultations

1.5.1 Desk Study

The ESIA study applied different participatory methods to involve all the concerned stakeholders. The methodology used in this study is commensurate with the Environmental Management Act, Cap 191 and the Environment Impact Assessment and Audit (Amendment) Regulations, 2018. The study was undertaken based on checklists complimented by the Consultants' experience and through discussion with MU staffs, local government officials and communities in the vicinity of the project area. The scoping study was done both as a desktop study and fieldwork. It involved the review of literature/documents on HEET Environmental and Social Management Framework (ESMF) as well as Project Appraisal Document (PAD) and Project Operational Manual (POM) all of 2021. ESMF (2021). and the World Bank Environmental and Social Standards on Assessment and Management of Environmental and Social Risks and Impacts (ESS1) were fully incorporated in this ESIA. According to ESS1, ESIA is an instrument to identify and assess the potential environmental impacts of a proposed project, evaluate alternative.

Stakeholders' engagement involved development of a systematic approach to develop good relationships and gather their views on issues that could affect them. It also intended to provide stakeholders with a mechanism through which to raise grievances. Other issues involved review of Mvomero socio-economic profile, district development plans and field studies at the project site. This aimed at gathering information and data on various aspects of the project.

1.5.2 Site visits

This involved undertaking systematic assessments within and around the proposed project localities. All observations were analyzed and documented. Furthermore, experts' observations and technical methods related to the issues in question were explored as detailed in this report. To get wide scope of the existing situation on the site, appraisal was made on physical and environmental conditions of the proposed project and areas that may be impacted by the project, including land use and drainage system as well as assessment of other relevant socio-economic parameters.

1.5.3 Stakeholder Engagement

Identification of stakeholders

The stakeholders were identified based on their roles, relevance, and potential to be impacted or to impact the project. Most of the stakeholders that might be impacted by the project, e.g., nearby developments, local government authorities, Government Departments, Parastatal Organisation and MU, were pre-determined. discussion, were conducted. The consulted stakeholders include:

- MU Staff both Academic and Administrative.
- MU Students.
- MU Gender unit.
- MU Service providers.
- Mzumbe ward officials
- Mzumbe village (Changarawe, Vikenge and Tangeni village).
- Mvomero District Council.
- Occupational Safety and Health Authority (OSHA).
- Wami/Ruvu Basin Water Board.
- MORUWASA
- RUWASA
- NGOs and CBOs

In contrast, others were identified by different stakeholders, including the Proponent. Some of the stakeholders unfolded as consultations went along, e.g., groups and individuals on and in the vicinity of the project area.

Involvement of stakeholders

The study team, in collaboration with the project proponent representative visited the proposed project area and neighboring community. Physical observations and stakeholder interviews were conducted to collect baseline data and issues of concern. The study applied different participatory methods to involve all relevant stakeholders. The interview with individuals is based on a list of available contents or questions and discussions. Focused group discussions were also used to gather information. In establishing the public's views concerning the proposed project, the consultants were provided with an introduction letter addressed to each stakeholder, briefing the project and asking them to raise their concerns to consultant freely.

Documentation of stakeholders' concerns

The stakeholders pointed out several issues and concerns. An individual or a group of people who raised an issue was cross-checked by discussing it with other groups. Key issues raised by each stakeholder group were summarized and further analysed in this report. For details of stakeholders consulted, the record of main issues raised (comments) and responses, see Chapter 5.

1.5.4 Baseline Data and Information

Environmental Consultants identified baseline information that will be required for the ESIA. The Information on the bio-physical, socio-economic environment, institutional and legal regimes were collected from a variety of sources, namely project documents and general literature review, visual and inspection, expert opinion, and consultations with selected stakeholders. Data/information gaps were identified and strategies for collecting the information before or during the environmental impact statement study will put in place.

1.5.4.1 Physical Environment

Information was gathered on the existing physical environment, particularly as related to topography, soils, drainage and hydrology in general.

Climate, soils and topography

Information on the climate, geology, topography, soils, was obtained by compiling data from existing reports, and source agencies. Maps were also examined to obtain some of the data such as topography of the general area. Field work was carried out to augment and verify existing information relating to topography and soils and to obtain first-hand knowledge of the other physical aspects.

Hydrology and drainage

Surface and ground water characteristics were assessed using field investigation as well as maps and data from previous reports.

Air quality

Air quality measurements were done to determine ambient dust in terms of particulate matter and pollutant gases at the project site. Particulate matters were measured at site in terms of $PM_{10,}$ and $PM_{2.5}$ by using Dust Monitor which complies with the EMC Directives. Ambient pollutant gas (i.e. CO, NOx, NO_2, SO_2, H_2S, and VOCs) concentration were measured using gas analyzer in accordance with the manufacturer's procedure that meets ISO 9001:2008 protocol. The device was elevated at a height of 1.5 meters above the ground.

Noise and Vibration

Spot measurements were done on site to determine noise levels at the project site using Sound level meter device. On taking measurements, the meter was set to the "A" weighed measurement scale, which enables the meter to respond in the same manner as the human ear. The meter was held approximately 1.5 m above the ground and at least 0.5 m away from hard reflecting surfaces such as walls.

Ground vibrations were measured using a vibrometer data logger in accordance with European standard EN 14253:2003. On taking measurements, the accelerometer transducer was mounted on the ground to record both ambient and peak vibrations. To produce accurate results, the transducer was secured in direct contact with the ground.

1.5.4.2 Biological Environment

The status of the flora and fauna of the study area was determined by a review of literature relevant to the area and field investigations. The vegetative communities were identified and classified into community types. Identification was carried out of dominant tree species. The vegetation was identified and described for their property. Information on fauna was gathered from existing literature on reported species as well as observations in the field. Observations were made particularly to assess the presence of birds in the general area. Information also was obtained from locals in the area about the presence of any significant specie.

1.5.4.3 Socio-economic Environment

To determine the cultural and social factors associated with the construction and operation of the proposed project, members of the communities in the general vicinity of the project were interviewed and a review of economic and social literature was conducted. Further, rapid field appraisal techniques

in conjunction with desk research were employed to investigations of the socio-economic considerations within the project area. These were undertaken to ascertain information to satisfy the following factors as outlined in the approved terms of reference provided:

i) Population and settlement characteristics
ii) Land uses and livelihoods.
iii) Community structure, employment and income
iv) Developments underway
v) Infrastructure in place
vi) Water supply and other utilities
vii) Waste management practices.
viii) Recreational activities
ix) Energy supply
x) Public health and safety
xi) Access to and delivery of health, education and social services

1.6 Review of project documents and literature

This involved reviewing available information on the project to gain a basic understanding of the components and their operation. The documents consulted are presented in the list of references and bibliography of this report.

1.7 Policy, Legal and Institutional Arrangement

Policy, legal, standards and institutional arrangement were compiled from review of documents. Information and data on local by-laws, institutional structures and mandates/authority were obtained from Mvomero District Council.

1.8 Report Structure

The report is presented in accordance to the format given in Section 18 (1 and 2) of the Environmental Impact Assessment and Audit Regulations, 2005. This report is structured in the following style: -

i) Executive Summary
ii) Table of Contents
iii) Acknowledgement
iv) List of Acronyms

1. Introduction
2. Project description
3. Policy, administrative and legal framework
4. Baseline/ Existing conditions
5. Stakeholders Analysis
6. Impacts Assessment, Mitigation Measures and Project Alternative
7. Environmental and Social Management Plan
8. Environmental and Social Monitoring Plan
9. Resource Evaluation / Cost Benefit Analysis
10. Decommissioning and Closure
11. Conclusions

References
Appendices

CHAPTER 2: PROJECT DESCRIPTION

2.1 Location and Accessibility

2.1.1 Location

The proposed project located within MU, Main Campus on Plot No. Block at Mzumbe Mtaa, Mzumbe ward, Mvomero District in Morogoro Region. At the national setting, MU is located in Morogoro Region. It is connected to the national/trunk road network that links MU to the rest of the country and makes it accessible at the national level through the Old Morogoro - Iringa Road. Figure 1 explains location and accessibility of MU at the national level. At the regional setting, MU is located about 6.2 km from Morogoro Municipality along the Old Morogoro - Iringa Road. Furthermore, the Mzumbe – Morogoro Road which is tarmac road connects the Old Iringa Road and the New Iringa Road. Therefore, MU is accessible from Morogoro town through either the Old Morogoro – Iringa Road or through the New Morogoro – Iringa Road via Mzumbe - Morogoro Road.

Table 2.1: GPS Coordinate of the project area

S/N	Code	Location Name	Latitude (S)	Longitude (E)
1	AQMS1	WSP (1 UNIT)	-6.922818	37.556865
2	AQMS2	WSP (2 UNIT)	-6.922182	37.557290
3	AQMS3	Residential area	-6.922301	37.558449
4	AQMS4	Roadside along MU (Mzumbe – Morogoro road)	-6.923235	37.558379

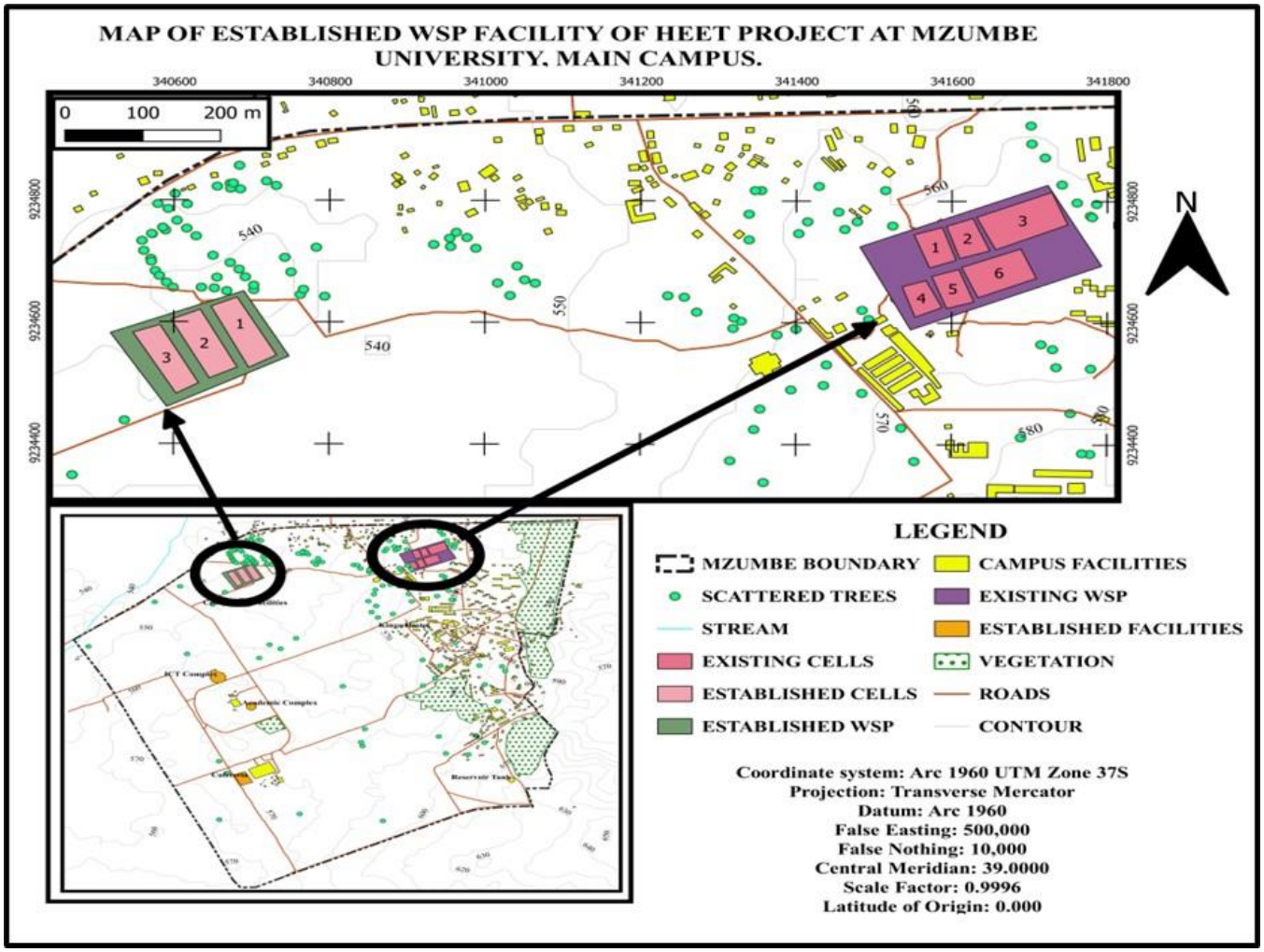


Figure 2.1: Display MU location at regional level (Source: 3Es 2023)

2.1.2 Accessibility

As regards to accessibility, the project site is along the earth road (Mzumbe road) at a distance of 1km on the left side as one drives from Morogoro Municipal centre to Mzumbe/Mlali through the Mzumbe - Morogoro Road.

2.1.3 Site Description

The project site is within the area characterized by sandy clay loams and sandy clay soils, different secondary vegetation i.e. (short and long grasses), tree species, and artificial tree species cover the surface land. No sensitive ecological sites are found near the proposed sites. The general area is characterized by flat alluvial plains with homogenous sedimentation pattern and the specific area has a largely flat topography and gentle slope. About three quarter of total land at MU constitutes undeveloped land. This land lies to the west of the built-up area stretching from students' halls of residence and hostels. This undeveloped land currently used for farming activities and is suitable for construction of all kinds of development required in spatial expansion of MU. Hence, the proposed construction under HEET project will be done at the least developed area.

2.1.4 Major Adjacent developments

The University overlooks the evergreen scenic Uluguru mountain ranges on the eastern side while on the south it shares a common boundary with Mzumbe Secondary School. The University has an area of 985.35 Acres. Currently the built-up area covers an area of 234.55 Acres and the rest is undeveloped land which has been planned for further expansion of the University. Figure 1.1 above explains location and accessibility of MU at the regional level.

2.2 Project Scope and Activities

The proposed project shall deal with establishment of WSP within the university to treat wastewater from existing buildings and the proposed facilities.

2.2.1 Description of Proposed Project Site

i. Wastewater Stabilization Pond

This will involve construction of a complete two unit of Water Stabilization Ponds (WSP)/ Oxidation Ponds. This will involve site clearance and grubbing within the limits of permanent works, Stone Masonry and Stone Pitching for erosion controls, vegetation growth for erosion control outside of ponds, pipe laying from end users to the ponds/ conveyance system including excavation and backfill, access roads to and within ponds area (Gravel layer) that will be used for treatment of wastewater from the proposed buildings and other existing infrastructure. This site is located nearby Mlali road. The site for the proposed project is covered by crops and grasses only.

2.3 The Project Designs

The project will involve the construction of two units of wastewater stabilization ponds which having a capacity of about 7,740m^3/day. The unit include anaerobic pond, facultative pond and maturation pond.

2.3.1 Design Loads

The Table shows design load data defined for the household crude water. The values given in the table, are defined based on multiple measurements; they are internationally recognized and introduced in many countries as the standard values.

Table 2.2: Table Adopted Wastewater quality.

S/N	Wastewater parameter	Value adopted for the design
1	BOD	40g per capital per day
2	Faecal Coliform	$1x10^8$ per 100ml
3	Helminth Eggs	500
4	Design Temperature (coolest temp)	20^0C

Source: MU Master Plan, 2015 -2035

3.3.2 Process in wastewater stabilization ponds

Wastewater stabilization ponds, also known as lagoons or oxidation ponds, are a type of wastewater treatment system that uses natural processes to remove contaminants from wastewater. These ponds are designed to provide a controlled environment for the biological degradation of organic matter and the reduction of pathogens.

The design and functionality of wastewater stabilization ponds typically involve the following components:

i. Anaerobic pond

This is first stage of treatment process. It is designed to promote the settling of heavier solids through sedimentation. In this pond, anaerobic bacteria break down organic matter in the absence of oxygen, resulting in the production of gases such as methane and carbon dioxide.

Anaerobic ponds are commonly 3m deep, 44m length, 44m wide, 1,966m^2 surface area and receive wastewater with high organic loads (i.e., usually about than 100-267 g BOD/m3.day, equivalent to more than 3000 kg/ha. day for a 7,740 m^3/day). They normally do not contain dissolved oxygen or algae. In anaerobic ponds, BOD removal is achieved by sedimentation of solids, and subsequent anaerobic digestion in the resulting sludge. The process of anaerobic digestion is more intense at temperatures above 15^{o}C. The anaerobic bacteria are usually sensitive to pH <6.2. Thus, acidic wastewater must be neutralized prior to its treatment in anaerobic ponds. A properly designed anaerobic pond will achieve about a 40% removal of BOD at 10^o C, and more than 60% at 20^o C. A shorter retention time of 1.0 - 1.5 days is commonly used. There is some removal of solids-associated bacteria in anaerobic ponds, principally by sedimentation. (Source: MU Master plan 2015 – 2035, and Kayombo, *et. al 2005*).

ii. Facultative Pond

It is the second stage in the treatment process, following the anaerobic pond. It is designed to provide a combination of aerobic, anaerobic, and facultative conditions. In this pond, various biological processes occur, including aerobic degradation of organic matter by oxygen-loving bacteria, anaerobic degradation by facultative bacteria, and natural mixing through wind and temperature gradients.

Facultative ponds (1.2m deep, 50m length and 50m wide) are of two types: Primary facultative ponds that receive raw wastewater, and secondary facultative ponds that receive particle-free wastewater (usually from anaerobic ponds, septic tanks, primary facultative ponds, and shallow sewerage systems). The process of oxidation of organic matter by aerobic bacteria is usually dominant in primary facultative ponds or secondary facultative ponds (MU Master plan 2015 – 2035).

The processes in anaerobic and secondary facultative ponds occur simultaneously in primary facultative ponds. It is estimated that about 30% of the influent BOD leaves the primary facultative pond in the form of methane. A high proportion of the BOD that does not leave the pond as methane ends up in algae. This process will require more time, more land area, and possibly 2-3 weeks water retention time, rather than 2 -3 days in the anaerobic pond. In the secondary facultative pond (and the upper layers of primary facultative ponds), sewage BOD is converted into "Algal BOD," and has implications for effluent quality requirements. About 70 – 90% of the BOD of the final effluent from a series of well-designed WSPs is related to the algae they contain (Kayombo, *et. al 2005*).

iii. Maturation Pond

This is the final stage of the WSP process. It is primarily designed to enhance the disinfection of wastewater through the natural action of sunlight, temperature, and microbial processes. The longer hydraulic retention time in this pond allows for additional removal of pathogens and further reduction of organic matter.

The maturation ponds for this operation will require 0.8m deep, 62m length and 62m wide receive the effluent from the facultative ponds. At this stage the main function will be to remove excreted pathogens. Although maturation ponds achieve only a small degree of BOD removal, their contribution to nutrient removal also will be significant. Maturation ponds usually show less vertical biological and physicochemical stratification and are well-oxygenated throughout the day. Although faecal bacteria are partially removed in the facultative ponds, the size and numbers of the maturation ponds will determine the numbers of faecal bacteria in the final effluent which is discharged into the receiving environment (MU Master plan 2015 – 2035).

The functionality of wastewater stabilization ponds relies on a combination of physical, biological, and chemical processes:

- **Sedimentation:** As wastewater flows into the ponds, suspended solids settle at the bottom of the ponds through gravity, allowing for their removal and subsequent stabilization.
- **Biological Degradation:** Microorganisms, including bacteria, algae, and protozoa, present in the ponds, break down organic matter through various biological processes, including aerobic and anaerobic degradation.
- **Natural Oxidation:** Oxygen is supplied to the ponds through atmospheric exchange and algal photosynthesis, promoting aerobic degradation and the removal of organic pollutants.
- **Pathogen Removal:** As wastewater passes through the ponds, exposure to sunlight, elevated temperatures, and microbial action helps in the inactivation and reduction of pathogens, making the effluent safer for release into the environment.

The specific design parameters, including pond size, depth, and hydraulic retention time, are determined based on factors such as wastewater characteristics, climate conditions, and effluent quality requirements (Figure 2.2). Adequate monitoring and maintenance of the ponds are essential to ensure their optimal performance in treating wastewater effectively and minimizing any potential environmental impacts.

3.3.3 Project design considerations

The overall design of the pond will promote environmental best practice by enhancing the impermeable materials like PVC liner and compacting clay soil to prevent any potential seepage. Pond base and

embankment will be also enhanced during construction. The bottom of the pond will be strictly impermeable, although the sludge layer is expected to seal up small pores in the soil. Sealing of the base is necessary to prevent ground water pollution.

Therefore, plain in-situ concrete is adopted for the ponds base, sides and on top of embankment to protect it from erosion.

The plain-in-situ concrete stop vegetation growth down the banks and so prevent the breeding of mosquitoes and makes maintenance easier. The following are the design criteria that will be followed during the design of the ponds:

- **Sewage flow rate**: This is based on eighty percent of 120L/C/d water consumption as stipulated by the National subcommittee on water supply and sanitation for urban areas.
- **Temperature:** The mean monthly ambient air temperature of the coldest month is 00C. 230C is the design temperature suitable for tropical countries**.**
- **Retention time**: This is the time required for the sewage BOD5 strength to reduce to the desired strength. It is usually minimum seven (7) days.
- **Influent concentration**: this is determined in the laboratory analysis. The result of the test shows that the BOD5 is 400mg/L which is medium strength. This is as a result that only domestic waste is being discharge and waste stabilization pond can handle sewage of this strength. Therefore, the use of anaerobic pond is not necessary since they are meant to receive very high strength organic sewage.
- **Effluent standard required**: Effluent standard adopted by (D Mara, 1972) is 50 ± 70 mg/l BOD5 for facultative pond and less than 25mg/L for maturation pond. Field experience in Africa has shown that an average of 60mg/L is adopted for facultative pond effluent.

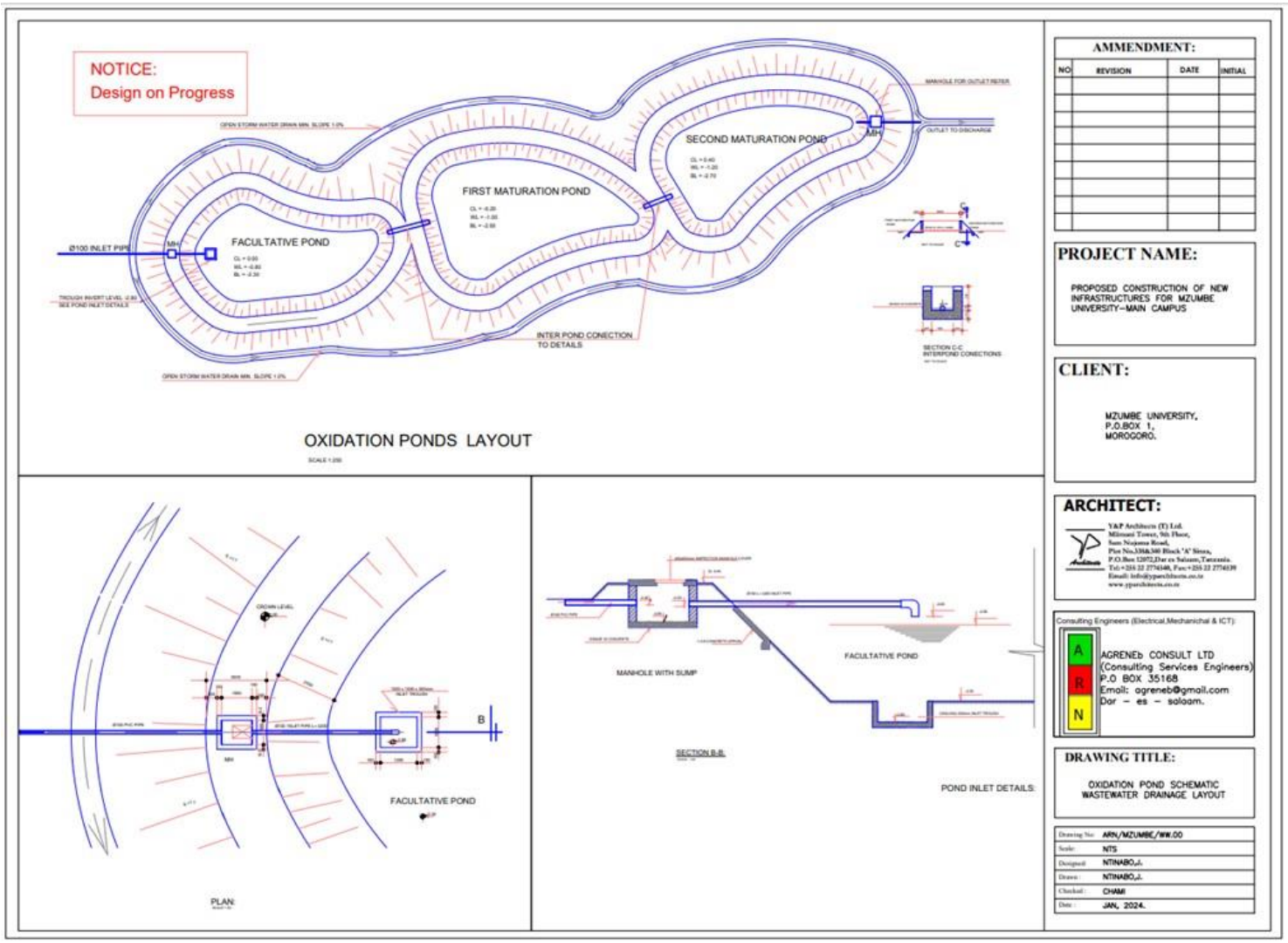


Figure 2.2: Schematic diagram of WSP (Source: MU-Main Campus, January 2024)

2.4 Project Activities

Activities for the project shall be implemented in four phases namely planning, construction, demobilization, and operation and maintenance phases. Details of each of the phases are provided in the sections that follow.

2.4.1 Mobilisation Phase

Planning phase for the project commenced in April 2023 and will be concluded in January 2024. Activities during mobilization phase will include;

a) **Topographical Survey**- The topographical survey shall be done by Surveyors to establish the boundaries and the ground levels.

b) **Project Planning and designing**- This includes feasibility study and site assessment to determine the suitability of the location for the wastewater stabilization pond, and Engagement of a qualified engineering firm to design the WSP system based on the specific needs and regulatory requirements.

c) **Geotechnical investigations, Hydrological and Hydrogeological study**- Geotechnical investigation will involve drilling the ground to study the soil profile the underling geological formations.

   Both **hydrological** and **hydrogeological** studies shall be conducted to ensure effective design, operation, and environmental protection. A hydrological study assesses surface water flow patterns, rainfall distribution, and runoff characteristics in the area. This information helps determine the water supply and drainage requirements for the stabilisation ponds, ensuring they can effectively treat the wastewater without causing flooding or overflow issues. On the other hand, a hydrogeological study focuses on understanding the groundwater flow regime, aquifer characteristics, and potential interactions between surface water and groundwater. This knowledge is essential for evaluating the potential for groundwater contamination from the wastewater ponds and designing appropriate measures to prevent pollution. Both studies provide essential data for site selection, pond sizing, and design considerations to ensure the WSP operates efficiently while minimizing negative impacts on the surrounding environment and water resources.

d) **Acquisition of various permits/ certificates**-This include necessary permits and approvals from local environmental regulatory authorities.

a) **Procurement and Contracting -** This involves development of procurement documents, including specifications, terms of reference, and evaluation criteria, for the selection of contractors or construction firms.

2.4.2 Construction Phase

The proponent will contract private construction company to construct the project site. The contactor will be responsible for sourcing of materials, labor recruitment and actual construction work.

2.4.2.1 Consideration for constructing different structures.

Different considerations will be given when constructing WSP. These will aim to provide stability and durability of the WSP. Some of the considerations are discussed in the sections that follow.

a) Founding conditions

The proposed construction of WSP will require foundation on a good and uniform soil to avoid deferential settlement. A full geotechnical investigation shall be conducted to ascertain the exact founding conditions of the WSP.

b) Durability of the concrete

Durability of any concrete is dependent on the cement being used, aggregates, admixtures, concrete mix design and curing. Rapid hardening cements will be avoided due to greater evolution of heat which can lead to increased shrinkage cracking. Construction activities is expected to take place for 18 months starting from September 2023 to March 2025. Over 100 people will be employed to work at the site when construction activities begin and 30% will be women. Construction activities will involve land clearing, landscaping, grading, excavation, compacting, trenching, construction of a workers' camp which will provide hostels to workers, storage facilities and an office facility, backfilling with compaction consolidation, levelling and earth marking, and transportation of construction materials.

2.4.2.2 Construction Activities

Activities during construction phase will be including site preparation, construction of workers camp, construction of WSP, construction equipment and construction materials.

a. Site preparation

Activities under site preparation will include but not limited to the following;

- Clearing and leveling the construction site.
- Excavating the area where the pond(s) will be located.
- Setting up temporary infrastructure such as access roads and construction facilities.

b. Construction materials

Different raw materials will be required during construction phase of WSP. Materials such as sand, gravel and quarry stone will be outsourced from different places. The concrete embankment materials such as quarry stone, gravel and sand will be collected from approved sites.

Other materials such as cement, concrete block, reinforced steel, PVC (Polyvinyl Chloride/non-pressure pipes), Fiberglass reinforced plastic (FRP), Geosynthetic clay liner (GCL), stainless steel, paints and other joinery, fuel and oil, electricity and water.

c. Construction of WSP

Some of the activities to be undertaken will include.

- Excavating and shaping the pond basins according to the design specifications.
- Constructing the pond walls, berms, and embankments using appropriate materials such as clay or compacted soil.
- Installing any necessary liners or geomembranes to prevent seepage or leakage.
- Constructing inlet and outlet structures to control the flow of wastewater into and out of the ponds.

d. Installation of Piping and Infrastructure

Some of the activities to be undertaken will include;

- Installing pipes and fittings for wastewater inflow and outflow.

- Constructing sedimentation and sludge removal structures, such as settling chambers or sludge removal channels.
- Setting up monitoring and control equipment, including level sensors, flow meters, and possibly aerators for oxygenation.

e. Landscaping and Vegetation

Some of the activities to be undertaken will include;

- Establishment of appropriate vegetation around the pond perimeters and on embankments to enhance aesthetics, stability, and ecological functions.
- Plantation of aquatic vegetation within the ponds to promote natural processes and enhance treatment efficiency.

f. Erosion Control and Drainage

Some of the activities to be undertaken will include;

- Implementation of erosion control measures to prevent soil erosion and sedimentation in and around the construction site.
- Installation of proper drainage systems to manage stormwater runoff and prevent pond flooding during heavy rainfall events.

g. Health and Safety Measures

This will involve;

- Implementation of appropriate health and safety protocols to protect workers and ensure compliance with occupational health and safety regulations.
- Provision of necessary personal protective equipment (PPE) for workers and conducting safety training programs.

h. Environmental Monitoring

This will include;

- Implementation of environmental monitoring measures to assess and mitigate potential impacts on the surrounding ecosystem during construction.
- Monitoring water quality, sedimentation, and any potential release of construction-related pollutants.

i. Documentation and Reporting

This will involve;

- Keeping detailed records of construction activities, including site plans, construction drawings, and progress reports.
- Documenting any deviations from the original design or unforeseen challenges encountered during construction.

2.4.3 Demobilization Phase

During the demobilization phase of a WSP project, several activities need to be undertaken to ensure a smooth and efficient transition from the construction and operation phases. The following are some activities involved in the demobilization phase:

- **Equipment Removal:** All construction equipment, machinery, and temporary structures that were used during the project should be removed from the site. This includes excavators, pumps, pipes, scaffolding, and other construction-related equipment.
- **Site Cleanup:** The construction site needs to be thoroughly cleaned and restored to its original condition or as specified in the project plan. This involves removing debris, construction waste, and any materials that are no longer needed.
- **Restoration of surrounding areas:** If any surrounding areas were disturbed during the construction phase, such as access roads or landscaping, they should be restored to their pre-construction state. This may involve repairing roads, replanting vegetation, and addressing erosion control measures.
- **Disposal of Waste and Hazardous Materials:** Proper disposal of waste materials, including construction debris and hazardous substances, should be carried out according to environmental regulations and guidelines. This may involve recycling, treatment, or disposal at authorized facilities.
- **Closure of Temporary Facilities:** If temporary facilities were set up during the project, such as worker accommodation, storage areas, or site offices, they should be dismantled and removed from the site.
- **Handover and Final Inspections:** A final inspection of the WSP system should be conducted to ensure that all components are functioning as intended and meet the required standards. Once the system has been deemed operational and in compliance, it can be formally handed over to the responsible entity.
- **Training and Knowledge Transfer:** If required, training sessions can be conducted to transfer knowledge and provide necessary guidance to the operation and maintenance personnel who will be responsible for the long-term management of the wastewater stabilization ponds.

2.4.4 Operation and Maintenance Phase

During the operation and maintenance phase of WSP, several essential activities need to be undertaken to ensure the efficient and effective functioning of the treatment system. These activities focus on sustaining the pond's treatment capacity, maintaining water quality, and promoting public health and environmental protection. Some of the key activities during this phase include:

- **Monitoring Effluent Quality:** Regularly monitoring the quality of the effluent discharged from the WSP is important. This involves testing for various parameters such as biochemical oxygen demand (BOD), Total Suspended Solids (TSS), ammonia, pathogens, and other pollutants to ensure compliance with regulatory standards.
- **Inspection and Repair;** Regular inspections of the pond infrastructure, including embankments, liners, and aerators (if applicable), help identify any signs of wear, erosion, or damage. Prompt repairs should be carried out to prevent potential failures.
- **Maintenance of Inlet and Outlet Structures;** Ensuring that inlet and outlet structures, such as weirs and gates, are functioning properly is crucial for maintaining proper flow rates and distribution within the pond system.
- **Sludge Management;** Managing the accumulated sludge in the ponds is essential to maintain the treatment efficiency and prevent potential odors and other environmental issues. Sludge removal or dredging should be scheduled based on the accumulation rate and the capacity of the pond.

- **Vegetation Management;** Controlling the growth of aquatic vegetation in the ponds is necessary to prevent excessive shading, maintain oxygen transfer, and avoid interference with hydraulic flow patterns.
- **Weed and Debris Removal;** Regularly removing weeds, debris, and any floating materials from the pond's surface helps prevent clogging and improves the overall performance of the treatment system.
- **Pest and Vector Control;** Implementing measures to control pests and vectors, such as mosquitoes, around the pond area is essential for preventing the transmission of waterborne diseases.
- **Health and Safety Measures;** Ensuring that proper health and safety protocols are followed during maintenance activities to protect workers and nearby communities.
- **Public Awareness and Education;** Conducting public awareness campaigns and education programs to inform nearby communities about the importance of the treatment system, proper wastewater disposal, and the potential health benefits.
- **Record-Keeping and Reporting;** Maintaining comprehensive records of maintenance activities, effluent quality monitoring results, and any incidents or issues that arise during the operation phase. This information is crucial for compliance reporting and future improvements.
- **Training and Capacity Building;** Providing ongoing training for the operators and maintenance staff on proper operation, monitoring techniques, and emergency response procedures.
- **Emergency Preparedness;** Developing and implementing an emergency response plan to address any potential spills, equipment failures, or extreme weather events that could affect the ponds' operation.

2.4.5 Decommissioning phase

During the decommissioning phase of the wastewater stabilization ponds (WSP), several crucial activities must be carried out to safeguard the environment from pollution. These activities include:

- **Waste Removal**: Proper removal and disposal of sludge and residual waste materials from the WSP to prevent contamination of soil and water.
- **Decontamination**: Thoroughly clean and decontaminate equipment, tanks, and infrastructure used in the WSP to eliminate potential pollutants.
- **Environmental Monitoring**: Continuously monitor water quality, soil conditions, and air quality during decommissioning to detect and address any emerging pollution risks.
- **Hazardous Materials Handling**: Safely manage and transport any hazardous materials or chemicals used in the WSP to prevent spills or leaks.
- **Site Remediation**: Remediate the decommissioned site by restoring it to its original state or converting it to an alternative beneficial land use, following environmental guidelines.
- **Closure Reporting**: Document and report on the decommissioning process, including all measures taken to mitigate environmental risks, for regulatory compliance and transparency.
- **Community Engagement**: Maintain open communication with local communities to address any concerns and provide information about the decommissioning activities and their potential impacts.
- **Regulatory Compliance**: Ensure full compliance with environmental regulations and permits throughout the decommissioning process.

- **Safety Measures**: Implement safety protocols to protect workers and the surrounding environment during decommissioning activities.
- **Record Keeping**: Maintain comprehensive records of all decommissioning activities, including waste disposal and environmental monitoring results, for future reference and audits.

2.5 Manpower and Utility Requirements

2.5.1 Manpower Requirements

The proposed project will temporarily employ about 100 persons during construction phase. Employment during construction phase will be under contractor and will be in the form of skilled as well as unskilled laborers considering all gender types. For the semiskilled and unskilled laborers, the contractor will employ people from the nearby communities as a way of making sure that the project becomes beneficial and brings a sense of community ownership. Moreover, the Contractor must comply with the stipulations of the Employment and Labor Relation Act No. 6 of 2004. In addition, they are obligated to create a recruitment and termination plan with the goal of securing required skills locally for the project and ensuring equal opportunities for all. It is essential to strictly follow the Labor Institution Wage Order (2013) and make payments in line with prevailing labor laws to avoid conflicts during the construction phase. The drafting of contracts should be a collaborative effort between the Contractor and the client, subject to approval by both the World Bank and the Labor Officer. Additionally, to prevent the engagement of child labor, the contractor has been provided with relevant laws outlined in POM 2021.

2.5.2 Energy Supply

The project will be supplied by TANESCO from the national grid network and on top of that backup generator will be used during emergency. Though the proposed establishment of WSP does not use electricity during its operation

2.5.3 Water Supply

The major water source is from Tangeni River and boreholes, water will be used for construction activities and for domestic purpose (flushing of toilets) and cleaning activities during construction and operation phases. It is expected that about 10000 liters per day of water will be used during construction phase.

2.6 Construction Products, by-products and wastes

It is anticipated that the project will generate a variety of products, by-products and wastes during its construction and operational phases. The characteristics of the products, by-products and wastes are discussed in this section.

2.6.1 Products

The final product of this proposed project, MU will be able to treat all wastewater generated from their facilities.

2.6.2 By-Products

The by-products will be disposed-off as follows:

i. Soil; the soil generated during excavation will be reused elsewhere in the project. Unusable soil will be transported for disposal at designated dumping sites.

ii. **Sludge;** Over time, sludge accumulates at the bottom of wastewater stabilization ponds as a by-product of the treatment process. This sludge is a mixture of organic and inorganic materials that require appropriate management and disposal.

2.6.3 Wastes generated.

i. **Debris:** During the construction phase, waste materials such as construction debris, packaging materials, and discarded equipment may be generated. Proper waste management practices should be followed to ensure their proper disposal or recycling.

ii. **Residual chemicals:** Depending on the specific treatment processes employed, there may be residual chemicals or disinfectants used in the ponds. These need to be handled and disposed of according to relevant regulations and guidelines.

2.7 Waste Management

2.7.1 Solid Waste

2.7.1.2 Construction phase

During the construction phase of a WSP, various solid wastes can be generated. These wastes typically include construction debris, excavated materials, packaging materials, surplus materials, and other waste generated from construction activities.

The effective management of solid waste is essential for maintaining environmental sustainability and adhering to waste management regulations. This responsibility will be entrusted to an authorized contractor, who will oversee the process either through their own facilities or by utilizing local facilities, such as the Masika dumpsite in Morogoro Municipal Council. The proximity of Masika dumpsite to Mzumbe University, approximately 13 kilometers away, makes it a more practical choice compared to the dumping site in Mvomero District, which is located approximately 35 kilometers from the university. The following are common solid wastes generated during the construction phase of WSP and their management described in table 2.3.

Table 2.3: Waste generation and treatment during construction Phase

Waste type	Treatment or Disposal Methods
Construction Debris	○ Construction debris such as concrete, bricks, timber, and metal scraps should be sorted and segregated on-site. ○ Recyclable materials should be separated for appropriate recycling facilities. ○ Non-recyclable debris should be disposed of at designated waste management facilities (open pit in Masika dumpsite) in accordance with local regulations and permits.
Excavated Materials	○ Excavated materials, including soil and rocks, can be reused or recycled if suitable. ○ Clean soil can be stockpiled for future use in landscaping or regrading purposes. ○ Contaminated soil or hazardous materials should be handled and disposed of according to proper waste management protocols, including treatment or proper containment.
Packaging Materials	○ Packaging materials, such as cardboard boxes, plastic wrap, and pallets, should be collected separately for recycling or reuse whenever possible. ○ If recycling facilities are not available, these materials should be disposed of at appropriate waste management facilities.
Surplus Materials	○ Surplus construction materials, such as pipes, fittings, and equipment, should be carefully managed. ○ Excess materials that are in good condition can be donated or sold for reuse in other construction projects.

Waste type	Treatment or Disposal Methods
	○ Materials that cannot be reused should be recycled if possible or disposed of properly following waste management regulations.
Hazardous Wastes	○ Hazardous wastes, including paints, solvents, oils, and chemicals, should be handled and disposed of in accordance with local hazardous waste regulations and permits. ○ These materials should be stored in designated containers, labeled appropriately, and transported by authorized waste management service providers for safe disposal or treatment in Masika dumpsite or incinerator.

2.7.1.1 Operational phase

During the operation phase of a WSP, various solid wastes are generated as byproducts of the treatment process. These solid wastes require proper management to ensure environmental protection and public health. Here are some common solid wastes generated during the operation phase of wastewater stabilization ponds and their management practices.

Table 2.4: Waste generation and their management during construction Phase

Waste type	Management/Treatment/Disposal Methods
Floating Debris; This includes leaves, twigs, plastics, and other floating materials, can accumulate on the surface of the ponds.	○ Debris can be manually or mechanically removed using nets, screens, or skimmers. Collected debris should be properly disposed of, considering recycling or waste management regulations. ○ Regular maintenance: Pond operators should conduct routine inspections and remove floating debris to ensure the efficient flow of wastewater and prevent potential blockages
Sludge; Sludge is the accumulated solids that settle at the bottom of the ponds during the treatment process.	○ Sludge can be dewatered and further treated through processes such as sludge drying beds, mechanical dewatering, or sludge treatment plants. ○ Proper disposal methods may include land application, incineration, or landfilling, depending on the characteristics of the sludge and local regulations.
Algal Biomass; Algal growth is a natural occurrence in wastewater stabilization ponds due to nutrient availability and sunlight exposure. Excessive algal biomass can lead to oxygen depletion, odor issues, and hinder the clarity of the treated effluent.	○ Management practices for algal biomass involve monitoring and controlling nutrient levels in the influent to minimize excessive growth. ○ Mechanical removal methods, such as raking or skimming, can be employed if algal biomass reaches problematic levels. The removed biomass can be composted, landfilled, or used as a source of renewable energy through anaerobic digestion.

2.7.2 Liquid waste

2.7.2.1 Construction phase

During the construction phase of a WSP, several liquid wastes may be generated (Table 2.5). These wastes can include.

Table 2.5: Liquid Waste generated and their management during construction Phase

Waste type	Management/Treatment/Disposal Methods
Stormwater runoff	○ Implement effective erosion and sediment control measures, like silt fences, sediment basins, and check dams, to prevent soil erosion and capture sediment-laden runoff.

Waste type	Management/Treatment/Disposal Methods
	○ Properly manage stormwater by directing it away from sensitive areas and into designated retention ponds or swales.
Domestic Wastewater from On-Site Facilities	○ Temporary facilities for workers can generate domestic wastewater. Ensure proper sanitation and manage the wastewater through temporary septic systems or holding tanks. Regularly pump out and dispose of the waste at approved facilities especially existing WSP at MU.
Concrete Wash Water Construction activities often involve the use of concrete, which requires regular equipment cleaning. Concrete wash water contains high pH levels, cement particles, and other chemicals used in the concrete mixture.	○ Concrete wash water should not be allowed to enter the WSP directly, as it can harm the ecosystem. It should be contained and collected separately. The water can be treated using methods like sedimentation and pH adjustment before being discharged or reused in non-sensitive areas.
Spillages and Leaks This includes accidental spillages or leaks of fuels, oils, lubricants, or other chemicals during construction period	○ It is essential to have spill response plans in place to minimize environmental impacts. ○ Spill kits and containment measures should be readily available, and proper cleanup and disposal procedures should be followed to prevent contamination of soil and water.

2.7.2.2 Operation phase

During the operation phase of a WSP, several liquid wastes may be generated this include treated effluent, overflow and spills (Table 2.6). Proper management of effluent is crucial to prevent adverse impacts on receiving water bodies or nearby ecosystems. These wastes can include.

Table 2.6: Liquid Waste generated and their management during operation Phase.

Waste type	Management/Treatment/Disposal Methods
Treated Effluent	○ Regular monitoring of effluent quality to ensure compliance with applicable standards and regulations. ○ Implementation of appropriate treatment processes, such as disinfection or filtration, if needed, to meet effluent quality requirements. ○ Establishing an effluent discharge point and ensuring proper dispersion to minimize the impact on receiving water bodies. ○ Regular maintenance and inspection of the stabilization pond system to ensure its efficient operation and optimum treatment performance
Overflow or Spills During heavy rainfall events or maintenance activities, there is a possibility of overflow or spills from the stabilization pond. This can lead to the release of untreated or partially treated wastewater into the surrounding environment, posing risks to water quality and ecosystems.	○ Adequate design and maintenance of the stabilization pond system to minimize the likelihood of overflow or spills. ○ Implementation of appropriate emergency response measures, such as containment systems or diversion structures, to mitigate the impacts of accidental spills. ○ Regular inspection and maintenance of the stabilization pond infrastructure to identify and address potential issues before they escalate.

2.8 Occupational health and safety (OHS)

2.8.1 OHS During construction phase.

MU will work hand in hand with the lead consultant to ensure regular trainings on occupational health and safety are provided to both permanent and casual staff. Further, relevant information on various outbreak and pandemic will be shared including Cholera, COVID-19 and HI/AIDS. During the construction phase, the contractor will provide with adequate protective gears such as helmets, heavy duty gloves, jackets, and boots. And also, ensure the right infrastructure is in place e.g., sign boards, first-aid station and also, when necessary, transport in case of emergency evacuation.

The MUSO leadership will provide relevant trainings to students to ensure smooth navigation of their daily to day transportation. The speed limit will be set not exceeding 50km/h but within the designated area shall not exceed 10km/h. The contractors shall ensure all their drivers are aware of the set speed limits to ensure safety within the project area and also, both the entrance and exit areas will be identified and labeled.

2.8.2 OHS During operation phase.

All the safety issues will be taken into consideration including the allocation of emergency assemble point; Emergency plans and procedure will be developed to prevent and mitigate the likely consequences of accidents associated with the project (construction). There will be a document that outlined in detail the potential accidents/emergencies and how to respond; this document will also explain on how to mitigate environmental hazard. The document will also respond to Occupational Health and Safety hazards related to daily operation e.g., risks of fire explosion. Thus, fire extinguishers of powder foam type and fire horse reel will be place in several strategic point and occasionally serviced.

2.8.3 Information and Education

Clear warnings and information will be placed at strategic locations around the project. In case of an emergency a system for notifying neighborhood will be developed. Posters highlighting safety measures in different location will be displayed. Training courses will be organized regularly to educate workers and students about the importance and procedures of safety measures.

2.9 Gender analysis and mainstreaming

The constitution of Tanzania, Act No. 15 of 1984 clearly stipulates equal rights for both men and women and prohibits any form of discrimination based on gender, colour, tribe, religion or station in life. Tanzania has signed and ratified both international and Regional Instruments such as the Elimination of All Forms of Discrimination against Women in 1987; the African Charter on Human and Peoples' Rights on the Rights on Women in Africa in 2005. Currently, Tanzania has achieved gender parity at primary school enrolment rates, this can be attributed by free education policy introduced through the Circular 5 of 2015 which implements the Education and Training Policy of 2014. This circular was responding to strategies of eliminating discrimination based on gender.

In the same context, MU has a deliberate policy to encourage equal employment opportunity for both men and women. The contractor of the project will also align with the policies to ensure equal employment opportunities for both men and women.

2.10 Project Boundaries

Determination of project boundaries refers to an identification of impact zones institutionally, temporal, and spatially, within which the project impacts will reach. This process involves determination of the extent impacts that would spread away from the core project site. The following project boundaries have been identified;

2.10.1. Institutional boundaries

Institutional boundaries refer to those institutions and sectors, which interact with the proposed project in terms of utilities or concern either direct or indirect. These can be determined from political boundaries, Acts, Regulations and Institutional mandates and administrative organisations. This proposed project touches the interest of many institutions and administrative units in relation to several policies, laws and plans in Tanzania and several sector ministries. These institutions include;

- Ministry of Education Science and Technology
- Mvomero District Council
- Tanzania Commission of Universities (TCU)
- Occupational Safety and Health Authority (OSHA)
- RUWASA
- MORUWASA
- Wami /Ruvu Basin Water Board
- Changarawe, Vikenge and Tangeni community

2.10.2 Temporal boundaries

Temporal boundaries refer to the period and reversibility of impacts. Most of impacts are short term but others may extend to long-term impacts. For example, the impacts such as noises and dusts may be short-lived, but the presence of the facility in the selected area may have implications that stretch far into the future until when decommissioning is undertaken. For instance, the issues of air pollution, waste management and dusts pollution may continue to be a problem unless measures are taken to ensure that acceptable limits are adhered to. In addition, consideration needs to be given to what happens when the project ends, where there is a need for decommissioning of the project and site restoration. Some of the impacts that will occur during construction and decommissioning such as increase in noise and dusts levels to be caused by demolition activities and disappear as soon as construction and decommissioning activities is completed. However, some impacts will remain irreversible even after the closure of the project. The ESIA process will address all impacts taking into account their temporal dimensions in various stages of the project.

2.10.3 Spatial boundaries

Spatial boundaries refer to the dispersion effect of the project impacts. The scale of dispersion can be locally, regionally, and nationally or internationally. The proposed establishment in the area will have a wide range of implications that could be felt locally, regionally, nationally or even internationally, thus causing impacts as far as to those areas. Therefore, in determining the spatial dimension of the project, it is important to consider impacts in a form similar to a contour layout. Two zones of impact namely core impact zone and influence impact zone are considered.

- Starting with the **core impact area** (where the project is located). In this case, the core impact area for the project will be Changarawe and Tangeni villages (where project will be located) and its nearby areas in Vikenge village as where the impact will be felt.

- The second area is the **immediate impact area**. This is the area surrounding the core area and bears relatively some of the impacts. In case of the proposed project, the immediate impact area will be the neighboring area within Mvomero District Council in general which will benefit from revenues paid by the investor and from different social economic activities.
- The other area is area known as the area of influence. In terms of spatial dimension, this is the outer most area that consists of centers of decision making that can influence the development of proposed project.

2.11 Project Cost

MU has received financial support from the World Bank (WB) through the Government of the United Republic of Tanzania (GoT) under the project named Higher Education for Economic Transformation (HEET). MU use about 3,110,906,083.02 TZS parts of its financial support to construct WSP. The project implementation is estimated to take 18 months after commencement.

CHAPTER 3: POLICIES, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Introduction

The basis of Environmental Management Are Policy, legal and administrative frameworks. In order to provide a broad guideline on areas of focus in undertaking environmental management activities in the sector a policy framework is vital. A legal and regulatory framework is essential for providing mandate, allocating specific responsibility and accountability to key actors and stakeholders, and also prescribes and enforces specific operating environmental procedures and standards.

Regulation on environmental management in the country is mainly vested on two public institutions, the National Environment Management Council (NEMC) and the Division of Environment (DoE) in the office of the Vice President. The NEMC undertakes enforcement, compliance, and review of environmental impact statements whereas the DoE provides the policy formulations and technical back-up and executes the overall mandate for environmental management in the country. The EIA certificate is issued by the minister responsible for environment. A few policies and laws that are relevant to the environmental and social management of the project are described in the subsequent sections.

3.2 Policies Relevant to the Project

The following are relevant Sectoral and cross–Sectoral policies that provide directives on how the project should operate in relation to the concerned environmental and socioeconomic settings. The proponent shall continue to consult these policies in the course of implementing the project activities.

Table 3.1: Policy Compliance

S/N	POLICY	REQUIREMENT	COMPLIANCE
1	The National Environmental Policy, 2021	The policy provides the framework for the formulation of plans, programmes and guidelines for the achievement of sustainable development. Instruments for implementation include the use of Environmental Audit (EA), development of national standards and indicators, and the preparation of appropriate legislation. NEP encourages good land and water resources management to reduce undesirable environmental impacts such as soil salinity, water pollution and spread of water borne diseases.	MU has observed one of the requirements of the national environmental policy by putting measures to control and minimizing pollution that will happen during constructions and operations period.
2	The National Land Policy (1997)	The National land Policy is relevant to this project because the project will be required to ensure protection of existing cultural heritage and conservation of ecological and socially sensitive areas. In addition, to promote sound land information management and to protect land resources from degradation for sustainable development.	MU comply with this policy because the proposed WSP will be located within the area planned for institutions and as such it is compatible with the land use in the project area as required by the National Land Policy.
3	The Construction Industry Policy (2003)	Among the major objectives of the policy, which supports a sustainable block development sector, include the promotion and application of cost effective and innovative technologies and practices to support socio-economic development activities such as blocks, roadworks, water supply, sanitation, shelter delivery and income generating activities and to ensure application of practices, technologies and products which are not harmful to either the environment or human health. This project is in-line with this policy as ultra-modern technology shall be used during construction and its operation.	This project is in-line with this policy as ultra-modern technology shall be used during its construction. Implementation of the proposed establishment will use of cost effective and environmentally friendly technologies to minimize wastage of resources specially building materials, water and energy.
4	The National Employment Policy (2008)	The major aim of this policy is to promote employment mainly of Tanzania Nationals. Relevant sections of this policy are (i) 10, which lays down strategies for promoting employment and section 10.1 is particularly focusing on industry and trade sectors (ii) 10.6 which deals with employment of special groups i.e., women, youth, persons with disabilities and (iii) 10.8 that deals with tendencies of private industries to employ expatriate seven where there are equally competent nationals.	MU shall abide by this policy by employing Tanzanians who have the required qualifications as well as unskilled
5	The National Gender Policy (2002)	The key objective of this policy is to provide guidelines that will ensure that gender sensitive plans and strategies are developed in all sectors and institutions. While the policy aims at establishing strategies to eradicate poverty, it is relevant to the project as it puts emphasis on gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of society. It also requires that women and men are given equal employment opportunities in the project, whenever possible.	This project shall ensure that women will be adequately involved at all levels of project planning to implementation.
6	National Policy on HIV/AIDS (2001)	The policy recognizes that HIV infection shall not be grounds for discrimination in relation to education, employment, health and any other social services. Pre-employment HIV screening shall not be required. For persons already employed, HIV/AIDS screening, whether direct or indirect, shall not be required. HIV infection	The proponent will adhere to the policy by availing HIV/AIDS information and voluntary screening services to its workers as

S/N	POLICY	REQUIREMENT	COMPLIANCE
		alone does not limit fitness to work or provide grounds for termination. HIV/AIDS patients shall be entitled to the social welfare benefits like other patients among the employees. HIV/AIDS information and education targeting the behavior and attitudes of employees and employers alike shall be part of HIV/AIDS intervention in the workplace.	well as observing other provisions of the policy.
8	The National Water Policy (URT, 2002)	The National Water Policy (NAWAPO) mandates the adoption of a comprehensive approach that integrates planning and management across multiple sectors and objectives. This approach aims to minimize adverse impacts on water resource development, thereby ensuring the sustainability and protection of both the resource and its surrounding environment. The policy emphasizes this holistic perspective by requiring that all water abstractions and effluent discharges into water bodies must obtain permits, specifying the intended beneficial use and the designated timeframe. Additionally, the policy sets a goal to promote environmentally friendly wastewater treatment systems. To prevent the indiscriminate discharge of wastewater and contamination of water sources, the project proponent should ensure proper management and disposal of wastewater sludge and treatment facilities capable of accommodating the whole university.	The proposed establishment of WSP at MU shall be designed in such a way that there is no any leaks or breaches that could lead to water contamination. It will also ensure that pollution of water sources is avoided or minimized during the construction and operation phases.
9	The National Health Policy (URT 2003)	The main objective of this policy is to ensure that health services are available and accessible to all people wherever they are in the country, whether in urban and rural areas. The policy encourages safe basic hygienic practices in workplaces, promote sound use of water, promotes construction of latrines and their use, encourage maintenance of clean environment; working environment which are conducive to satisfactory work performance.	The Proponent/Contractor shall observe this policy by providing good hygienic condition to the workers and shall continue to be provided with appropriate PPE's based on their working sections.
10	Cultural Policy of 1997	This policy addresses a broad spectrum of subjects pertaining to both the preservation of living cultural heritage and the safeguarding of historical and archaeological artifacts, collectively referred to as "cultural property". The policy mandates that any land development activities must be preceded by Cultural Resource Impact Studies	MU and the contractor will adhere to the stipulations outlined in this policy
10	Education Training Policy (2014)	The policy stressed that for improvement of the quality of education in Tanzania there should be a shift from using many textbooks into using single text book for each subject. The policy also emphasizes all private schools need to have affordable school fees on the basis of "Unit per course" and analyse its operation as well. The school fees should relate with the service offered by the school.	MU will enhance teaching infrastructure via HEET, boosting student enrollment and environmental facilities like wastewater treatment, benefiting relevant programs' practical training.
11	National Mineral Policy (2009)	The National Mineral Policy also addresses that the mining activities should be undertaken in a sustainable manner. Reclamation of lands after mining activities is recommended. As far as this project is concerned, mining activities is directed to quarrying activities for obtaining stones and aggregates.	No mining activities will be undertaken by proponent within the project area as raw materials (Fine and coarse aggregates) for the proposed establishment shall be bought from authorized vendors.

3.3 Relevant Legal Framework

This section addresses the legal conditions that are relevant to the proposed project. This ESIA has been prepared in general compliance with the following legislations.

Table 3.2: Legislation Compliance

S/N	LEGISLATION	REQUIREMENT	COMPLIANCE
1	Environmental Management Act, Cap 191, 2004	The Environmental Management Act, Cap 191 establishes a legal framework for sustainable environmental management aligned with the National Environmental Policy. It ensures the continuity of the National Environmental Management Council (NEMC), empowering it for enforcement, compliance, and monitoring of environmental impact assessments. Proponents must also heed Environment Management Act Cap 72 concerning land use responsibilities and sustainability.	All section shall continue to be observed by Proponent in order to protect the environment against any sort of pollution (refer to the Environmental Management Plan of this report).
2	Occupational Health and Safety Act (2003)	This Act deals with the protection of human health from occupational hazards. It specifically requires the employer to ensure the safety of workers by providing safety gears at the workplace.	The Proponent/Contractor will acquire a certificate of registration of a workplace from OSHA to abide to the law.
3	The Land Act, 1999, CAP 113 R.E. 2019	The Act seeks to control the land use and clarify issues pertaining to ownership of land and land-based resources, transactions on land and land administration. The law provides for technical procedures for preparing land use plans, detailed schemes and urban development conditions in conformity with land use plan and schemes.	The land is owned by the project proponent and title deed (certificate of occupancy) for the proposed establishment land is attached in appendix 2.
4	Employment and Labour Relations Act, R.E 2019	The Act ensures fundamental labor rights and sets employment standards, offering extensive protection against discrimination. It mandates equal opportunity, prohibiting discrimination based on various factors including gender, pregnancy, marital status, disability, and age. Employers must take affirmative action to ensure a safe and healthy workplace for all genders.	The Proponent commits to enforcing labor laws, ensuring workplace equality, fostering economic justice, and upholding labor rights
5	The Engineers Registration Act and its Amendments 1997 and 2007	The Act provides restriction that no person other than a registered engineer shall engage in professional engineering work or services which includes professional service consultation, planning, designing or responsible supervision of construction or operation in connection with any public or privately owned public utilities, buildings, machines, equipment, processes, works or projects where public interest and welfare, or the safeguarding of life, public health or property is concerned or involved, and that requires application of engineering principles and data.	MU shall engage registered engineers to observe the provisions of the Act when executing its activities.
6	The Contractors Registration Act, 1997	This Act establishes the Contractors Registration Board (CRB). CRB has a mandate to register contractors, regulate the conduct of the contractors and for related matters. Among other things CRB is required to take legal action against unregistered contractors who undertake construction, installation, erection or	The proponent shall therefore appoint a registered contractor and make sure that the provisions of the Act are adhered to.

S/N	LEGISLATION	REQUIREMENT	COMPLIANCE
		alteration works; ensure that all construction sites are hoarded; and labour laws, occupational health and safety regulations in the construction industry are adhered to. On executing its construction activities.	
7	The Architects and Quantity Surveyors, Act 2010	This Act was enacted by the parliament to provide for establishment of a board to regulate the conduct of Architects and Quantity surveyors and architectural and quantity surveying consulting firms in Tanzania. The board is vested with powers to inspect premises or construction sites to verify whether the rules and regulations of carrying out construction projects are adhered by consulting firms. This is aimed at ensuring that appropriate professionals who are registered by the board are involved in undertaking works as required by the law.	Therefore, the proponent shall abide by this Act by carrying out construction by adhered consulting firm.
8	Public Health Act, 2009	The Act provide for the promotion, preservation and maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the general public and to provide for other.	The Proponent will observe this Act by promoting and preserve the public health.
9	Water Resources Management Act, 2009	The Act provides for the protection of the water resources and the user so that there is a balance between different uses. The provisions of the Act will be adhered to during implementation by ensuring that surface and ground water sources are protected. Furthermore, water to be sourced from a borehole which will be drilled within the project area shall be used wisely at the project site and from the river shall have water use permit. the proponent shall have discharge permit from responsible authority for its proposed WSP for wastewater treatment.	The proponent shall adhere with the act by ensuring the protection of surface and ground water resources, and there is water use permit from WRBWB for Tangeni river. However, currently MU has no discharge permit for its effluent from the existing WSP
10	The Workers Compensation Act, 2015	An Act to provide for the compensation to employees for disablement of death caused by or resulting from injuries or diseases sustained or contracted in the course of employment, to establish the Funds for administration and regulation of worker's compensation and to provide for related matter. It applies to both workers in the private and public sectors.	The Proponent shall comply with this act by ensuring that all workers from Contractor shall be compensated accordingly in this manner and registered to WCF.
11	Prevention and Control of HIV/AIDS Act, 2008	The Act primarily addresses prevention, treatment, and support for HIV/AIDS, promoting public awareness, reducing transmission, and providing community-based services. Section 4(1) emphasizes awareness and protection rights, while Section 19(2) focuses on community-based services, potentially impacting local HIV transmission dynamics.	The Proponent shall operate within the requirements of this legislation in addition to those of the HIV policy.
12	The Law of the Child Act, 2019	This act reforms and consolidates laws regarding children's rights, welfare, and protection. It addresses adoption, custody, employment regulations, and prohibits child labor exploitation by individuals or companies.	Contractor and MU vow to prevent child labor by enforcing rules during project, safeguarding those under fourteen.
13	The Roads and Fuel Toll Act, [Cap.220 R.E.2019]	The Roads Act covers financing, development, maintenance, and management. Key clauses include constructing access roads, notifying affected landholders, and regulating weight, speed, and dimensions. It also addresses offenses, penalties, and recovery procedures.	The project proponent shall observe relevant section of the Act by ensuring that his project don't affect the roads which is near the project site.

S/N	LEGISLATION	REQUIREMENT	COMPLIANCE
14	The Road Act, 2007	Part IX of the Act provides for offences and penalties against the contravention of the provisions of the Act. Furthermore, the Act stipulates that the Road authority shall be compensated in respect of the expenses incurred while repairing the road damaged by any person.	The project proponent shall observe relevant section of the Act by ensuring that his project will be located outside the road reserve.
15	Standard Act of 2009	The Standards Act establishes the National Environmental Standards Compendium (NESC) with compulsory standards (TBS), covering various industries' environmental impacts. Test methods for compliance are specified. The MU project will adhere to these requirements.	MU must adhere to Act, regulatory requirements, implement proposed mitigation measures for air pollution abatement, and follow environmental best practices.
16	Universities Act No. 7 of 2005	Universities Act No. 7 of 2005 provides for establishment of the Tanzania Commission for Universities (TCU) to provide the procedure for accreditation of institutions of higher learning and other related matters. The proposed project at MU will be regulated by the Tanzania Commission for Universities (TCU) for ensuring that quality education is offered, which meets the needs of all the stakeholders in line with this Act.	MU should ensure Tanzania commission for universities (TCU) provides procedures to higher education accreditation in the institution of the project, which will bring to the people related to on the project. The project complies with all the procedures of the universities act to be consulted for the project development.
17	The Education (Amendment) Act, 1995	This Act establish the Higher Education Accreditation Council, to provide the procedure for accreditation and other related matters. Among other functions, the council accredits higher education institutions; approve admissions into state institutions of higher education, to examine and approve proposals for courses of study and course regulations submitted to it by institutions of higher education; make regulations in respect of admission of persons seeking to enroll in state institutions of higher education and to provide a central admission service to higher education institutions; and make visitations and inspection of higher institutions.	MU under HEET project will be monitored by Accreditation Council.

3.4 Relevant Regulations

Table 3.3: Regulations Compliance

S/N	REGULATIONS	REQUIREMENT	COMPLIANCE STATUS
1	The Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018	The Environmental Management (Environmental Impact Assessment and Audit) Amendment Regulations, 2018, are part of Tanzania Environmental Management Framework, building on the EIA and Audit regulations from 2005 under the Environmental Management Act No. 20 of 2004. These regulations establish procedures for conducting Environmental Impact Assessments (EIA) and Audits for development projects with significant environmental impacts. They outline steps like project registration with NEMC, screening, scoping, and producing an ESIA report, which must consider environmental,	Proponent has carried out this ESIA, hence, the requirements of these regulations are observed.

S/N	REGULATIONS	REQUIREMENT	COMPLIANCE STATUS
		social, cultural, economic, and legal factors. The regulations are relevant to the MU project, requiring its registration and EIA study to comply with specified guidelines	
2	The Environmental Management (Fees and Charges) Regulations, 2021	The National Environment Management Council (NEMC), established under the Environmental Management Act Cap 191, oversees enforcement, compliance, and monitoring of environmental impact assessments, research, and awareness. Mandated by relevant regulations, it monitors industries for environmental effects, charging fees for compliance monitoring and audits, which are non-refundable as per the Environmental Management (Fees and Charges) Regulations, 2021.	MU complies with regulation by paying review fees as required by the NEMC Council.
3	Environmental Management (Air Quality Standards) Regulations, 2007	This standard aims to establish baseline air quality parameters, enforcing NEMC-prescribed standards for industries, promoting eco-friendly technologies to safeguard human health and the environment from pollution sources. Compliance with 2007 regulations is crucial.	MU will ensure that all emissions will be within recommended standard level.
4	Environmental Management (Soil Quality Standards) Regulations, 2007	This standard sets limits for soil contaminants in agriculture and habitat, ensuring adherence to minimum soil quality standards to sustain, restore, and enhance soil productivity. It also regulates expansion projects to prevent environmental contamination	MU complies by maintaining trucks and excavators to prevent oil spills and directing wastewater from washrooms to treatment facilities
5	Environmental Management (Water Quality Standards) Regulations, 2007	This standard aims to uphold water quality set by NEMC, considering the capacity of receiving waters to handle pollutants without harm, safeguarding human health and the environment through adherence to regulations.	MU complies with regulation, treating all liquid waste from project in WSP to protect environment
6	The Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015	The regulation prohibits a person to make any loud, unreasonable, and unnecessary on unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and of the environment describes the permissible noise levels from different facilities. The provisions of these regulations will guide in ensuring that noise and vibration levels do not exceed the maximum thresholds specified.	MU ensures that these regulations are adhered by ensuring noise and vibrations produced during construction period are within acceptable limit.
7	The Urban Planning (Use Groups and Use Classes) Regulations, 2018	These regulations have been made under section 77(1)(i) of the Urban Planning Act (Act No. 8 of 2007). This regulation is made for the purposes of planning and the control of development, all uses of land and buildings are categorized in the use groups and use classes in the First Schedule. For proposed establishment at MU regarding MU title deeds it follows under Use Group K – Educational Buildings and Use Class: (d) Schools/Faculties, institutes, colleges, university colleges and universities.	MU abide to the requirement of the regulations because the lands shall be used solely for Educational purposes and for the other purposes ancillary thereto.
8	The Urban Planning (Application for Planning Consent) Regulations, 2018	These regulations, pursuant to section 77(1)(o) of the Urban Planning Act (Cap. 355), mandate that all development within the Planning Area must obtain planning consent from the Planning Authority. Additionally, they require specific documentation including block plans, elevation plans, floor plans, and site plans for proposed developments.	MU will abide to the requirement of the regulations.

S/N	REGULATIONS	REQUIREMENT	COMPLIANCE STATUS
9	The Urban Planning (Planning Space Standards) Regulations, 2018	The Urban Planning Space Standards offer guidelines for efficient space use, aiming for sustainable development. Applied to the HEET project at MU, these standards informed building design and site selection. They dictate building heights, setbacks, plot coverage, and provision for transport systems, including roads, parking, and pedestrian walkways.	MU HEET project integrates urban planning space standards into building design, ensuring efficient project area utilization throughout implementation.
10	The Urban Planning (Zoning of Land Uses) Regulations, 2018	The regulations, based on section 77(1)(d) of the Urban Planning Act (Cap. 355), detail permissible land uses in different zones. Residential, commercial, industrial, institutional, public utilities, beach, open spaces, recreational, transportation, communication, agricultural, water bodies, conservation, and economic development uses are specified. Institutional zones allow central and local government offices, educational institutions, cultural and religious centers, medical facilities, recreational areas, utilities, and essential staff quarters, among other uses, subject to specific criteria.	MU will abide to the requirement of the regulations during design and construction period.
11	The Industries and Consumer Chemicals [Management and Control] Regulations, 2020	The Industrial and Consumer Chemicals Act in Mainland Tanzania mandates registration for those dealing with industrial chemicals. Managed by the Industrial and Consumer Chemicals Management and Control Board, it lists chemicals requiring registration. Compliance with the law is crucial during importation, storage, use, and disposal of chemicals to meet legal requirements.	MU will use registered chemicals in Tanzanian labs, avoiding imports by sourcing from local importers for their projects.
12	The Environmental Management [Control of Ozone Depleting Substances] Regulations, 2007	Regulations identify products with ozone-depleting potentials, including automobile and truck conditioning units, refrigeration, and air conditioning equipment containing controlled substances. This encompasses refrigerators, freezers, dehumidifiers, water coolers, ice machines, and air conditioning units. Dust emissions may occur during material handling, especially during construction at MU.	MU should adhere to this regulation so as not to participate in ozone depleting and pay pollution cost when needed.
13	The Environmental Management (Solid Waste Management) Regulation, 2009 as amended in 2016	The regulation has been made under section 114, 115, 116,117, 118, 119, 120,121, 122 and 230 of Environmental Management Act, 2004. These regulations apply to all matter pertaining to solid waste management. They aimed among other things at setting standard for permit to operate solid waste disposal sites, permit to transport solid waste, permit to dispose solid waste and license to own or operate solid waste disposal site.	MU will ensure proper handling of construction and operational waste to prevent pollution and comply with regulations
14	Environmental Management Act (Hazardous Waste Control) Regulations, 2021	This regulations under the Environmental Management Act, 2004, mandate Tanzanian residents to protect the environment from hazardous waste. They must report any hazardous waste activities to authorities. These rules cover hazardous waste handling, including generation, storage, and disposal, within mainland Tanzania. Principles of environmental sustainability like precautionary, polluter pays, and producer extended responsibility guide waste management.	MU will abide to the requirement of the regulations.

3.5 Relevant National Plans/Strategies

In order to guide national development more effectively and systematically, Tanzania has prepared a number of strategies aiming at operationalizing the various policies in key sectors. Some of the strategies that have a bearing on the proposed project are:

3.5.1 The Tanzania Development Vision 2025

The Composite Development Goal for the Tanzania Development Vision 2025 foresees the alleviation of poverty through improved socio-economic opportunities, good governance, transparency, and improved public sector performance. These objectives not only deal with economic issues, but also include social challenges such as education, health, the environment and increasing involvement of the people in working for their own development. The thrust of these objectives is to attain a sustainable development of the people. The Vision 2025 seeks to mobilize the people, the private sector, and resources of the nation towards achievement of shared goals and achieving a sustainable middle market economy by 2025. The vision outlines Tanzania plans and strategic goals covering all sectors of the economy and outlines institutional changes that must take place to enable Tanzania to make the progress suggested in the vision. The proposed project will stimulate local economic growth and will contribute towards realisation of the Vision ‘s objectives.

Compliance: *MU project will contribute to the attainment of the 2025 Vision through provision of adequate skilled labor force for implementing various development plans.*

3.5.2 The National Five-Year Development Plan (FYDP III) 2021/22-2025/26

In implementing the Third Five Year National Development Plan the Government will focus on stimulating an inclusive and competitive economy, strengthening industrial production capabilities and service delivery, promoting investment and trade, bringing development to our citizens and building human resource capacity.

To facilitate its implementation, this plan has been developed in line with the implementation Strategy which is divided into three implementation plans. First, is the Action Plan which outlines all activities and objectives intended for whole period of implementation. The second is the Financing Strategy (FS) that shows how to avail funding for development projects as well as other strategic steps outlined in the Plan. The latter has prepared a Monitoring and Evaluation Strategy (MES) for monitoring the implementation of projects to know whether the intended results are being met and prompt corrective measures whenever needed to ensure delivery of the intended results. Through the slogan of the Sixth Phase Government of *Kazi Iendelee*, each of us has a responsibility to fulfill assigned responsibilities effectively in order to achieve effective implementation of this Plan.

3.5.3 Project Operational Manual (POM)

This Project Operational Manual (POM) sets forth all the operational and procedural steps which will guide the implementation of the Higher Education for Economic Transformation Project (HEET) at Mzumbe University. The Operational Manual offers a brief description of the components, details the results expected to be achieved through HEET and outlines the operational and financial reporting arrangements, procurement and disbursement processes, standard formats for biannual and annual reporting and amendment procedures. It is supported and -complimented by a series of technical documents which will provide further guidance on key project components.

It should be used in conjunction with the recent versions of the Project Appraisal Document (PAD), Legal Agreement, and Environmental and Social Management Framework (ESMF).
The primary users of the POM will be the technical, financial, operational and administrative staff at MU, consultants, contractors and any other agency tasked with implementing and monitoring any part of HEET-MU.

3.5.4 Project Appraisal Document (PAD)

This document provides the project formulation underpinning. It describes the strategic context, project description including its project development objectives, components, beneficiaries and rationale for the World Bank involvement and role of partners. Further, the document outlines the implementation arrangements. Grievance redress services as well as the key risks and results framework and monitoring have also been presented in PAD. The projects under MU will be implemented in line with the requirements by PAD.

3.6 Relevant International Agreements, Conventions and Treaties

International agreements, convention and treaties which are relevant to this project include:

- United Nations Framework Convention on Climate Change (1992)
- Paris Agreement (2015)
- The Convention on Biological Diversity (1992)
- Stockholm Convention (2001)
- United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification (UNCCD-1994)
- International Labour Convention

3.6.1 United Nations Framework Convention on Climate Change (1992)

The objective of the United Nations Framework Convention on Climatic Change (UNFCCC) is to stabilize the concentration of greenhouse gas (GHG) in the atmosphere, at a level that allows ecosystems to adapt naturally and protects food production and economic development.
Since Tanzania is a Party to the Convention, she will have to account for all sources of GHG in her future National Communications. Undertaking of this ESIA study will enable the country to identify some of the GHG that will be emitted by the project activities.
Compliance: *MU project will abide with the requirements on control and prevention of greenhouse gases by emphasizing use of soft copies as opposed to hard copies in teaching and learning.*

3.6.2 Paris Agreement (2015)

The Paris Agreement aims to hold global temperatures 'well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C' (Art. 2.1.(a)) Since Tanzania is among the parties to the agreement, she will make profound changes to its economy to achieve this goal.
Compliance: *MU project will abide with the requirements to reduce greenhouse gas emissions, at least to a point where there is a balance between emissions and sequestration by discouraging the use of solid biomass fuels and encourage utilization of clean, sustainable energy fuels including Liquefied Petroleum Gas (LPG), electricity and sustainable biomass.*

3.6.3 The Convention on Biological Diversity (1992)

The Convention on Biological Diversity (1992) has three objectives which are; the Conservation of biological diversity; sustainable use of biodiversity components, and the fair and equitable sharing of the benefits arising from the utilization of genetic resources.

Tanzania ratified the conversion on biological diversity in 1996 and launched the National Biodiversity Strategy and Action Plan with a sectoral approach. The Government has committed to ambitious national targets for biodiversity conservation.

Compliance: *MU project will abide with the requirements to safeguard biological diversity by enhancing protection of different plant and animal species around the university; and take measures for vulnerable ecosystems against climate change.*

3.6.4 United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification (UNCCD-1994)

The objective of the Convention, provided in article 2, is "to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements."

Tanzania ratified the UNCCD in 1997 with the obliged to implement the provisions of the Conventions within her respective capacity in support of sustainable development.

Compliance: *MU project will abide with the requirements to* combat desertification and mitigate the effects of drought *by undertaking different measures to control floods, minimize deforestation, manage water resources and induce water harvesting technologies.*

3.6.5 International Labour Convention

International Labor Organisation (ILO) Conventions ratified by Tanzania include: C138 Minimum Age Convention of 1973, which prohibits child labor, and C182 Worst Forms of Child Labor Convention of 1999. As the conventions have been adopted by the Tanzania Government, MU project will abide by them and ensure that no child labor is practiced throughout the project. Other relevant agreements include ILO Convention C148 Working Environment (Air Pollution, Noise and Vibration) Convention of 1977, which protects workers against occupational hazards in the working environment due to air pollution, noise and vibration. The proposed project will ensure workers work in safe environment.

3.7 Institutional Framework for the Management of Environment

Tanzania is among countries in East Africa with an Act for environmental management legislation. The legislation, Environmental Management Act (EMA) (2004), provides a legal and institution framework that guides the implementation of the environmental management activities. The framework provides a pre-requisite for effective implementation of Environment Policy at all levels (National, Region, Council, and Village/Mtaa/Hamlet). According to the Environmental Management Act (EMA) (2004), there is the Environmental Management Committee established at the Hamlet/Village/Mtaa, Ward, and Council and at National level with the responsibility for the proper management of the environment in respect of the area in which they are established. The functions and responsibility of these committees are well explained in the Act. The proposed

project will include all governance levels in the management of environment during HEET execution as shown in Table 3.4

Table 3.4: Key Institutions to the ESIA process

Level	Institution	Role and responsibility
National Level	Vice Presidents Office (Division of Environment)	o Coordinate the implementation of the National Environmental Policy. o Coordinate various environment management activities in Tanzania. o Advise the Government on legislative and other measures for the management of the environment. o Advise the Government on international environmental agreements. o Monitor and assess activities, being carried out by relevant agencies in order to ensure that the environment is not degraded. o Prepare and issue a report on the state of the environment in Tanzania.
	Vice Presidents Office (NEMC)	o Coordinate Environmental Management Policy, Act and EIA guidelines. o Approval of ToR, Review of ESIA o Issuing an Environmental Certificate o Review and recommend for approval of environment impact statements. o Enforce and ensure compliance of the national environmental quality standards. o Initiate and evolve procedures and safeguards for the prevention of accidents which may cause environmental degradation and evolve remedial measures where accidents occur; o Undertake in co-operation with relevant key stakeholders' environmental education and public awareness;
	Ministry of lands, housing and human settlements development	o Authority over the national land including the project area. o Enforce law and regulations in the area of influence of the project.
	Ministry of Education, Science and Technology (MoEST)	o To develop and implement Policies on Education, Research, Library Services, Science, Technology, Innovation, Skills, Training Development and their implementation; o To improve Basic Education Development through Teachers Training Accreditation and Professional Development; o Teachers Professional Standards Development; o Schools Accreditation and Quality Assurance; o Development of Local Experts in Science, Technology and Innovation; o Coordinates roles of Departments, Parastatal Organisations, Agencies, Programmes and Projects under the Ministry.
	Tanzania Commission for Universities (TCU)	o Mandate to recognize, approve, register and accredit Universities. o Conduct regular and impromptu periodic evaluation of universities, their systems and programmes. o Advise the government and the general public on matters related to higher education in Tanzania as well as international issues pertaining to higher education, including advice on program and policy formulation and other best practices.

Level	Institution	Role and responsibility
		o Providing support to universities in terms of coordinating the admission of students, offering training and other sensitization interventions in key areas like quality assurance, university leadership and management, fund raising and resources mobilization, entrepreneurial skills and gender mainstreaming.
	Occupation Safety and Health Authority OSHA	o Approval of WSP plans for the proposed project. o Monitoring Health and Safety of workers in working premises. o Issuing certificates of compliance and oversee occupational safety and health issues. o Designated Authority for occupational safety issues
Project Proponent	Mzumbe University (MU)	o Project investment and project cycle implementation, monitoring, and auditing; Conducting ESIA study and follow-up on ESIA certificate. o Land acquisition and payment of compensations. o Paying of applicable taxes and charges. o Project operation and decommissioning
Regional Level	Morogoro Region	o Oversee and advice on implementation of national policies at regional level. o Oversee enforcement of laws and regulations. o Advice on implementation of development projects and activities at regional level.
Local Governments Authorities and Communities	Mvomero District Council	o Oversee and advice on implementation of national policies at District level. o Oversee enforcement of laws and regulations. o Advice on implementation of development projects and activities at District level
	Ward Office and Village Office at MU	o Project monitoring (as watchdogs for the environment, ensure the well-being of residents) and participate in project activities. o To extend administrative assistance and advice on the implementation of the project. o Managing the community's relation
	Local communities, NGOs, CSOs and FBOs	o Project monitoring (as watchdogs) o Provides assistance and advice on the implementation of the project o Part of the project beneficiaries through employment opportunities, income generation and CSR projects.

3.7.1 Principal Participants in the Implementation of the Proposed Project

In order to guarantee the robust advancement and successful execution of the envisioned project, it is imperative to delineate and specify the roles and authority of key project implementors. The involvement of the following entities will play a crucial role in this process;

- Funding Institutions
- Mzumbe University (MU)
- National Environmental Management Council (NEMC)
- Consultant
- Design Consultant
- Contractor

3.7.1.1 Funding Institutions (GoT and World Bank)

The primary responsibility of HEET project funders will be to ensure the meticulous execution of the project in adherence to the highest environmental standards, in strict accordance with the Environmental and Social Framework (ESF), Environmental and Social Standards (ESSs), and Environmental Impact Statement (EIS).

Table 3.5: Principal Participants in the Implementation of the Proposed Project

S/N	Institutions/ Position	Roles and responsibilities in HEET Project
1	**World Bank and GoT**	o Review sub-project screening including risk level categorization; o Review the ESIAs, ESMPs and site specific ESMPs; o Review quarterly reports by the implementing agencies; o Monitor compliance with the ESMF; and o Undertake implementation support missions.
2	**UPIU-MU**	o Coordinate specialist/consultants for any support missions or attend different meetings and provide any guidance in the bid to ascertain that the different challenges identified for each sub-project/activity are duly covered from risk. o Support the procurement officer at respective project implementing institutions in making sure that the bidding documents clearly cover the health, safety and environmental component with appropriate provisions of the same for the contractors to bid. o Coordinate preparation of ESIA and environmental and social management plans (ESMPs) done by consultant and site-specific ESMPs (C-ESMP). o Ensure implementation of the ESMP and mitigation measures aligns with pertinent national policies, legislations, and the World Bank Environmental and Social Standard (ESS1). MU oversees the Project Implementation Unit (PIU), tasked with supervising and monitoring the implementation of project construction activities. o Ensure that contractors have an Environmental Health and Safety Officer (EHS), who are familiar with the compliance requirements, including WB EHS guidelines. o Review progress reports by the supervision engineer/consultant during civil works and conduct inspection of the sites. o During project operation, overall management falls under the UPIU, collaborating with other departments and units as per the activity's nature. Generally, the UPIU operates under the day-to-day management of MU. o The UPIU is overseen by management meetings chaired by the Deputy Vice Chancellor, providing support, guidance, and oversight. Additionally, the UPIU designates Environmental and Social Safeguard Specialists for the supervision and monitoring of project implementation.
3	**NEMC**	o Receive ESIA/ESMP reports, review and provide recommendations for improvement and further guidance. o Provide environmental permit where necessary upon receiving of ESIA / ESMP reports prepared by consultants on behalf of clients. o Invited to deliver presentations in some of the trainings conducted by the project on environmental and social issues in the country. They can be invited as participants sometimes to allow them share experience. o Conduct monitoring of environmental and social issues during project implementation and provide guidance on the way forward.

4	**Supervision Engineer/ Consultant**	**a. Environmental specialist(s)** o They shall guarantee that contractors employ an Environmental Health and Safety Officer (EHS) who is well-versed in compliance requirements, including World Bank Environmental Health and Safety (WB EHS) guidelines. o Assist the PIU to ensure that the necessary environmental, health and safety authorizations and permits have been obtained; o Maintain open and direct lines of communication between the PIU and contractor(s) with regard to environmental matters; o Review and approve the contractor's site-specific construction ESMPs (C-ESMP), Waste Management Plans together with the PIU; o Conduct regular site inspections of all work areas to ensure compliance with C-ESMPs and E&S specifications for contractors Assist the contractor in finding environmentally responsible solutions to problems; o Instruct the contractor(s) to stop activities which generate adverse impacts, and/or when the contractor(s) fails to implement the ESMP requirements / remedial actions; o Monitor the contractor's environmental awareness training program for all personnel working onsite; o Prepare written reports for the PIU such as weekly report of non-compliance issues; summary monthly report covering key issues and findings from supervision activities; and consolidated summary report from contractor's monthly report. **b. Social specialist(s)** o Facilitating dialogue between project stakeholders, including local communities, to address concerns and ensure their perspectives are considered. o Ensuring project activities adhere to Tanzanian regulations, policies, and World Bank standards related to social safeguards and community well-being. o Providing training and support to project staff and community members on social issues, grievance mechanisms, and community development initiatives. o Regularly monitoring project activities to assess their social impacts, effectiveness of mitigation measures, and compliance with agreed-upon standards and regulations. o Compiling and submitting regular reports on social performance, community engagement activities, and compliance with regulatory requirements to relevant stakeholders, including the UPIU and World Bank. o Identifying and mitigating social risks associated with the project, such as conflicts with local communities, land acquisition issues, and cultural heritage preservation. o Working closely with other project stakeholders, including government agencies, NGOs, and local authorities, to coordinate social interventions and maximize positive project impacts while minimizing negative ones.

		c. Health and Safety Officer (EHS) o Ensure that all construction activities adhere to World Bank Standards, Tanzanian regulations, and relevant policies and legislations concerning health and safety. o Regularly inspect construction sites to monitor compliance with safety standards and identify any deficiencies that need addressing. o Provide training to the contractor on the EHS requirements to be followed; o Review and approve the contractor's site-specific construction ESMPs (C-ESMP), Health and Safety Mangement Plan, Waste Management Plan, Labour Management Plans and Traffic Management Plans together with the PIU; o Monitor protocols for handling accidents or emergencies on construction sites from contractor, including immediate response procedures and post-incident investigations. o Monitor the contractor's environmental awareness training program for all personnel working onsite; o In case of any accidents or incidents, immediately notify the PIU and support the process of documenting and reporting the case to the WB; o Conduct thorough risk assessments of construction sites to identify potential hazards and develop mitigation strategies to prevent accidents and injuries. o Prepare written reports for the PIU such as weekly report of non-compliance issues; summary monthly report covering key issues and findings from supervision activities; and consolidated summary report from contractor's monthly report. o Maintain comprehensive records of safety inspections, incident reports, and compliance documentation, and submit required reports to UPIU and project stakeholders. o Collaborate with UPIU, contractors, and workers to promote a culture of safety and ensure that safety considerations are integrated into all aspects of project planning and execution.
5	**Design Consultant**	o Understand the sub-project setting and site-specific requirements with discussions with the PIU; o Incorporate the issues identified in the ESIAs, ESMPS into the project design. o Provide cost estimates for implementing the design requirements.
6	**Contractor**	**a. Environmental Specialist (s)** o Compliance with relevant environmental and social legislative requirements (project-specific, district- and national level), including allocating adequate budget for implementation of these requirements; o Prepare C-ESMPs based on the ESMP in the bidding documents and contracts; o Work within the scope of contractual requirements and other tender conditions; o In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact; o Propose and carry out corrective actions in order to minimize the environmental impacts; o Provide training to project personnel on environmental best practices and build capacity for effective environmental management.

		○ Develop contingency plans and response protocols to address environmental emergencies or incidents that may arise during construction. ○ Implement monitoring programs to track environmental parameters during construction activities; ○ Maintain accurate documentation of environmental compliance activities and ensure that all necessary permits and approvals are obtained. ○ Identify opportunities for improving environmental performance and implement measures to minimize negative impacts and enhance sustainability. ○ Send weekly reports of non-compliance to the Supervision Engineer/consultant; and ○ Send monthly progress reports to the Supervision Engineer/consultant. **b. Social specialist(s)** ○ Ensure adherence to World Bank Standards and Tanzanian regulations, policies, and legislation concerning social aspects of construction projects. ○ Developing mitigation strategies to address social risks and impacts. ○ Facilitate meaningful engagement with local communities, government agencies, NGOs, and other stakeholders affected by the project throughout the project lifecycle. ○ Monitoring project activities to ensure compliance with social safeguards. ○ Providing capacity building and training to project stakeholders on social issues. ○ Collaborating with relevant government agencies to ensure alignment with national policies and legislations. ○ Reporting on social performance and addressing grievances from affected communities. ○ Ensuring transparency and accountability in project implementation, promoting sustainable development goals. ○ Continuously review and improve social management strategies and practices to enhance project outcomes and minimize negative impacts on communities. **c. Health and Safety Officer (EHS)** ○ Prepare and implement the contractor's site-specific construction ESMPs (C-ESMP), Health and Safety Management Plan, Labour Management Plans and Traffic Management Plans. ○ Organize and facilitate regular safety training sessions about EHS (including relevant WBG EHS Guidelines) for all personnel involved in the project to enhance awareness and ensure adherence to safety protocols. ○ Perform frequent site inspections with the PIU and Environmental Supervision Engineer/consultant to monitor compliance with safety regulations, identify any unsafe practices or conditions, and take corrective actions as necessary ○ Develop and implement emergency response plans to effectively manage accidents, injuries, or other emergencies that may arise during construction activities. ○ Carry out any corrective actions instructed by the Supervision Engineer/consultant;

		○ Provide training to the labourers on the EHS requirements to be followed; ○ Monitoring and reporting covers details of fatalities, injuries, crash types, and locations. ○ Maintain comprehensive records of safety inspections, incidents, and corrective actions taken, and ensure timely reporting to relevant authorities as per regulatory requirements. ○ Foster a culture of safety among all project stakeholders, encouraging active participation and accountability for maintaining a safe work environment. ○ Liaise with relevant government agencies, regulatory bodies, and other stakeholders to ensure alignment with health and safety standards and facilitate inspections or audits as needed. ○ Continuously monitor and evaluate safety performance, identify areas for improvement, and implement measures to enhance safety standards throughout the project lifecycle.

3.8 Environmental and Social Management Framework (ESMF)

The World Bank Environmental and Social Policy for Investment Project Financing sets out the requirements that the Bank must follow regarding projects it supports through Investment Project Financing. The Environmental and Social Standards set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts and mitigation measures associated with projects supported by the Bank through Investment Project Financing. In that context, the World Bank has set out the E&S standards that must complied with in the implementation of any project. These standards among others aim to support borrowers in achieving good international practice relating to environmental and social sustainability, assist borrowers in fulfilling their national and international environmental and social obligations, enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

3.8.1 Objective of the Environmental and Social Framework

The proposed project will be developed and implemented according to the requirements of the World Bank Environmental and Social Framework (ESF). The ESF sets out the World Bank's commitment to sustainable development. The ESF protects people and the environment from potential adverse impacts that could arise from Bank-financed projects and promotes sustainable development. The ESF enables the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes. The ESF also places more emphasis on building Borrower governments' own capacity to deal with environmental and social issues.

The ESF offers broad and systematic coverage of environmental and social risks. It makes important advances in areas such as climate change; labour standards; transparency; nondiscrimination; social inclusion; public participation; and accountability - including expanded roles of grievance redress mechanisms. The ESF codifies best practice in development policies. It brings the World Bank's environmental and social protections into closer harmony with those of other development institutions; and encourages Client countries to use, and improve, their own national environment and social policies, when these policies are materially consistent with the ESF and supported by adequate implementation capacity. The ESF provides an incentive for countries to develop and build their own environmental and social policies and capacity.
This section (Table 3.2) shows how the World Bank Environmental and Social standards (ESSs) are taken on board on ensuring that all HEET project to be implemented at MU is environmentally and socially sensitive.

Table 3.6: World Bank Environmental and Social Standards

Environmental and Social Standards (ESS)	Applicability	Requirements
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	YES	The standard focuses in helping project beneficiaries to manage and reduce both environmental and social risks and enhance project positive impacts. The project at MU will use this requirement in order to strengthen the environmental and social framework for the assessment, development, and implementation of World Bank-financed projects where appropriate.
ESS2: Labor and Working Conditions	YES	The standard focuses on the adoption of standard labor practices that take into account the acceptable working conditions for the people to be employed in the execution of the project activities. It requires the Borrower to prepare and adopt labor management procedures. Among others the standard call for provisions on the treatment of direct, contracted, community, primary supply workers, and government civil servants. It further calls for fair terms and conditions of work, non-discrimination and equal opportunity and workers organisations. Provisions on child labor and forced labor. Requirements on occupational health and safety, in keeping with the World Bank Group's Environmental, Health, and Safety Guidelines (EHSG).
ESS3: Resource Efficiency and Pollution Prevention and Management	YES	The standard aims at enhancing effective use of resources and control of pollution. It further requires an estimate of gross greenhouse gas emissions resulting from project (unless minor), where technically and financially feasible. Requirements on management of wastes, chemical and hazardous materials, and contains provisions to address historical pollution. ESS3 refers to national law and Good International Industry Practice, in the first instance the World Bank Groups' EHSGs.
ESS4: Community Health and Safety	YES	The standard aims at protecting local communities against any health risks and ensure their safety against project activities. It requires infrastructure to take into account taking safety and climate change, and applying the concept of universal access which are technically and financially feasible. It requires further on traffic and road safety, including road safety assessments and monitoring. It calls for addressing risks arising from impacts on provisioning and regulating ecosystem service. Measures to avoid or minimize the risk of water-related, communicable, and non- communicable diseases. Requirements to assess risks associated with security personnel, and review and report unlawful and abusive acts to relevant authorities.
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	NO	This standard is not applicable in this proposed project because land is legally owned by MU (Appendix 2)
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	NO	The ESS6 is not applicable as the area of the proposed project is located in area where is already impacted by human activities and there is no any sensitive habitat/ species
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	NO	This standard is not applicable in this project because there is no any requirement related to ESS7.

Environmental and Social Standards (ESS)	Applicability	Requirements
ESS8: Cultural Heritage	YES	This standard is applicable for the proposed project due to chance finds of physical cultural resources during excavation activities for new construction.
ESS9: Financial Intermediaries (FIs)	NO	This standard is not applicable in this project because there is no any requirement related to ESS9.
ESS10: Stakeholder Engagement and Information Disclosure	YES	The standard aims at making stakeholders part of the project through continuous sharing of information and updates. The standard call for stakeholder engagement throughout the project life cycle, and preparation and implementation of a Stakeholder Engagement Plan (SEP). It requires early identification of stakeholders, both project-affected parties and other interested parties, and clarification on how effective engagement takes place. Stakeholder engagement to be conducted in a manner proportionate to the nature, scale, risks and impacts of the project, and appropriate to stakeholders' interests.

3.8.2 Assessment and Management of Environmental and Social Risks and Impacts (ESS1)

The proposed construction of WSP at MU, Main campus will involve clearance of some secondary vegetation which are currently environmental conversation agent MU. The secondary vegetation to be cleared are grasses and few indigenous trees. This Environmental and Social Standard is applicable to this project due to potentially adverse environmental risks and impacts on the site and in the areas of influence. These include impacts on environment such as air, water, land, human, health and safety. Thus, MU shall analyze project activities and associated environmental and social risks and impacts the during construction phase.

The project has prepared an Environmental and Social Impact Assessment (ESIA) and/or Environmental and Social Management Plans (ESMPs). Therefore, the project components have been screened to determine potential adverse impacts and mitigation measures for their planned activities.

According to the social relation between MU and the nearby community, social services like playing grounds, churches, mosques, and accommodation facilities within and outside the MU, Main campus can be pressurized due to the increase of student's enrolment. Thus, the current social services provision at MU needs to be rechecked in order to prevent pressure on local communities.

3.8.3 Labor and Working Conditions (ESS2)

The standard recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. ESS2 is applicable to the project given that the project will employ/engage both skilled and non-skilled workers, through contractors/subcontractors, and primary suppliers, to undertake various activities. In order to comply with the provisions of ESS2, MU will take worker safety seriously by laying out internal controls and procedures that will protect workers employed or engaged in relation to the project from occupational hazards during all relevant project phases.

All works will be done in compliance with relevant environmental and health and safety standards to minimize impact on workers as well as the local area and citizens. The ESIA contains robust procedures for worker safety, requiring plans for accident prevention as well for health and safety of workers and communities, which are also part of contracts for civil works.
MU will ensure that the project contractors and sub-contractors operate under policy-led objectives that promote gender equality, non-discrimination and fair treatment in recruitment and employment, respect for national labor laws, including prohibiting child and forced labor, and combatting gender-based violence, in particular sexual harassment.

Contractors/subcontractors, primary suppliers and sub-contractors shall ensure equal employment opportunity and not discriminate anyone on the basis of color, nationality, tribe, social origin, political opinion, religion, gender, pregnancy, marital status/family responsibility, disability, HIV/AIDS, age or station of life, sexual orientation, or union membership. MU will ensure that workplace sexual harassment of any nature by workers directly hired, or project workers engaged through contracts/subcontracts companies shall be prohibited, and those determined to be guilty will be subject to disciplinary action, including summary dismissal.

3.8.4 Resource Efficiency and Pollution Prevention and Management (ESS3)

This ESS3 sets out the requirements to address resource efficiency and pollution prevention and management throughout the project lifecycle. In order to ensure the efficient use of resources, MU projects will source construction materials from government authorized sources and water from their own independent source (Tangeni river) throughout the project implementation.

MU has a total area of 985.35 Acres but currently the built-up area covers an area of 234.55 Acres and the rest is undeveloped land which has been planned for further expansion of the University. This implies ta the big portion of the MU is covered by green spaces and number of tons of CO_2 generated per year from main sources like cafeterias, vehicles will be sequestered by the available green spaces. Moreover, the project will utilize the pollution prevention and emergency response plan drafted as part of the ESIA to mitigate any potential source of pollution from the planned activities. The risks identified for strengthening the system for complying with ESS1 are applicable to ESS3.

3.8.5 Community Health and Safety (ESS4)

The ESS requires beneficiary to avoid or minimize safety and health risks and impacts of the project, with particular attention to people who, because of their particular circumstances, may be vulnerable. Implementation of project components has the health and safety risks and impacts on project-affected communities. These risks and impacts could include increased rates of crime, and social conflict and violence, increases in traffic accidents, increased pressure on local accommodation and rents, increased transmission of HIV/STDS, as well as increases in gender-based violence.

The project will ensure compliance with national law requirements regarding the COVID-19 situation. MU shall work closely with street leaders to communicate to local communities related health and safety risks and preventive measures for accidents associated transportation of materials and other human health issues including covering mitigation measures to GBV risks and prevention of HIV and AIDS during construction. All works will be done in compliance with relevant environmental and health and safety standards to minimize impact on workers and the local area. During the project's operational phase, waste will be disposed of to the designated dumping area.

In order to ensure safety during project implementation, MU will ensure that contractors and sub-contractors enclose all project sites in fencing for safety and security reasons. Where required, adequate safety clearance zones can be established on sites where neighboring activities may affect project operation. Appropriate safety signage shall be put in place to warn potential dangers associated with trespassing or accessing the enclosure with no supervision. The ESIA process shall contain robust procedures for accident prevention as well for health and safety of project affected communities.

3.8.6 Cultural Heritage (ESS8)

This recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. In that regard, it echoes out the need to protect cultural heritage from the adverse impacts of project activities and support its preservation. Hence, the project will ensure measures defined in the ESMF and contracts are follow

by contractors during excavations and road clearing (if any) to avoid impacts to cultural heritage and also ensure that chance find procedures will be enforced. HEET project will consult Division of Antiquities in the Ministry of Natural Resources and Tourism on application of the ESS8. However, no specific cultural sites were identified within the MU-Main campus project area hence its applicability in this case is not relevant except during civil work.

3.8.7 Stakeholder Engagement and Information Disclosure (ESS10)

Effective stakeholder engagement improves the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. The proposed project has engaged stakeholders as per SEP developed for HEET project. The engagement will cover all phases of the project. Implementing agencies will provide stakeholders with timely, relevant, understandable and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination and intimidation. *See chapter five for comprehensive Stakeholders Engagement Plan for this project.*

3.9 Environmental, Health and Safety General Guidelines

The World Bank Groups Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for the project in accordance to the proposed project activities. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of technical feasibility. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. Other World Bank instruments applicable to this Project are the following:

- Community Health and Safety: http://documents.worldbank.org/curated/en/290471530216994899/ESF-Guidance-Note-4-Community-Health-and-Safety-English.pdf
- Gender based violence: http://documents.worldbank.org/curated/en/399881538336159607/Environment-and-Social-Framework-ESF-Good-Practice-Note-on-Gender-based-Violence-English.pd

CHAPTER 4: BASELINE ENVIRONMENTAL AND SOCIAL CONDITION

4.1 Introduction

This chapter describes the existing environmental setting of the proposed project and its immediate surroundings. This includes the physical environmental condition comprising air, water and land components, the biological environment and social – economic environment. Attributes of the physical environment like water, soil and noise quality in the surrounding area that were assessed primarily through analysis of sample collected from the field. Surveys were carried out to understanding, record the biological environment prevailing in the area, and were verified against published information and literatures reviews. The social-economic environment has been studied through consultations with various stakeholders in the area within the project site.

4.2 Components and Parameters for Baseline Environment Study

The various components studied as a part of the baseline study are discussed in the following sections components;

- Physical Environment
- Biological Environment
- Baseline Environment (Air, Noise, Vibration and Water Environment)
- Socio-Economic Environment

4.3 Physical Environment

4.3.1 Climate

The climate varies from semi and warm tropical to cool high altitude tropical. The wet season is oppressive and mostly cloudy, the dry season is muggy and mostly clear, and it is hot year-round. The project area of MU-Main Campus in Changarawe village falls within the broad climatic zone of hot and humid coastal tropical climate. This is a climatic zone which is attractive because of the higher attitude above mean sea level.

The project's outcomes are influenced in various ways by climate conditions, impacting both how efficiently it operates and the sustainability of the proposed facilities. Variations in temperature and precipitation can affect the WSP treatment efficiency, causing changes in microbial activity and nutrient removal processes. Moreover, extreme weather events like floods or droughts pose a potential threat to the pond's stability and functionality. Additionally, the social dimensions of the project, including water resource availability for the facilities and potential effects on the local community, are closely connected to climate variability.

4.3.1.1 Temperature

The hot season in Mzumbe ward lasts for 1.9 months, from January 15 to March 13, with an average daily high temperature above 92°F. The hottest month of the year for Mzumbe ward in Mvomero district is February, with an average high of 93°F and low of 75°F.The cool season lasts for 3.5 months, from May 2 to August 18, with an average daily high temperature below 87°F. The coldest month of the year in Mzumbe is July, with an average low of 67°F and high of 86°F. The temperature plays a crucial role in the biological processes associated with wastewater treatment. In WSP, microbial activity is indispensable for breaking down organic matter, and the rate of these biological reactions is significantly influenced by temperature. Elevated temperatures generally boost microbial activity, expediting the treatment process. Conversely, lower temperatures can impede or even halt these biological processes. Extreme temperatures may also

affect the stability of treatment systems. Therefore, it is essential to monitor and control temperature levels to ensure the efficiency of both the wastewater stabilization pond and the broader environmental and social impact project. Flexible designs and operational strategies may be necessary to accommodate seasonal temperature variations and maintain optimal conditions for wastewater treatment processes.

4.3.1.2 Rainfall

Mzumbe ward in Mvomero District experiences extreme seasonal variation in monthly rainfall. Rain falls throughout the year in Mzumbe ward, Mvomero District, the month with the most rain in Mvomero is April, with an average rainfall of 7.2 inches. The month with the least rain in Mzumbe ward, Mvomero District is July, with an average rainfall of 0.5 inches (https://weatherspark.com/y/100618/Average-Weather-in-Mvomero-Tanzania-Year-Round).
The effectiveness and functioning of the WSP can be greatly affected by rainfall, as an excessive amount of rain might cause an influx of water that could surpass the system's intended capacity. This overflow has the potential to undermine the treatment process and contribute to environmental contamination.

4.3.1.3 Humidity

Mzumbe ward in Mvomero District experiences significant seasonal variation in the perceived humidity. The muggier period of the year lasts for 9.7 months, from September 11 to July 1, during which time the comfort level is muggy, oppressive, or miserable at least 77% of the time. The month with the muggiest days in Mzumbe ward, Mvomero District is December, with 31.0 days that are muggy or worse.The month with the fewest muggy days in Mzumbe ward, Mvomero District is August, with 22.1 days that are muggy or worse.

The effectiveness of WSP is significantly influenced by humidity, impacting evaporation rates and treatment efficiency. Elevated humidity levels can result in decreased evaporation, potentially limiting the overall treatment capacity of the WSP. This, in turn, may lead to heightened odors and increased insect activity, posing potential discomfort to nearby communities and affecting the social aspects of the project. Hence, it is essential to thoroughly evaluate humidity levels and possible fluctuations in the intended location to ensure the success of the WSP, promoting environmental sustainability and minimizing adverse social impacts on the surrounding communities.

4.3.1.4 Wind

The average hourly wind speed in Mvomero District experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 6.4 months, from April 28 to November 9, with average wind speeds of more than 7.2 miles per hour. The windiest month of the year in Mvomero is September, with an average hourly wind speed of 8.6 miles per hour.
The calmer time of year lasts for 5.6 months, from November 9 to April 28. The calmest month of the year in Mvomero is March, with an average hourly wind speed of 6.1 miles per hour.
The predominant average hourly wind direction in Mvomero varies throughout the year. The wind is most often from the east for 1.9 months, from February 14 to April 10 and for 4.3 months, from August 16 to December 26, with a peak percentage of 88% on November 3. The wind is most often from the south for 4.2 months, from April 10 to August 16, with a peak percentage

of 85% on June 6. The wind is most often from the north for 1.6 months, from December 26 to February 14, with a peak percentage of 54% on January 1.

The role of wind is significant in influencing both the positive and negative aspects of the environmental and social dimensions of this project. Strong winds, for instance, can positively impact the project by improving the aeration process in the WSP. This enhancement facilitates the efficient breakdown of organic matter through aerobic decomposition, contributing to the overall effectiveness of the wastewater treatment system. Furthermore, when designing the project, the consultancy should take into account the local wind patterns to optimize the layout and operation of the wastewater stabilization pond. This consideration aims to minimize adverse effects and maximize the efficiency of waste management.

4.3.2 Soil and Geology

Mzumbe ward characterized by flat alluvial plains with homogenous sedimentation pattern. Major soils are imperfectly to poorly drained, deep, dark grey or grey-brown, often mottled clays (clay 40-70%), more compact and contain fewer sandy strata. Natural fertility status is low to moderate. For instance, the Mgongola plains in Kambala, Dakawa in Mvomero Division possess the characteristics. The soils of these types normally lie on the altitudes ranging from 400 – 500m above sea level. Physiographic units range from well drained, level to rolling plains at low altitude (200- 500m) to strongly dissected uplands and low hills transitional to mountains at altitude 500 – 1000 m; mainly developed on intermediate metamorphic rocks. Major soils are well drained, moderately deep to deep, yellowish, or reddish sandy clays to clays with moderate to very low natural fertility (Covers parts of Mzumbe, Mlali and Mvomero Wards). *(Source: Strategic Plan for Mvomero District Council, 2015).*

Taking into account the geologic specificity issue at local scales, there is a need of detailed geotechnical surveys prior to construction of any of the proposed establishments of new buildings. Identification of soil types, soil bearing capacity, coefficient of linear extensibility (COLE) and level of erosion should be critically analyzed in order to construct appropriate types of foundations in specific proposed establishment of building structures.
The success and efficiency of the WSP heavily depend on the soil quality in the designated area. Essential soil traits like permeability and composition are vital for efficiently treating wastewater in the stabilization pond. On the flip side, the installation of these facilities can also influence the soil quality. Inadequate management of effluent from the stabilization pond has the potential to introduce contaminants into the soil, negatively impacting its fertility and overall health.

4.3.3 Hydrology and Topography

The district has eleven permanent rivers namely Mjonga, Divue, Mvaji, Mkindo, Diwale, Mburuni, Dikurura, Mbakana, Mgeta, Tangeni and Ngerengere. There are also few seasonal dams and ponds, providing water for livestocks and sometimes water for irrigation schemes.The larger part of MU - Main campus site is characterized by gently sloping land and the whole site is sloping toward the north. Generally, the whole area is suitable for all kinds of development, and it does not need additional costs in terms of grading for construction of houses and infrastructure facilities. However, the hydrological and hydrogeological information for the proposed establishment area will be integrated on this report after completion of hydrological study during project design and

all-important information including hydrological maps and digital elevation models will be described.

A thorough evaluation of the site's hydrological features, such as rainfall patterns and surface water flow, is essential to guarantee the WSP optimal performance. The project impact on surface runoff, pond hydraulic retention time, and treatment efficiency may be influenced by changes in land use and the introduction of impervious surfaces. Additionally, a comprehensive understanding of the hydrological cycle is crucial for anticipating environmental consequences, such as flooding risk or alterations to local watercourses. The establishment of the project will inevitably alter the catchment, potentially affecting the natural water flow and nutrient dynamics in the area. Proper consideration of catchment and hydrology within the EIS is crucial for designing and implementing effective measures to mitigate potential adverse effects on the environment and social aspects of the region. This ensures the sustainability and success of the proposed WSP.

4.4 Environmental data of the proposed site and the surrounded community

This includes measuring recommended parameters to be used as a baseline for monitoring practices during project construction and operation phases. For our proposed project, baseline measurement will consider air quality measurement for particulate matter and gaseous emission, noise level measurement and water quality analysis.

4.4.1 Baseline Data on Air Quality, Noise and Vibrations

The ambient air quality was monitored in the impact area as per air quality monitoring guidelines. The study area represents per urban environment. The prime objective of the baseline air quality study was to assess the ambient air quality of the project area.

4.4.1.1 Ambient pollutant gases

Levels of ambient pollutant gases were measured in line with manufacturer's procedure and ISO 11042-1: 1996(E) protocol that meet the European standards (say EN 61779, EN 50104 and EN 45544). Generally, the results show that all measured noxious gases concentrations for all sites of the proposed project were within permissible limits corresponding to limits prescribed by Local Standard (TBS limits) and international limits (WHO/IFC limit) for ambient air quality (Appendix 2).

4.4.1.2 Dust (Particulate matter) concentrations in terms of PM_{10} and $PM_{2.5}$

Dust levels were measured using Particulate Matter/Dust Monitor that complies with the EMC Directive 89/336/EEC of the European Union in accordance with manufacturer procedure and applicable local standards and/or international environmental guidelines. Based on the results, all recorded data for PM_{10} and for $PM_{2.5}$ were within the standards prescribed by TBS and IFC/WB Group limits at each location (Appendix 3).

4.4.2 Noise and Vibration Environment

4.4.2.1 Noise levels

Noise data were recorded at the same stations used to measure ambient pollutant gases, dust and one offsite point were recorded. At each station, noise levels were measured in accordance with ISO 1996-1:2003 using a Digital Sound Level Meter. Based on findings, the average noise level indicate that the existing status of the project area and the nearby community are within the

acceptable noise levels prescribed by WB/IFC limit and TBS limit.

4.4.2.2 Ground Vibration

The ground vibration levels measured were compared with Occupational Safety and Health (Working Environment) Regulations, 2016 limit of 5 mm/s PPV. Also, the results were compared with British Standard of 0.3mm/s and 0.15 mm/s PPV (Peak Particle Velocity) as levels that human beings and/or animals can detect or may experience stress resulted to vibrations. The vibration of the area is insignificant as it did neither exceed the 0.15 mm/sec PPV criteria established to evaluate the extent that can easily be detected by human nor exceed 5 mm/sec PPV criteria established for conducive working environment for a person at work.

4.4.3 Water Quality Analysis

The aim of this is to ensure safety, sustainability, and effective management of this vital natural resource for both human and environmental well-being and understand the various physical, chemical and biological characteristics of the water regarding wastewater from the existing WSP. This analysis helps in determining the suitability and efficient of the WSP by measuring treated effluent and river water for different purposes and identifying any potential risks or contaminants present. However, MU does not conduct environmental monitoring for the existing WSP and has no discharge permit.

4.5 The Biological Environmental

4.5.1 Flora and Fauna

The proposed area for project implementation has no variety of plants species except only grasses like Rhodes grass (*Chloris gayana*) and few trees (*Eucalyptus)* were observed. During general searches it was observed that there is no species of the amphibians and reptiles that are included in the IUCN Red list of threatened species.

4.5.2 Unique and Endangered species

There are neither unique nor endangered species of concern that were observed during site assessment.

4.6 Socio-Economic Environment

The Socio-economic aspects that were studied in the project area included:

4.6.1 Demographic profile

In the last national census of 2022 Mvomero District had 260,525 people of which 131,256 were male and 129,269 were male. Mzumbe ward had total of 19,677 people of which 9462 were male and 10255 were female. (Source; NBS, 2022).

The development of WSP may lead to an influx of people to the area, either as workers or due to increased opportunities associated with the project. This could impact local infrastructure, services, and social dynamics.

4.6.2 Cultural Heritage, Aspirations and Traditions

The dominant culture for the communities of Mvomero district particularly Mzumbe ward is the Swahili culture. The main indigenous ethnic groups are Nguu (Walukungwi), Zigua and Luguru tribes which is equivalent to 81% of the total population in Mvomero District. Other tribal groups

of the Bantu origin who migrated into the district are Makua, Chaga, and Sukuma and Nilo Hamitic which include Maasai and Mang'ati.
It is expected that much of the unskilled labour force for the construction activities will be sourced from surrounding areas of Mzumbe ward. This is because most of the people from these areas are from low socio-economic status.

4.6.3 Education

a. Primary Education

Mvomero District Council has a major role of providing education including Pre- primary, Primary, Secondary and also post primary level of schooling. There are 142 government primary schools offering pre and primary education with a total of 60,377 pupils (boys 29,948 and girls 30,429, 1362 teachers, 775 classrooms, 227 teacher's houses and 11,026 desks.
Also, there are five centers in five primary school offering Special Education to pupil with special needs. Total number of pupils is 146 (boys 83 and girls 198). There are 17 Complementary Basic Education Centre (COBET) with 408 pupils. (Boys are 210 and girls 198).
Mzumbe ward and associated villages are Committed to provide equal and quality education to all school aged children. Despite of the effort made by the government and Council in general, there are some constraints encountered including shortage of 884 classrooms, 1,471 teacher's house and 12,974 desks especially in Mzumbe primary school which located near MU.

b. Secondary Education

Mvomero District Council has 24 secondary schools which 21 are community based secondary school, 1 Government boarding secondary school and 2 non-Government secondary schools. There is also 1 Teachers Training College at Mhonda and 1 higher learning Institution namely MU. In Mvomero District the total number of secondary school students is 17,073, teachers are 420 and 33 non-teaching staff.
In achieving the Education Policy goals, the district strategy is to ensure that all selected students are enrolled and complete secondary education. The laid down initiative is to ensure that there is proper allocation of resources which will enable to improve the current teaching and learning situation in our secondary school s by creating conducive teaching and learning environment for teachers and learners.

4.6.4 Employment

The district economy depends mainly on agriculture particularly on crop production. The district has 549,375Ha, of arable land for Agriculture but currently only 247,219Ha are effectively utilized, this is equivalent to 45% of the arable land and 266,400 is suitable for animal husbandry. Agriculture is the main source of livelihood for most Mzumbe ward households due to presence of fertile soil and favourable climatic condition. It estimated that about 82 percent of the households are engaged in agricultural activities for both crop production and livestock rearing. The common food crops which are cultivated are maize, Sorghum, Paddy, bananas, horticultural and leguminous products. Cash crops are sugarcane, Cocoa, Simsim, Sunflower, Paddy, Coffee and spices. Also, during site visit some area for the proposed establishment are used by surrounded community for agricultural activities. Hence, MU will provide other land for agricultural activities for persons from Changarawe, Vikenge and Tangeni to ensure corporate social responsibilities with their community.

4.6.5 Energy supply

MU receives its energy from public institution TANESCO power supply. The supply is sufficient to meet the existing demand. However, the proposed establishments of WSP does not use electric during its operational phase.

4.6.6 Water supply

The existing main source of water supply at the MU-Main campus is a Tangeni river that is located about 9km from the University and 10km from the proposed area for the establishment of WSP. This water is transmitted from the source to the elevated water tank from which it is distributed to the campus. Hence, the proposed establishment of WSP will not pollute ground water and water from Tangeni river based on hydrogeological study.

CHAPTER 5: STAKEHOLDER ENGAGEMENT PLAN AND GRIEVANCES REDRESS MECHANISM

5.1 Introduction

This chapter gives an overview of the stakeholder engagement efforts conducted thus far including the process of identifying stakeholders. It highlights the stakeholders who have been identified and consulted, the methods used for consultation, and the concerns and issues raised by stakeholders regarding the construction activities of various facilities at MU and conclude with a review of how these issues have been addressed. The primary objective of stakeholder engagement is to outline how MU will involve stakeholders throughout the development of the proposed project.

The Engagement activities associated with the Environmental and Social Impact Assessment (ESIA) offers an opportunity for all individuals who are interested in or affected by the project to express their opinions and concerns regarding the projects impacts and mitigation measures. The project will consider and respond to these inputs during ESIA process. Furthermore, the engagement activities enable the relevant authorities to ensure that concerns and comments from various stakeholders are taken into account while developing Environmental and Social Management Plan (ESMP) and an Environmental Monitoring Plan for the project. Stakeholder consultation will continue during the disclosure of the ESIA report and throughout the implementation of the proposed project.

5.2 Stakeholders Identification and Analysis

Stakeholders include all individuals, groups or organisations that might be affected or might affect the proposed project (positively or negatively) in one way or the other. A Public consultation process has been conducted during the scoping report preparation for the proposed project to be located within MU at Mzumbe ward, Changarawe village. This process allowed the creation of a channel of communication for consultation from the local and national level. National and local authorities including leaders in the area of influence of the project have been involved in the process.

The stakeholder identification and involvement adhered to guidelines specified in the Environmental Impact Assessment (EIA) and Audit Regulations (2005, as amended in 2018), World Bank Environmental and Social Standards (ESS10), and the Stakeholders Engagement Plan (SEP). Public consultations entailed the sharing of project details, comprehension of stakeholder concerns, and cultivation of community relationships. Key stakeholders were pinpointed based on their roles, significance, influence, and potential impact on the project. The Stakeholders Engagement Plan (SEP) encompassed both national and sub-national levels, with a particular emphasis on sub-national stakeholders. It delineated the specifics of engagement pertaining to project activities, encompassing stakeholders at regional, district, and village tiers. The project aspired to inclusivity by involving women, vulnerable populations, and individuals with special needs. Consultations occurred throughout the project's duration, and mechanisms were instituted to address issues such as Gender-based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH).

The consulted stakeholders are found at Regional, District and local levels (Table 5.1). At district levels consultant meet with District Environment Management Officer, Town planning officer and community development officer. At the ward level, MU (Staff, Students and Services providers),

Mzumbe Ward Executive Officer (WEO), Changarawe, Vikenge, and Tangeni Village officials were consulted. In addition, interview was held with the health and safety inspectors at Occupation Health and Safety Authority (OSHA), Fire and Rescue Force office, Morogoro Water Supply and Sanitation Authority (MORUWASA), Rural Water Supply and Sanitation Authority (RUWASA), Wami/Ruvu Basin Water Board, TANESCO, NGOs and CBOs.

Table 5.1: List of Stakeholders identified, their roles and the rate of interest in the Project

Authority	Role of the stakeholder	Rate of Interest
Morogoro Regional Administrative Secretary	Political and administrative issues	**HIGH**
Mvomero District Council	Overall advice on both professional works (land, Planning, environments, social, economics) with regards to the execution of the project at MU-Main Campus	**HIGH**
Mzumbe University (MU)	Provides advice on all work-related safety measures to the project	**LOW**
Occupational Safety and Health Authority (OSHA)	Oversees the provision, availability and control of power in the project area at MU-Main Campus and the surrounding communities of Mzumbe ward	**LOW**
Tanzania Electricity Supply Company (TANESCO	Power supply	**HIGH**
RURAL Water and Sanitation Agency (RUWASA)	Plan, design, construct and supervise rural water supply projects	**LOW**
Fire and Rescue Force	Oversee fire risk and hazards associated with the project	**LOW**
TTCL	Data provider	**HIGH**
Mzumbe Ward (Changarawe, Vikenge and Tangeni village)	Beneficiaries of the MU-Main Campus in Mororgoro Region	**HIGH**
NON-STATE ACTORS (NGOs, CBOs, FBOs) and PRIVATE SECTOR	Employment opportunities associated with project	**HIGH**
MUSO	Building users	**HIGH**
MU staff	Building users	**HIGH**

5.3 Requirement of Stakeholder Engagement

According to the Environmental Management Act Cap 191, the Environmental Management (Environment Impact Assessment and Audit) (Amendment) Regulations of 2018, and the World Bank ESS10 (Stakeholder Engagement and Information Disclosure), its necessary to include Stakeholder Engagement and Information Disclosure as integral parts of project planning and implementation in order to develop good relationships and gather their views on issues that could affect the project throughout the project life.

The Environmental Management (Environment Impact Assessment and Audit) (Amendment) Regulations of 2018 along with the ESIA emphasize the importance of stakeholder engagement and provide the guidelines on when and how the public should be notified during key stages of the ESIA process. Specifically, stakeholder engagement is required during the ESIA Scoping stage and after the completion of impact analyze. The project proponent is also obligated to inform the public at the commencement of scoping activities and upon submission of the Draft ESIA to NEMC (National Environmental Management Council).

5.4 Objectives of Stakeholder Engagement

The general objective of the Stakeholder Engagement Plan (SEP) is to guarantee a consistent, though, coordinated and culturally suitable approach to engaging stakeholders and disclosing project information. The objective is to showcase the commitment of the MU to following internationally recognized best practice in engagement. Following the standards of current international best practices, the stakeholder engagement for this project seeks to ensure that the engagement process is conducted without manipulation and interference. MU is fully dedicated to adhering to Tanzania national environmental policy and legislation, and World Bank Environmental and Social Policy.

This Stakeholder Engagement plan identifies the key stakeholder and establishes effective mechanisms for obtaining stakeholder feedback and demonstrates how it will be integrated into the broader ESIA process. The plan ensures that concerns raised by key stakeholders are addressed both in the ESIA and during project decision making and design phase. It also serves as a documentation of the engagement process and outlines the responsibilities of the project proponent in accordance with Tanzania legislative requirements and international best practices. Considering this context, the specific objectives of this stakeholder engagement plan are as follows;

- Provide relevant, timely, accessible and appropriate information regarding hydroelectric power plant related developments, in an appropriate manner and understandable format to all stakeholders. Information will be disclosed as early and as comprehensively as possible.
- Consult stakeholders on their opinions, concerns, preferences and perceived gains and risks with respect to the project planning and implementation, including the design and proposed management and mitigation measures to reduce potential impacts and to enhance possible benefits.
- Provide all stakeholders with the means to address concerns and grievances with the project, in a structured, reliable and responsive manner.

5.5 Stakeholders Engagement and Disclosure Methodologies

Various communication techniques are employed during stakeholder engagement (Plate 5.1). Essentially, community meetings serve as the primary methods for involving the public, other method are focus group discussion and interview. These methods are utilized to generate initial awareness, encourage participation, and facilitate long-term information sharing. However, the selection of specific methods depends on the level and purpose of engagement, as well as the specific stakeholder group being targeted. In the ESIA process, the ESIA Consultants employed the following methods to engage the public.

5.5.1 Community Meetings

This method facilitates sustained information exchange between the proponent and the relevant public, including women and vulnerable groups. Community meetings were organized to

disseminate information to individuals who could potentially be impacted by the project, as well as to gather their comments and address any queries they may have. These meetings involved a presentation followed by a session for questions and answers. The main goals were to clarify the project details and seek opinions regarding both positive and negative impacts of the project.

5.5.2 Formal Meetings

Formal meetings with elected officials and government functionaries were held to provide information about the project to agency representatives, and to solicit their comments and questions. The meetings consisted of a short formal presentation followed by a question-and-answer period.

5.5.3 Focus Group Discussions

MU employed Focus Group Discussion (FGD) aiming to bring together stakeholders with the same interests or common characteristics into a meeting to discuss specific topics or project components in a focused manner. FGD was employed to explore issues that were relevant to specific groups or sub-groups of a community – such as youth, the elderly, women, students, and people with disabilities. The intention of using this approach was centered upon establishing similarities and differences among people of the same or different groups.

5.5.4 One on one interviews

The interviews aimed to give a chance to individuals to air concerns on the project and involved Project Affected Persons (PAP) and Other Interested Parties (OIPs) depending on the issues to be addressed.

5.5.5 Site visits

These visits are focused to identify and discuss stakeholder concerns and to disclose project information within communities.

5.5.6 Disclosure

- MU will made accessibility of ESIA report, along with other pertinent project documents to the public.
- The complete set of documents will be physically accessible in local offices and project offices. Electronically copies will be available on the MU website.
- Summary information will also be provided at Ward and Village offices situated in the project area (Table 5.2).

Table 5.2: Summary of Stakeholders Communication methodology

S/N	Stakeholders Group	Language	Communication means
1	Government Institutions and Agencies (TCU, OSHA, MORUWASA, RUWASA)	Kiswahili & English	o Phone and Email o Meetings o Roundtable discussions
2	Local government (Mvomero District Council, Mzumbe ward, Changarawe, Vikenge and Tangeni village)	Kiswahili	o Community Meeting o Roundtable discussions
3	MU student and disabled people	Kiswahili & English	o Roundtable discussions

S/N	Stakeholders Group	Language	Communication means
4	MU Staff (Administrative and Academic staff, and Service provider)	Kiswahili & English	o Phone and Email o Meetings o Roundtable discussions
5	Vulnerable Groups (women, youth and elders)	Kiswahili	o Community Meeting o Roundtable discussions
6	Others (NGOs, CBOs, and private sector etc.)		o Phone and Email o Meetings o Roundtable discussions

5.6 Stakeholders Concerns

Generally, all government stakeholders consulted had no objections regarding the proposed project and appeared to be content with its objectives leading to its initiation. They all urged the proponent to abide by the relevant rules and regulations guiding her project operations. All raised issues from consulted stakeholders are pointed and noted as explained on table 5.3;

Table 5.3: Details of Stakeholders concerns (Source; Consultation with stakeholders on April 2023)

Level	Institution/ Group	Views and Concerns of Stakeholders	Response to Concerns
National Level	**Tanzania Commission of Universities (TCU)**	○ The contractor should deploy dust suppression and mitigation measures such as regular sprinkling of water and scaffolding the site to minimize on dust pollution. ○ Construction of WSP and their design should follow design requirement for WSP. ○ The proponent should take into account issues of waste management for both solid, liquid and hazardous waste in project phases.	○ The design group shall incorporate and revise all the addressing concerns in the drawings in order to enhance their functionality. ○ MU management shall cooperate with contractor to develop a plan that ensures that dust generated during construction activities are well managed. ○ MU shall treat wastewater into septic tanks, soak away pits, pit latrines and the existing WSP and ensure that all problems associated with wastewater generation are treated and well managed. ○ The soil suitability should be assessed through a soil analysis as detailed in the Geotechnical report.
Regional Level	**OSHA**	○ The proponent should make sure the project is registered under the Workplace Information Management System (WIMS) before pre-construction and construction phases. ○ Medical examination should be done to all workers before and after construction and operation phases as well as during operation phase. ○ There should be trained First Aiders at all project phases, as well as First Aid Kits with all necessary facilities. ○ Conducting Health and Safety training and awareness programs. ○ The proponent should conduct Risk Assessment before construction and prepare a Risk Assessment report. ○ The proponent should prepare the Occupational Health and Safety Policy both in English and Swahili languages, and it should be displayed in an accessible place within a workplace.	○ MU and Contractor shall register the proposed establishment of WSP at OSHA. ○ Medical check-ups (Pre and Post medical) for the new employee and labourers will be done and workers shall be tested their health as per OSHA regulations. ○ MU and Contractor shall ensure that first aid and trained first aiders are in place for the proposed project. ○ Contractor shall have registered HSE representatives. ○ MU and contractor shall have health and safety management plan to ensure safety of workers within the project area. And the first aid kits shall be provided in an area where it will be easily visible and accessible. ○ Contractor should provide Induction training to workers on health and safety and the appreciation of safety gear will be done.

Level	Institution/ Group	Views and Concerns of Stakeholders	Response to Concerns
		○ All workers should be provided with sufficient Personal Protective Equipment (PPEs) during all project phases. ○ The proponent should ensure temporally, or portable toilet are in place within the project site if the existing toilet facilities are distant from the proposed area that will be used for establishment of WSP.	○ MU and contractor should explain the nature of the project to the surrounded community and people living within the project area. ○ Risk assessment report is a part of ESIA report. Hence Contractor should conduct risk assessment. ○ Personal Protective Equipment (PPE) must be supplied due to the inherent nature of construction tasks and the associated hazards.
	RUWASA & MORUWASA	It could be good if the surrounding community will also be given access to water after rehabilitation of the water supply systems	○ MU will enhance water availability for the project activities. ○ MU will provide and distribute water to the surrounding community if water is available all the time.
Local Level	**Mvomero District Council** (DED, Environmental Management Officer, Town Planning Officer, Community Development Officer)	○ Job opportunities that the project could bring, both during the construction and operational phases should give first priorities for local community around the project area for both skilled and unskilled labor. ○ Ensure the proposed WSP are managed to avoid potential health risks and odors associated with the WSP process. ○ Clearance should be done only on the proposed establishment areas in order to minimize cutting of trees and other vegetation. ○ Safety of workers and community should be considered during construction phase. ○ Sensitization and trainings on finance management should be given to laborers. ○ During construction safety must be enhanced and health education e.g., HIV&AIDS and COVID19. ○ It is a nice project and gender balance should be considered during project execution. ○ The development must take place within the university Campus and the land already belong to MU.	○ The contractor awarded should provide employment for local residents for both skilled and unskilled labourers. ○ The proponent should implement regular water quality monitoring to ensure the ponds are functioning as intended. ○ The proponent and contractor will make sure that clearance will be done on the proposed establishment. ○ The proponent and contractor shall raise awareness and sensitize on HIV/AIDS transmission. ○ The contractor shall provide and enhance health education eg HIV&AIDS and COVID19. ○ The proponent and contractor should promote knowledge transfer and technological advancement.

Level	Institution/ Group	Views and Concerns of Stakeholders	Response to Concerns
	Ward Office- Mzumbe ward and Village offices (Ward Executive Officer, Village Executive Officers, chairmen, Community Development Officer, Health and Environmental officer, community representative)	○ The project is worth being undertaken and accepted. ○ Project should provide employment opportunities to the local people. ○ Integrate the component of Corporate Social Responsibility (CSR) to the proposed projects. ○ Interaction of workers, students and the community can cause an increase in sexual conflicts and moral erosion. ○ The payments for laborers should be done timely and fairly. ○ The proponent should build a good relationship with the surrounding community.	○ The proponent and contractor shall provide employment for local residents for both skilled and unskilled labourers. ○ The proponent and contractor should raise and sensitize awareness on the impact associated regarding social issues. ○ The proponent and contractor shall provide contract to the workers and payment are prepared within the required time. ○ The proponent and their workers working on Health center will provide equal and good services for both students, staff and persons from the surrounded village. ○ The proponent shall engage local leader in any meeting concerning this project.
	Mzumbe University (MU) (Administrative and Academic staff, Student and Service provider)	○ The project contractor and MU should have the HSE policy in place. ○ The potential project should integrate the entertainment and recreational facilities. ○ Through complying with economic justice, local food vendors (mama and baba lishe) should have access of doing business within the MU campus. ○ Focus on proper liquid and solid waste management. ○ Public health and safety should be incorporated in the project life cycle. ○ Focus on intensified MU, Main campus security, a security system should be in place prohibiting unauthorized people to access into the proposed WSP. ○ Temporary toilet facilities should be in place especially during construction phase. ○ The proposed project should have alternative sources of energy (e.g., generators). ○ The potential project should use environmentally friendly materials especially during construction.	○ Proponent and contractor should have a health and safety policy and implement it to reduce injury/accident at work. ○ The proponent and contractor will ensure proper management of solid waste and policies for waste management will be adhered to which will guide all workers to protect the environment. ○ The proponent and contractor shall ensure health and safety of workers through the project life cycle. ○ During the construction phase, the proponent shall ensure that the whole area is fenced and only workers and permitted visitors will have access to enter the proposed project premises. ○ Security personnel from recognized security company shall be employed to provide service for 24 hours during construction phase. ○ The contractor will construct temporary toilet to ensure hygiene of workers within the project area and prohibit environment pollution.

Level	Institution/ Group	Views and Concerns of Stakeholders	Response to Concerns
		○ The proposed wastewater stabilization ponds should be distant from the surrounding community. ○ The proposed project should integrate proper assessment of vegetation.	○ The proponent shall give access to all baba lishe and Mama lishe surrounded the project area to provide services to all interested workers within the project area. ○ MU and Contractor should comply to all policies and laws. ○ MU shall enhance health and Safety of students within the project area.
Others	**Non-Government Organisations (NGO's) and Service providers**	○ Restore any temporarily impacted areas to their original state or as agreed upon with relevant stakeholders.	○ MU and Contractor will restore the impacted area into its original area.

CHAPTER 6: IMPACTS ASSESSMENT, MITIGATION MEASURES AND PROJECT ALTERNATIVES

6.1 Introduction

This chapter details the suggested steps for mitigation, which MoEST, through MU, is dedicated to implementing. The objective is to avoid or minimize the adverse effects identified. This study aims to ensure that the investments funded by this project adhere to both the World Bank Environmental Standards (ESS) and the Government of Tanzania (GoT) legislations in an environmentally and socially responsible way.

- The assessment of environmental risks and impacts encompassed several aspects: (i) adhering to the Environmental Health and Safety Guidelines (EHSGs) outlined by the WB; (ii) evaluating risks concerning community safety; (iii) addressing issues linked to climate change; (iv) considering any potential threats to the preservation, conservation, maintenance, and restoration of habitats and biodiversity; and (v) examining the impacts on ecosystem services and the utilization of living natural resources.

- The assessment of social risks and impacts involved: (i) identifying potential threats to human security, such as crime or violence; (ii) analyzing risks that could disproportionately affect specific individuals or groups due to their unique circumstances, making them more disadvantaged or vulnerable; and (iii) evaluating negative economic and social consequences related to the involuntary acquisition of land or restrictions on land use.

The following aspects were considered when determining the significance of identified impacts:

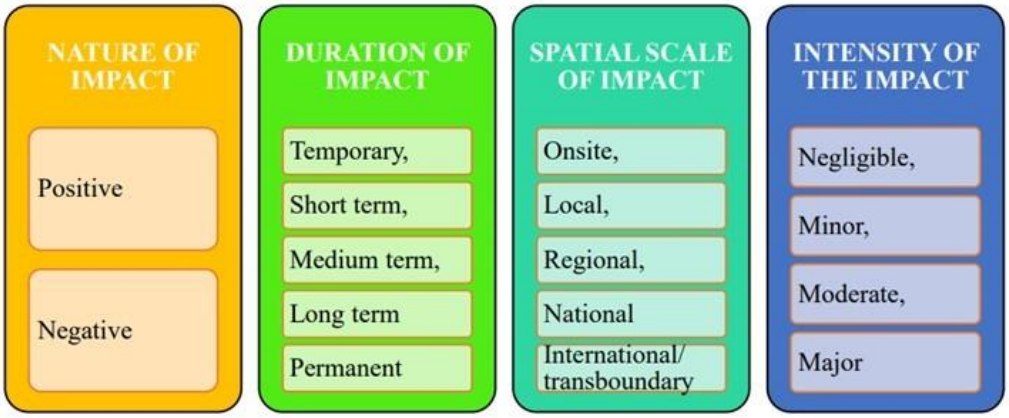


Figure 6.1: Impacts Identification (Source: 3Es Consultant, 2023)

6.1.1 Nature of Impact

There are two basic natures of impacts; impacts that tends to be beneficial or useful to the environment or social-economic aspects are termed as Positive Impacts and those which tends to affect the environment or social-economic aspects in a negative way are termed as Negative Impacts.

6.1.2 Duration of Impact

The duration of impacts defines the timeframe by which the impact will be felt or the time by which the positive or negative impacts related to the project will continue to occur. In other

writings, they are termed as temporal scale. This duration can either be short term, medium term, long Term or permanent.

6.2 Environmental Impact Rating Scale

In order to guarantee a fair and accurate comparison among different studies conducted by ESIA teams, a uniform assessment approach was employed to evaluate the significance of the identified impacts. The assessment of impact significance, which refers to the importance of the impact within the larger context of the affected system, was based on specific criteria.

- **Severity/Benefit**: the importance of the impact from a purely technical perspective;
- **Spatial scale:** extent or magnitude of the impact (the area that will be affected by the impact);
- **Temporal scale:** how long the impact will last:
- **Degree of certainty**: the degree of confidence in the prediction;
- **Likelihood:** an indication of the risk or chance of an impact taking place;

The impact assessment involves analyzing of the overall effect within the surrounding environment to determine the significant of the impact. This assessment considers various factors such as social, cultural, historical, economic, political and ecological aspects. As a result, the severity or benefit of an impact is initially assessed within a specific field of expertise before evaluating its significance on a larger scale. This requires two separate rating scales, one to determine the severity or benefit and another to determine the environmental significance.

6.2.1 Severity/Benefit

The severity of impacts is determined by experts who use their professional judgement to assess the degree of change that negative impact would have on the existing conditions, or the level of benefits that positive impacts would bring to a specific affected system or specific affected group (Table 6.1).

Table 6.1: Severity rating scale

Negative Impacts	Positive Impacts
Very severe An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example, change in topography.	**Very Beneficial** A permanent and very substantial benefit to the affected system(s) or party (ies), with no alternative to achieve this benefit. For example, the creation of a large number of long-term jobs.
Severe Long-term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	**Beneficial** A long-term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example, an increase in the local economy.
Moderately severe Medium- to long-term impact on the affected system(s) or party(ies), that could be mitigated. For example, constructing a narrow road with an area with low conservation value.	**Moderately beneficial** A medium- to long-term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising are equally difficult, expensive and time consuming (or a combination of these), as achieving them in this way.
Slight	**Slightly beneficial** A short- to medium-term impact and negligible benefit to the affected system(s) or party(ies). Other

Negative Impacts	Positive Impacts
Medium- to short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	ways of optimizing the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect The system(s) or party(ies) is not affected by the proposed development.	**Don't know/Can't know.** In certain cases, it may not be possible to determine the severity of the impact.

The extent of the impacts can be assessed both with and without measures to minimize them in order to illustrate the gravity of the impact if no action is taken. The term mitigation encompasses more than just compensation and encompasses concepts of control and remedy. When it comes to positive effects, optimization refers to any approach that can enhance those benefit. Both mitigation and optimization should be realistic, technically feasible and economically viable.

6.2.2 Spatial scale

The Spatial scale defines the extent or area over which the impact will take place. Environmental Impacts due to the proposed underground transmission cables can affect the environment or social-economic aspects at Household level, Localized, at a study area, District, Regional, National or International Level. See Table 6.2.

Table 6.2: Spatial scale

Individual	Individuals in the area that could be affected
Households	Households in the area could be affected
Localized	A few hectares in extent (from the site). The specific area to which this scale refers is defined for the impact to which it refers.
Study Area	Includes the entire project area.
District	Includes areas around the project includes Mzumbe ward within Mvomero District Council.
Regional	The impacts will be of such a nature that it may affect the Morogoro Region.
National	The impacts will be of such a nature that it may affect the entire Tanzania.
International	The impact would affect resources and processes outside the borders of Tanzania

6.2.3 Temporal scale

The temporal scale defines the times over which the impacts would continue to occur (Table 6.3).

Table 6.3: Temporal scale

Temporal scale	Explanation
Short term	Less than 5 years.
Medium term	Between 5 and 20 years
Long term	Between 20 and 40 years, and from a human perspective essentially permanent
Permanent	More than 40 years and resulting in a permanent and lasting change.

6.2.4 Criteria and Significance Rating

The significance of the impact, considering all the assessment criteria mentioned earlier, serve as an indication of its overall importance (Table 6.4). The assessment of significance was conducted

within the appropriate context, recognizing that an impact can be relevant to the ecological environment, the social-economic environment. This can be achieved by ensuring that all ESIA team followed the mentioned objective criteria, subjectivity was minimized to the greatest extent possible. Nevertheless, it is important to acknowledge that there will always be an element of judgement involved that cannot be entirely eliminated from the assessment of significance.

The importance of an impact does not always correlate directly with its severity, even though one would anticipate a direct relationship, meaning that a severe impact would typically be considered highly significant. However, this is not always true. For instance, alterations to the geology could be significant in terms of their severity, but their significance is perceived as low because society does not consider the environmental changes to be important.

Table 6.4: Significance of an Impacts

Significance	Explanation
High (+3)	These impacts will usually result in long-term effects on the environment that will only be mitigated over very long periods of time. At times, this is not possible, and it is up to the government to decide if this is acceptable when considering the benefits of the Project.
Moderate (+2)	These impacts will usually result in medium to long term effects on the environment. These impacts do exist but not substantial, and usually result in moderately severe effects or moderately beneficial effects. The emphasis for moderate impact is on signifying that the impact has been reduced to a level that is as low and reasonably practicable
Minor (+1)	These impacts will usually result in medium to short term effects on the environment. The environmental and/or social conditions will be affected, but the impact is small enough that it is unlikely to be a concern to the government, communities, and organisations.
Negligible (0)	There are no primary or secondary effects at all that are significant to scientists or the public. Also, this means that the existing environmental and social conditions will not be affected, or the effect is not detectable. A negligible impact is likely to be of no concern to the government, communities, and organisations.

The impacts were further rated on a scale of "–3" to "+3" through "0" in the following manner:

- +3: High positive impacts
- +2: Moderate positive impacts
- +1: Minor positive impact
- 0: Negligible/ No impacts
- -1: Minor negative impact
- -2: Moderate negative impacts
- -3: High negative impacts

The team focused on significant positive and negative impacts that were rated -2, -3 and proposed mitigation measures (Table 6.5).

Table 6.5: Summary of Potential Environmental and Socio-economic Impacts

S/N	Identified Impacts	Description of Impacts	Mobilization phase	Construction Phase	Demobilization Phase	Operation Phase	Decommissioning Phase
Socio-Economic Impacts							
1	Job Creation and employment opportunities	The impact is direct, indirectly, inducive, cumulative and reversible	+2	+2	0	+3	0
2	Business opportunities in supply of materials and utilities	The impact is direct, indirectly, inducive, cumulative and reversible	+2	+2	0	+3	0
3	Population pressure	The impact is direct, indirectly, and inducive	0	-3	0	-1	0
4	Disruption of Economic and Social Activities	The impact is direct, inducive, cumulative and reversible	-2	-2	0	-2	-2
5	Prevalence of Communicable diseases	The impact is direct, indirectly, inducive, cumulative and partially reversible	-1	-2	0	+2	0
6	Traffic Congestion	The impact is direct, reversible, cumulative and inducive	-1	-2	0	-2	-1
7	Increased skills and impart knowledge to local communities	The impact is direct, indirectly, and inducive	0	+3	0	+3	0
8	Health and safety risks	The impact is direct, indirectly, and inducive	0	-3	-1	-2	-2
9	Community Health, Safety and Security impacts	The impact is direct, indirectly, reversible, cumulative and inducive	0	-3	-1	-2	-2
10	Conflicts and grievances	The impact is direct, indirectly, and inducive	0	-2	0	0	0
11	Impact on gender during employment	The impact is direct, indirectly, partially reversible, cumulative and inducive	-1	-3	0	-2	0
13	Reduced Traffic and Congestion	The impact is indirectly and inducive	0	-2	0	0	-1
14	Child labor	The impact is direct, indirectly, and inducive	0	-3	0	0	0
15	Improved Health and Safety of the community members close to the project area	The impact is direct, indirectly, cumulative, reversible and inducive	0	0	0	+3	+3

S/N	Identified Impacts	Description of Impacts	Mobilization phase	Construction Phase	Demobilization Phase	Operation Phase	Decommissioning Phase
16	Educational Opportunities	The impact is direct, indirectly, and inducive	0	0	0	+3	0
17	Reduced Health Risks	The impact is direct, indirectly, and inducive	0	-1	0	+2	+3
18	Improved Water Quality	The impact is direct, indirectly, and inducive	0	-2	0	-2	0
19	Loss of employment and business opportunities	The impact is direct, indirectly, inducive, and reversible	0	0	0	0	-3
20	Loss of Community Assets	The impact is direct, indirectly, inducive, and reversible	0	0	-3	0	-2
Environmental Impacts							
21	Improved Water Quality	The impact is direct, inducive and reversible	0	+1	0	+2	+3
22	Improved Aesthetics	The impact is direct, indirectly, inducive and irreversible		+1	0	0	+2
23	Loss of vegetation and other natural resources (Energy and water)	The impact is direct, indirectly, inducive and irreversible	-2	-2	0	0	0
24	Impairment of air quality due to dust and gases emission	The impact is direct, indirectly, inducive, and reversible	0	-2	-2	0	-2
25	Contribution to Climate Changes	The impact is direct, indirectly, inducive, and reversible	0	-1	0	0	-1
26	Foul smell (Odor)		0	0	0	-2	-1
27	Mosquitoes breeding					-2	-1
28	Increased Noise and Vibration level	The impact is direct, indirectly, inducive, and reversible	-2	-2	0	-2	-2
29	Improved Sanitation		0	-3	0	-3	+3
30	Generation of solid and hazardous wastes	The impact is direct, indirectly, inducive, and reversible	0	-3	0	-3	-2
31	Generation of liquid waste	The impact is direct, indirectly, inducive, and reversible	0	-3	0	-3	-2
32	Soil Erosion and Pollution	The impact is direct, indirectly, inducive, and reversible	-1	-2	0	0	-2
33	Loss of visual Aesthetics	The impact is direct, indirectly, inducive, and reversible	0	-2	0	-1	-2

S/N	Identified Impacts	Description of Impacts	Mobilization phase	Construction Phase	Demobilization Phase	Operation Phase	Decommissioning Phase
34	Increased water pollution	The impact is direct, indirectly, inducive, and reversible & irreversible	**0**	**0**	**0**	**-3**	**-3**
35	Overflowing of sludge into the surrounding environment	The impact is direct, inducive, and reversible	**0**	**0**	**0**	**-2**	**0**
36	Release of Contaminants	The impact is direct, indirectly, inducive, and reversible	**0**	**0**	**-1**	**-2**	**-2**
37	Loss of aesthetic value	The impact is direct, indirectly, inducive, and reversible	**0**	**0**	**0**	**0**	**-2**
38	Reduced Soil Contamination	The impact is direct, indirectly, inducive, and reversible	**0**	**+2**	**0**	**+2**	**+1**

KEY

+1	Minor positive impact	**-1**	Minor negative impact
+2	Moderate positive impacts	**-2**	Moderate negative impacts
+3	High positive impacts	**-3**	High negative impacts
0	Negligible		

6.3 Possible Potential Impacts during Mobilization Phase

During this stage, activities included conducting topographic surveys, choosing suitable sites, performing geotechnical studies, pinpointing sources of natural construction materials like gravel, building sand, aggregates, and water, as well as transporting construction machinery to the site. It's important to note that as of the completion of this ESIA report, the planning and design phase will be concluded in the final ESIA report. Any potential positive or negative effects from this phase have been minimal and are no longer under examination**.**

6.4 Possible Potential Impacts during Construction Phase

Assessment of the possible impact that are likely to be caused by the proposed project was based on different activities that will be conducted during construction phase. These activities are;

- Earthworks (site clearance and removal of topsoil).
- Material transportation and storage.
- Abstraction and transportation of water to the construction site.
- Collection, storage, transportation, treatment and disposal of wastes generated from construction activities.
- Actual construction works.
- Landscaping and environmental restoration and

In the course of construction, the following positive and negative impacts are anticipated;

A. POSITIVE SOCIAL IMPACTS

6.4.1 Job Creation and Employment opportunities

The construction phase of the project is likely to create job opportunities for Mzumbe residents, fostering income generation and contributing to overall economic development in the area. This could potentially uplift the standard of living for the local population. However, from an environmental and social perspective, the project's impact may be of moderate significance, primarily localized to the Mzumbe region. The positive job creation aspect is a short to medium-term benefit, while the wastewater stabilization ponds' long-term environmental effects need careful consideration. Additionally, the impact is primarily direct, as it directly influences the local job market and community well-being. The reversibility of the impact depends on the project's long-term sustainability and management of environmental concerns.

Enhancement Measures

- Invest in training and skill development programs for local residents, equipping them with valuable skills that can be applied beyond the construction phase, potentially leading to sustainable employment opportunities.
- Promote diversity and inclusion in the workforce by actively recruiting and providing equal opportunities to underrepresented groups, such as women and minority communities.

6.4.3 Increased skills and impart knowledge to local communities

The construction phase of the project will create opportunities for both skilled and non-skilled laborers, offering training and practical learning experiences for locals, especially technicians and machine operators. This presents a positive side as it enhances the skill sets of the workforce, providing long-term benefits for their personal and professional lives. However, the impact is moderate in significance, regional in scope, and long-term in duration. The positive aspect lies in the potential for local experts to update their knowledge and gain practical experience throughout the project.

On the social concerns front, the positive side involves the empowerment of the local workforce through skill development, which can lead to improved employment prospects and community well-being. However, there are potential negative aspects, such as possible disruptions during the construction phase and environmental concerns related to WSP.

Mitigation/Enhancement Measures

- Community engagement programs and the implementation of best practices in construction and wastewater management. These measures aim to address and minimize any negative consequences associated with the project, ensuring a balanced and sustainable impact on both the local community and the environment.

6.4.4 Business opportunities in supply of materials and utilities

The project will stimulate the local economy by creating a demand for large quantities of construction materials, such as cement and miscellaneous items, boosting revenue for local businesses in Mzumbe Ward and nearby areas. This presents a significant business opportunity for suppliers of construction materials and utilities. However, on the negative side, the construction phase may cause environmental disruption and potential social concerns. The extraction and transportation of construction materials might lead to environmental degradation, impacting the local ecosystem.

In terms of significance, the impact is moderate, as it has both positive and negative aspects. The impact is localized, primarily affecting Mzumbe Ward and its surroundings. It is expected to be of medium-term duration, extending throughout the construction phase. The impact is both direct, due to the extraction and use of materials, and indirect, through the potential environmental consequences.

Mitigation/Enhancement Measures

- The project should implement measures such as sustainable sourcing of construction materials to minimize environmental degradation.
- Additionally, proper waste management practices during construction can help prevent pollution.
- Community engagement programs to ensure that local residents benefit economically from the project and environmental awareness initiatives to promote sustainable practices.

B. NEGATIVE SOCIAL IMPACTS

6.4.5 Population Pressure

The proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, is expected to have both positive and negative social impacts during its construction phases. The population pressure in the vicinity is likely to increase as a result of the construction, bringing both benefits and challenges. On the positive side, the project could create job opportunities for the local population and contribute to economic growth. However, the negative aspects may include increased strain on local resources, eruption of diseases, source of criminal activities, potential disruption to the community way of life, and the displacement of some residents.

The significance of the impact is subjective, with both high and moderate elements depending on individual perspectives. Geographically, the impact is primarily localized to the immediate area surrounding the construction site. In terms of time, the impact is likely to be short-term during the

construction phases. The nature of the impact is primarily direct, as it directly affects the local population and environment.

Mitigation Measures

Mitigation measures should be implemented to address the negative social impacts. These may include;

- Community engagement programs to involve residents in decision-making processes, providing alternative housing solutions for those displaced, and creating awareness campaigns to minimize potential conflicts.
- Enhancement measures could involve skill development programs to empower the local workforce and the establishment of community development projects to ensure a lasting positive legacy. These measures aim to balance the social concerns and promote sustainable development.

6.4.6 Health and Safety Risks

Both workers and nearby residents face potential risks if proper management protocols are not in place. The positive aspect lies in the potential enhancement of wastewater treatment facilities, contributing to environmental sustainability. However, the negative side involves the immediate health and safety hazards associated with construction processes and the potential impact on the local community's well-being.

In terms of significance, the impact is deemed high due to the potential risks involved. The impact is localized, primarily affecting the immediate vicinity of the proposed construction site. It is also considered a long-term impact, given that the WSP are likely to operate continuously. The impact is direct, affecting individuals in close proximity to the construction and operation areas, and cumulative as it may accrue over time.

Mitigation Measures

- Rigorous safety protocols for construction workers, such as the use of personal protective equipment and proper training.
- Establishing buffer zones, implementing dust and noise control measures, and conducting regular health assessments.
- Enhanced community engagement and awareness programs can also contribute to minimizing the social concerns associated with the construction activities.
- Regular monitoring and assessment during and after construction will help ensure that any negative impacts are promptly identified and addressed, while also providing an opportunity to continuously improve the effectiveness of mitigation measures.

6.4.7 Traffic Congestion

The increased construction-related traffic resulting from the proposed development of two units of WSP can have significant social and environmental impacts. On the positive side, the development may improve wastewater management, addressing environmental concerns. However, the negative consequences include heightened traffic congestion on local roads, adversely affecting daily commuting for residents. The passage of large, heavy vehicles may contribute to road deterioration in rural areas, leading to road closures and an elevated risk of accidents. The impact is considered moderate in significance, localized to the immediate vicinity of the project, and potentially long-term, as road deterioration may persist. It is both direct and cumulative, as each passing vehicle

contributes to the impact over time. The effects could be reversible with proper road maintenance and traffic management measures.

Mitigation Measures

- Implementing a comprehensive traffic management plan to minimize congestion during construction, regular maintenance of affected roads, and implementing safety measures to reduce the risk of accidents.
- Additionally, community engagement and awareness programs can help residents navigate disruptions caused by increased traffic and road closures, fostering a more positive social response to the development.

6.4.8 Community Health, Safety and Security

The proposed development of two units of WSP at MU-Main Campus in Changarawe Village, outlines potential impacts on community health, safety, and security. The technological advancements and labor-saving equipment associated with the project will lead to an influx of skilled construction workers residing in labor camps, while local low-skilled jobs may see a reduction, limited to roles such as protecting and guarding construction properties. The concentration of workers near construction sites is expected to negatively impact local communities, leading to uncontrolled movements, difficulty in identifying strangers, and increased risks of communicable diseases like COVID-19 and HIV/AIDS. Social concerns include potential rises in local prices, crime, prostitution, and alcohol abuse. The sources of harmful effects to the general public are identified in Table 6.5.

In terms of the significance the impact is high, given the potential negative consequences on community health, safety, and security. The impact is localized, primarily affecting the immediate project area and nearby settlements. And the duration is likely to be medium-term, persisting throughout the construction phase. In addition to that, the nature of the impact is both direct and indirect, involving direct effects on public safety and indirect consequences such as increased disease risks, and is reversible, and mitigative measures can be implemented to address the identified concerns.

Table 6.6: Source of the harmful effects on health and community safety

Type of harmful effect	Sources of the threat
Accident risk	○ During excavation work ○ Movements and operations of heavy equipment ○ Access to danger zones ○ Transport, handling and storage of the materials ○ Concrete batching and mixing plant
Indirect health risk	○ Environmental pollution ○ Contamination of water or/and food

Mitigation Measures

- Training workers, enforcing a labor code of conduct, and implementing disease prevention protocols are essential.
- Develop and implement Community health management plan,
- Monitoring and regulating worker movements, enhancing community awareness, and addressing potential social issues through community engagement programs can also contribute to minimizing adverse effects.

- Furthermore, traffic management strategies and safety protocols should be implemented to reduce the risks associated with increased construction-related traffic on local roads.

6.4.9 Conflicts and grievances

The impact described in the paragraph pertains to conflicts and grievances arising from the development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village. The conflicts may stem from issues such as construction workers approaching married women and school children, as well as construction-related problems like dust and flying stones, leading to tensions between the construction workers and the local community. The lack of proper channels to address grievances from various stakeholders could result in project delays and increased costs. This impact is deemed local, negative, short-term, and of moderate significance.
In terms of significance, the impact is rated as low. It is localized, affecting the immediate project area. The impact is short-term, implying that the issues may be resolved once the construction is complete. The nature of the impact is direct, arising from the construction activities and interactions between workers and the community.

Mitigation Measures

- Implementing community engagement programs to foster understanding between construction workers and the local community, establishing clear channels for grievance redressal, and employing dust control measures during construction. These measures aim to minimize negative social impacts and promote a harmonious relationship between the project and the local community.
- Establish regular communication and engagement channels between the project management team and the local community to address concerns and grievances promptly.
- Develop and communicate clear and accessible grievance mechanisms that allow community members to report issues related to construction worker behavior, dust, and other construction-related problems.
- Provide training to construction workers on respecting local customs, cultural norms, and codes of conduct. Sensitize them about the importance of maintaining a positive relationship with the community.
- Implement effective dust and debris control measures to minimize the impact on the local community, such as using dust suppressants, erecting barriers, and scheduling construction activities during less sensitive times.
- Appoint a community liaison officer responsible for addressing and resolving conflicts and grievances. This individual should serve as a point of contact between the community and the project.
- Ensure that grievances are addressed promptly to prevent delays in project activities and mitigate potential cost increases.

6.4.10 Gender Discrimination

Gender discrimination in employment has a profound impact on women and girls in the local community, subjecting them to direct costs resulting from gender inequalities. Women often face reduced opportunities for employment and are more susceptible to sexual harassment, particularly from male supervisors and decision-makers. Instances of harassment may range from unwelcome touching and degrading remarks to explicit or abusive language, rape, or defilement. Such behavior inflicts psychological trauma, causing lasting damage to victims' self-esteem. Moreover, it contributes to early pregnancies among young girls, increased school dropouts, and higher rates of

sexually transmitted diseases. This impact is local, negative, long-term, and of significant magnitude. On the positive side, addressing gender discrimination can lead to a more equitable society, promoting inclusivity and equal opportunities.

In the context of the proposed development of two units of WSP at MU-Main Campus in Changarawe Village, the environmental and social impact statement reveals several considerations. The impact of the WSP is assessed as moderate in significance. It is primarily localized to the immediate area surrounding the university's campus. The impact is expected to be long-term, given the nature of wastewater management infrastructure. The effect is both direct and indirect, as it directly affects the local environment and indirectly influences social aspects such as health and well-being.

Mitigation Measures

- Develop and implement a gender equity policy that promotes equal employment opportunities for women and girls in the project. Ensure that this policy includes provisions to prevent sexual harassment and discrimination.
- Conduct gender sensitivity training for all project staff, including male supervisors and decision-makers, to raise awareness about gender equality, respect, and the prevention of sexual harassment.
- Establish confidential and safe reporting mechanisms for cases of sexual harassment and misconduct. Ensure that victims can report incidents without fear of retaliation.
- Engage with local organisations and support networks to provide assistance and counseling for victims of sexual harassment. Create a safe and supportive environment for those affected.
- Regularly monitor and enforce the gender equity policy to ensure that employment practices are in compliance. Take immediate action against any instances of sexual harassment or discrimination.

6.4.11 Child labor

The potential involvement of child labor in project-related activities, as outlined in this EIS for the Proposed development of two units of WSP," presents a concerning aspect with multifaceted implications. On the positive side, enforcing a labor management plan that prohibits the employment of individuals under the age of 18 can contribute to safeguarding children's well-being, ensuring they are not subjected to conditions that compromise their mental, physical, social, or moral development. However, the negative aspect lies in the risk of violating child labor laws and ethical standards, perpetuating a cycle of exploitation and depriving children of their fundamental rights.

In terms of significance, the impact is of high concern as it involves a vulnerable demographic group- children- potentially exposed to harmful conditions. The impact is localized to the specific project activities but can have broader regional and international implications if not addressed adequately. The potential harm is likely to be long-term, affecting the overall development of the impacted children. The nature of the impact is both direct and indirect, as it involves the actual engagement of children in project activities and the broader societal consequences.

Mitigation Measures

Mitigation measures must be implemented to address and prevent child labor in project activities. These measures should include;

- Implement rigorous age verification processes during the hiring of workers to ensure that no one under the age of 18 is employed in project activities.
- Invest in community education programs and promoting alternative income-generating activities for adults can help alleviate the socio-economic conditions that often lead to child labor.
- Collaborate with local authorities, non-governmental organizations, and the community are essential to effectively implement and enforce these mitigation measures.
- Collaborate with local educational institutions and organisations to promote and support the education of children in the community, ensuring that they are not engaged in project-related work.
- Conduct awareness campaigns within the community to educate parents and guardians about the importance of children's education and the risks associated with child labor.
- Develop and enforce a comprehensive Labor Management Plan that explicitly prohibits child labor and outlines consequences for non-compliance.

C. POSITIVE ENVIRONMENTAL IMPACTS

6.4.12 Environmental Protection and Management

By effectively treating and managing wastewater, the project prevents the discharge of untreated effluent into nearby water bodies, safeguarding rivers, streams, and groundwater sources. This initiative mitigates pollution, ensuring a sustainable environment for both human and aquatic life. The positive side lies in the preservation of local ecosystems and the promotion of a healthier environment. On the negative side, there may be initial costs and potential disruptions during construction.

In terms of impact significance, the project impact is high, given its crucial role in preventing pollution and preserving the local ecosystem. The impact is localized to the Mzumbe University campus and its surrounding areas. It is a long-term impact, as the WSP are designed for sustainable, ongoing wastewater management. The impact is direct, as it directly addresses the treatment and prevention of wastewater discharge.

Enhancement Measures

- Ensuring the proper construction and maintenance of the wastewater stabilization ponds to minimize any potential negative effects during the project's implementation.
- Regular monitoring and assessment of water quality can help identify and address any emerging issues.
- Additionally, community awareness programs can be implemented to educate local residents about the importance of wastewater management and its positive impact on the environment. These measures collectively enhance the overall positive impact of the project while minimizing potential negative consequences.

6.4.13 Improved Wastewater Management

The construction of WSP is poised to bring about significant positive impacts on both the environment and social well-being. Improved wastewater management will lead to better treatment, reducing the pollution of local water bodies. This endeavor reflects a commitment to

environmental sustainability and public health. Also, the project benefits include enhanced water quality, mitigated environmental degradation, and potentially improved community health. However, there are potential negative consequences, such as the disruption of local ecosystems during the construction phase and the need for careful monitoring to prevent any unintended environmental consequences.

In terms of significance, the impact is high as it directly addresses the critical issue of wastewater management in the university's vicinity. The impact is localized since it primarily affects the immediate surroundings of the campus and Changarawe Village. The project's effects are likely to be long-term, offering sustained benefits over an extended period. The impact is both direct and indirect, with direct effects on water quality and indirect effects on the broader ecosystem.

Enhancement Measures

- Implementing eco-friendly construction practices to minimize disruption to local ecosystems, regular monitoring of water quality, and community outreach to raise awareness about the importance of responsible wastewater disposal.
- Involve the incorporation of advanced technologies for wastewater treatment, ensuring a more efficient and sustainable solution.
- The proponents should also collaborate with local communities to address any social concerns and foster a sense of ownership and responsibility towards the sustainable management of the WSP.

6.4.14 Improved Sanitation

The development aims to reduce the risk of waterborne diseases by enhancing wastewater treatment processes. Improved sanitation facilities contribute to a healthier environment and community well-being, promoting overall public health. This initiative can lead to a cleaner and safer campus environment, fostering a better quality of life for students, faculty, and surrounding communities. However, on the negative side, there may be concerns related to the construction and maintenance of the WSP, potential environmental disturbances during the development phase, or issues related to the disposal of sludge.

In terms of significance, the impact is high, particularly for the local community, as it directly addresses sanitation issues and the risk of waterborne diseases. The impact is localized to the campus and its immediate surroundings. The effects are expected to be long-term, as improved sanitation facilities contribute to sustained community health. The impact is direct, as it directly addresses the sanitation challenges faced by the community.

Enhancement Measures

- Conduct sanitation and hygiene awareness programs in the local community to educate residents on the importance of maintaining proper sanitation practices even after the project completion.
- Collaborate with local health authorities to establish or support public health clinics that can provide ongoing healthcare services and waterborne disease prevention.
- Proper planning and execution of construction activities to minimize environmental disturbances, effective management of sludge disposal to prevent adverse effects, and ongoing monitoring and maintenance of the WSP.

6.4.15 Reduced Soil Contamination

By ensuring proper containment of wastewater within the stabilization ponds, the project aims to prevent soil contamination and, consequently, safeguard agricultural lands in the university vicinity. This measure contributes to environmental sustainability and protects the livelihoods of local communities dependent on agriculture. The positive side of this impact includes improved soil quality, agricultural productivity, and overall environmental health in the region.

The significance of this impact is moderate, as it directly addresses a localized environmental issue. The impact is localized to the immediate vicinity of the university, with potential benefits reaching the surrounding agricultural lands. In terms of duration, the impact is likely to be long-term, ensuring sustained protection against soil contamination. It is a direct impact, as the wastewater stabilization ponds directly contribute to preventing soil contamination.

Mitigation/Enhancement Measures

- Regular monitoring of the stabilization ponds, implementing proper maintenance protocols, and conducting periodic assessments of soil quality in the surrounding areas.
- Additionally, ongoing community engagement and education programs could enhance awareness of the importance of responsible wastewater management.
- Enhanced by exploring opportunities for water reuse or recycling, thereby promoting a more sustainable approach to wastewater management at the university.

6.4.16 Water Quality Improvement

Improved wastewater treatment is expected to have a direct and long-term effect on the quality of water in nearby rivers or streams. This positive aspect is particularly crucial for the well-being of local communities and the sustainability of the environment. On the negative side, there may be concerns related to the initial construction phase and potential disruptions to the local environment.

However, these negative impacts are likely to be temporary, and once the wastewater stabilization ponds are operational, the long-term benefits are expected to outweigh the short-term disturbances. In terms of significance, the impact is considered high due to its potential to positively affect water quality and environment in the area. The impact is localized as it directly affects the immediate vicinity of Mzumbe University's main campus. The duration of the impact is primarily long-term, with sustained benefits expected after the wastewater stabilization ponds become operational. The impact is direct, as it directly influences the water quality and ecosystems in the nearby rivers and streams.

Mitigation/Enhancement Measures

- Measures such as proper sedimentation control, erosion prevention, and habitat restoration should be implemented.
- During the operational phase, continuous monitoring of the wastewater treatment processes and water quality should be conducted to ensure ongoing positive impacts.
- Additionally, community engagement and awareness programs can be employed to educate local residents about the project and its long-term benefits, fostering a sense of shared responsibility for environmental conservation.

D. NEGATIVE ENVIRONMENTAL IMPACTS

6.4.17 Impairment of air quality due to dust and gases emission from vehicles and Machinery

Air pollution resulting from dust and vehicle emissions, coupled with the environmental and social impact of construction activities, poses a multifaceted challenge. The release of particulate matter and gases from vehicles contributes to air pollution, affecting both the environment and public health. Construction activities, on the other hand, introduce noise and dust, disrupting the tranquility of nearby communities.

These impacts have both positive and negative dimensions. On the positive side, construction activities may stimulate economic growth, providing job opportunities and infrastructural development. However, the negative aspects involve health hazards, environmental degradation, and the disturbance of local residents.

In terms of significance, the impact is generally moderate. It is localized, primarily affecting the immediate vicinity of the construction site and nearby residents. The impact is considered medium-term, lasting for the duration of the construction phase. The effects are both direct, such as the immediate disturbance caused by noise and dust, and indirect, as air pollution may have long-term health implications. The impact is reversible with proper mitigation measures in place.

Mitigation Measures

- Implementing dust control measures at the construction site, such as water spraying and covering materials, as well as enforcing emission standards for vehicles.
- Additionally, scheduling noisy activities during non-peak hours and providing sound barriers can help minimize the impact on the surrounding community.
- To enhance the situation, promoting the use of cleaner energy sources for construction equipment and encouraging public transportation can contribute to reducing air pollution in the long term.

6.4.18 Soil Erosion

Soil erosion resulting from excavation and earthmoving activities during construction poses significant environmental and social concerns. On the positive side, construction activities are essential for development, but the negative consequences cannot be ignored. The disturbance of soil in areas with steep slopes can lead to sedimentation in nearby water bodies, causing water pollution and degradation of aquatic habitats. This impact is particularly emphasized in the context of the proposed development of WSP at MU in Morogoro Region, as outlined in the EIS. The significance of this impact is high, as it directly affects the local ecosystem. It is localized to the specific area of construction but can have regional implications due to water pollution. The impact is primarily short-term during construction but can have long-term consequences if not adequately addressed.

Mitigation Measures

- Implementing erosion control practices, such as installing silt fences and sediment basins, to prevent soil runoff.
- Establish ground cover through the planting of grass or ground-covering plants in cleared areas to stabilize soil and reduce erosion.
- Proper waste management during construction activities is crucial to prevent the introduction of pollutants into water bodies.
- Additionally, the use of environmentally friendly construction materials and techniques can contribute to minimizing the overall impact.

- Regular monitoring and enforcement of these measures are essential to ensure their effectiveness in mitigating the negative effects of soil erosion during construction.
- Modify the construction site design to minimize soil disturbance and erosion risk. For example, use silt barriers around construction sites to contain sediment.
- Construct sedimentation ponds to capture and treat runoff water, preventing sediment-laden water from reaching nearby water bodies.
- Continuously monitor erosion control measures to ensure their effectiveness and make necessary adjustments as construction progresses.
- Provide construction workers with training on erosion control practices to minimize soil erosion risks.

6.4.19 Impact on climate change

The emissions from fuel-powered equipment, including vehicles and construction machinery, release pollutants such as carbon dioxide (CO2), nitrogen oxides (NOx), sulphur dioxides (SOx), hydrocarbons, and particulate matters (PM). These greenhouse gases (GHGs) can interfere with the Earth's temperature system, contributing to climate change effects. Despite being of minor significance, the impact is considered local and short-term. The significance of the impact is low, its scope is localized, and the duration is short-term.

This impact is also considered direct and potentially reversible. On the positive side, the impact is limited in significance and duration, suggesting that the overall contribution to climate change is minimal. However, the negative aspects involve the release of harmful pollutants that can have adverse effects on the environment and human health in the short term.

Mitigation Measures

Mitigation measures to address these impacts may include;

- To develop and implement an emissions reduction plan that includes measures to minimize emissions from construction equipment and vehicles. This may involve using cleaner fuel, employing emission controls, and optimizing equipment.
- To encourage the use of alternative transportation methods for workers, such as carpooling or public transportation, to reduce the number of vehicles on-site.
- To utilize energy-efficient and low-emission construction equipment and machinery to reduce greenhouse gas emissions during construction.
- To implement a monitoring and reporting system to track emissions and air quality during construction. Take corrective actions if emissions exceed predefined limits.
- To consider participating in carbon offset programs or initiatives to compensate for any unavoidable emissions associated with the project.

6.4.20 Increased Noise and vibration level

The noise and vibrations generated during construction have the potential to cause disturbances to the local communities, and ecosystems. The negative social concerns include the disruption of daily activities, potential stress on loc, and disturbances to the overall environmental balance. Therefore, the impact is localized and short-term, minimizing the overall duration and geographical extent of the disturbance.

Mitigation Measures

Mitigation measures should be implemented to address these concerns. These measures may include;

- Scheduling construction activities during specific hours to minimize disruption to the community, employing noise barriers or soundproofing technologies, and providing adequate communication to the local residents about the construction timeline and potential disruptions.
- Vehicles carrying construction materials be restricted to work during nighttime only;
- Implement a construction schedule that restricts noisy activities to specific times of the day when they are least likely to disturb residents, such as avoiding noisy work during nighttime or early morning hours.
- Utilizing construction equipment that produces less noise and dust when possible and ensure that equipment is properly maintained to minimize noise emissions.
- Establishing effective communication channels with nearby residents to inform them of construction schedules and potential noise disruptions.
- Implementing noise barriers, restricting construction hours, and using equipment with noise-reducing features can help mitigate the impacts of noise pollution.
- Conducting vibration monitoring and implementing measures to minimize vibrations can also be beneficial.

6.4.21 Generations of Solid and Liquid Wastes

The construction project's impact on the environment and society is significant, as it involves the generation of both organic and inorganic solid and liquid wastes. Excavated soil or rock may be subpar, necessitating proper disposal measures. The production of these wastes requires strict adherence to government regulations for disposal at specified locations to prevent environmental littering and pollution. The proposed development of two units of WSP at MU raises environmental and social concerns.

The positive side lies in the potential improvement of wastewater management infrastructure. However, the negative side involves the risk of non-compliance, leading to environmental harm.

In terms of significance, the impact is high, given the potential for environmental pollution. The impact is localized, as it pertains specifically to the MU-Main Campus in Changarawe Village. The impact is also long-term, as the construction and waste generation processes are ongoing and may persist for an extended period. The impact is both direct, through the actual waste generation, and indirect, through the potential consequences of non-compliance with regulations.

Mitigation Measures

Mitigation measures should be implemented to address these concerns. These may include;

- The proper treatment and disposal of solid and liquid wastes in accordance with government regulations,
- The use of environmentally friendly construction practices, and regular monitoring to ensure compliance.
- Education and awareness programs for construction personnel and the local community can also contribute to minimizing the environmental and social impact of the project. Additionally, the construction project could invest in innovative technologies for waste management to enhance sustainability and reduce the overall impact on the environment.

6.4.22 Water Pollution

The positive aspect lies in the potential improvement of wastewater management, contributing to a cleaner environment and reducing the impact of untreated sewage on water bodies. However, the

negative side involves the risk of water pollution, as poorly managed wastewater can introduce harmful contaminants into the water ecosystem, affecting both aquatic life and human health. The significance of the impact is deemed moderate, primarily localized to the immediate vicinity of the university campus. It is anticipated to be a long-term effect as the stabilization ponds will likely be in operation for an extended period. The impact is direct and potentially irreversible if adequate measures are not implemented.

Mitigation Measures

Mitigation measures should include the following;

- implementation of advanced wastewater treatment technologies to ensure the discharged water meets quality standards.
- Regular monitoring and assessment of water quality, as well as the establishment of contingency plans for potential leaks or spills, are essential components of the mitigation strategy.
- Implementation of proper stormwater management practices, including the installation of sedimentation basins and sediment filters, can help prevent construction-related pollutants from reaching water bodies.
- Proper storage and handling of construction chemicals and fuels, along with prompt cleanup of any spills, are also essential.
- Provision of community education programs can raise awareness about the importance of proper waste disposal practices, fostering a sense of responsibility among residents and reducing the likelihood of negative social impacts associated with water pollution. Engaging stakeholders in the planning and decision-making processes can also enhance the overall effectiveness of mitigation efforts.

6.4.23 Loss of Visual Aesthetics

This impact is associated with the alteration of physical factors such as geology, landform, microclimate, drainage, soil, and ecology, as well as aesthetic factors including proportion, scale, enclosure, texture, color views, and sounds. Construction activities may result in the removal of existing landscape features like trees, replacing them with concrete and gravel surfaces. Furthermore, if construction occurs at night, it could contribute to increased light pollution. On the positive side, the project may enhance the overall urban character of the area. The impact is deemed moderate, localized, and long-term in nature.

In terms of significance, the impact is moderate. It is localized to the immediate vicinity of the proposed development, affecting the views and aesthetics within that region. The impact is long-term, as the changes to the landscape are expected to persist over an extended period. The nature of the impact is direct, as it directly results from the construction and operational activities associated with the wastewater stabilization ponds.

Mitigation Measures

Mitigation measures for this impact could include;

- Incorporating landscaping plans to minimize the visual intrusion,
- Ensuring the preservation of key landscape features and implementing lighting strategies to reduce light pollution during nighttime operations.
- Additionally, community engagement and awareness programs could be implemented to address social concerns and gather input on aesthetic preferences, potentially leading to

adjustments in the project design to better align with the community's values and expectations.

6.5 Possible Potential Impacts during Demobilization Phase

There will be need to demolish the temporary structures that will be used for storage and pit latrines for the construction workers. The construction rubble and construction wastes will have to be cleared from the site in readiness for the operation phase of the project.

A. POSITIVE SOCIAL IMPACTS

6.5.1 Reduced Traffic and Congestion

As construction-related traffic decreases, the reduction in congestion is expected to enhance the overall accessibility of the area. This positive effect aligns with social concerns, offering potential benefits such as smoother transportation and improved quality of life for local residents. On the negative side, the reduced activity might have economic implications for local businesses that relied on construction-related traffic. Additionally, there might be concerns about potential disruptions during the demobilization process.

In terms of significance, the impact is likely to be moderate, as it directly affects the immediate vicinity of the construction site. The impact is localized, predominantly affecting the area around MU-Main Campus. It is considered short-term, as the reduction in traffic and congestion is expected to be temporary during the demobilization phase. The impact is direct, stemming directly from the decrease in construction-related activities.

Enhancement/ Mitigation Measures

Mitigation measures could include;

- Careful planning of the demobilization process to minimize disruptions to local businesses and residents.
- Communication strategies to inform the community about the demobilization schedule and potential inconveniences could help manage expectations.
- Exploring alternative transportation routes during demobilization may help further mitigate the impact on local mobility.
- Regular monitoring and feedback mechanisms could be established to address any unforeseen issues that may arise during the demobilization phase, ensuring a more seamless transition for the local community.

6.5.2 Reduced noise levels

The demobilization phases of the proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, bring about a significant positive impact on the environment and local communities. The reduction in noise levels associated with construction activities winding down is a direct result, leading to a decrease in noise pollution and dust emissions. This reduction positively affects air quality and minimizes disturbances to local ecosystems, fostering a healthier environment. On the downside, the demobilization may result in job losses or economic slowdown in the short term, affecting the local community's livelihoods.

In terms of significance, the impact is moderate, as it directly improves environmental conditions and has some short-term socio-economic consequences. The impact is localized, primarily affecting the immediate surroundings of the university campus. It is short-term, given that the noise

reduction and improved air quality will be noticeable as construction activities cease. The impact is direct, as it directly addresses the noise and dust emissions associated with construction.

Enhancement/ Mitigation Measures

Mitigation measures can include;

- The implementation of alternative livelihood programs to support those affected by job losses,
- Public awareness campaigns to prepare the community for the short-term disruptions, and strict adherence to environmental regulations to ensure a smooth transition during demobilization.
- Additionally, incorporating green technologies and sustainable practices during the construction phase can enhance the positive impact on the environment, making the overall development more eco-friendly and socially responsible.

B. NEGATIVE SOCIAL IMPACTS

6.5.3 Loss of employment

The demobilization of construction-related activities of WSP at MU-Main Campus in Changarawe Village, can have significant social implications. On the positive side, the completion of construction projects may lead to environmental benefits and improved infrastructure. However, the loss of employment for local workers who were engaged during the construction phase is a notable negative consequence.

This temporary job loss can contribute to economic hardships and social challenges in the affected community. The significance of this impact is moderate, as it directly affects the local workforce. The impact is localized, occurring specifically in the Changarawe Village in the Mvomero District of the Morogoro Region. In terms of duration, the impact is short-term as it corresponds to the demobilization period.

Mitigation Measures

Mitigation measures could include.

- Implementing skill development programs for affected workers,
- Facilitating alternative employment opportunities and engaging with the local community to identify and address specific needs arising from the job loss.

These measures aim to minimize the negative social impact and enhance the overall well-being of the affected community during the demobilization phase.

6.5.4 Health and Safety Risks

The removal of heavy equipment and materials during the demobilization phases of the proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, poses both positive and negative impacts on health and safety, with broader implications for the local community. On the positive side, the demobilization process can create job opportunities and contribute to economic development. However, the negative aspect revolves around health and safety risks for workers involved in the removal process. If not managed effectively, accidents can occur, jeopardizing the well-being of workers and potentially impacting the local community. The significance of this impact is moderate, primarily localized to the immediate project area. The risk is short-term and direct, as it directly affects the safety of workers during the demobilization process.

Mitigation Measures

Mitigation measures should include;

- Comprehensive safety training for workers, the implementation of strict safety protocols, and the use of proper equipment to minimize the potential risks associated with the removal of heavy equipment and materials.
- Develop Health and Safety management plan.
- Additionally, regular monitoring and reporting mechanisms should be established to ensure ongoing safety throughout the demobilization phases.

C. POSITIVE ENVIRONMENTAL IMPACTS

6.5.5 Improved Local Aesthetics

The impact of improved local aesthetics during the demobilization phases of the proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, can be significant for the social well-being of the community. The removal of construction equipment and the cleanup of the site contribute to a visually pleasing environment, positively influencing the residents' quality of life. On the positive side, enhanced aesthetics can foster a sense of pride and satisfaction among locals, promoting a healthier and happier community. However, the negative aspect could be the potential disruption and inconvenience caused during the demobilization process.

In terms of significance, the impact is moderate, as it directly influences the local community's well-being but may not have far-reaching effects beyond the immediate vicinity. The impact is localized, as it primarily affects the residents in the proximity of the WSP. The effect is short-term, occurring during the demobilization phases, with the potential for rapid improvement once the cleanup is complete. The impact is direct, as it directly influences the visual aspect of the local environment.

Enhancement/ Mitigation Measures

- Enhancement measures may involve incorporating landscaping elements or green spaces in the area to further improve the aesthetics and overall environmental quality. Additionally, waste disposal and site cleanup practices should adhere to environmental standards to ensure a sustainable and responsible demobilization process.

D. NEGATVE ENVIRONMENTAL IMPACTS

6.5.6 Potential for Noise and Disruption

The demobilization phase in the development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, brings about a mix of positive and negative social concerns. On the positive side, overall noise levels are expected to decrease as the project winds down. However, the removal of equipment and materials during demobilization may still cause localized noise and disruption, potentially inconveniencing residents. The impact is considered moderate in significance, localized, and short-term. It is a direct impact that can be reversible.

Mitigation Measures

Mitigation measures to address the potential for noise and disruption could include;

- Scheduling demobilization activities during less sensitive hours, providing advance notice to residents, and utilizing noise reduction technologies.

- Community engagement and communication strategies can be employed to keep residents informed and address any concerns promptly.

These measures aim to minimize the negative social impact and enhance the overall community experience during the demobilization phases of the wastewater stabilization pond development.

6.5.7 Waste Generation

The impact of waste generation during demobilization phases can have both positive and negative consequences on the social and environmental fronts. On the positive side, proper waste management practices can contribute to the reduction of environmental pollution, ensuring the safety of local ecosystems and communities. Additionally, responsible waste disposal can lead to the creation of employment opportunities in the waste management sector. However, the negative aspects arise when hazardous materials are not handled correctly, posing risks to human health and the environment. The improper disposal of construction-related waste can contribute to soil and water contamination, negatively affecting nearby communities.

The impact of waste generation in this case is likely to be moderate in significance, as it involves the development of wastewater stabilization ponds. The impact is localized, mainly affecting the immediate surroundings of the university campus and Changarawe and Vikenge Villages. It is also likely to be a long-term impact, given the nature of wastewater management infrastructure.

Mitigation Measures

Mitigation measures should focus on;

- Ensuring the safe disposal of construction-related waste and hazardous materials. This may involve implementing proper waste separation and recycling practices,
- Conducting regular monitoring of water and soil quality and providing training to workers on safe waste management procedures.
- Community education programs to raise awareness about the importance of responsible waste disposal and involving local communities in monitoring and managing the environmental impact of the project.

These measures aim to minimize negative impacts, promote sustainable practices, and enhance the overall well-being of the affected communities.

6.6 Possible Potential Impacts during Operations and Maintenance Phase

During operation phase there are number of effects, these effects will affect the environment of the vicinity as described below:

A. POSITIVE SOCIAL IMPACT

6.6.1 Improved Health and Safety of the community members close to the project area.

The implementation of two units of at MU-Main Campus in Changarawe Village, has a notable impact on the health and well-being of nearby communities. The improved health aspect stems from the reduction in the risk of waterborne diseases associated with cleaner water resulting from the wastewater treatment process. This positively affects the social concerns during both the operational and maintenance phases. On the positive side, there is a direct improvement in public health as the community of Changarawe and Vikenge Village is less susceptible to waterborne illnesses. However, on the negative side, there might be challenges related to operational maintenance, such as potential disruptions or inconveniences to the community during the upkeep of the wastewater stabilization ponds.

In terms of significance, the impact is high as it directly influences the health of the community. The impact is localized to the immediate vicinity of MU-main campus. It is a long-term impact as improved water quality is expected to persist over an extended period. The impact is direct as it directly relates to the reduction of waterborne diseases.

Enhancement/ Mitigation Measures

Mitigation measures could include;

- Community awareness programs to educate residents about the benefits of the wastewater treatment system,
- Minimizing disruptions during maintenance through effective scheduling and implementing robust monitoring systems to ensure continued water quality improvement.
- Enhancement measures may involve the incorporation of additional technologies or best practices to further optimize the wastewater treatment process and its positive effects on community health.

6.6.2 Employment Opportunities

The proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, has significant social impacts, particularly in terms of employment opportunities during the operational and maintenance phases. On the positive side, the project has the potential to create jobs for local residents from Changarawe and Vikenge Village, contributing to economic development and poverty alleviation in the area. This is especially beneficial for the community, as it enhances livelihoods and provides sustainable employment. However, on the negative side, there may be concerns related to potential environmental and health risks associated with wastewater treatment, which could impact the well-being of the local population.

In terms of significance, the impact is moderate, as it directly affects the local community but may not have widespread implications beyond the region. The impact is primarily localized, with minimal regional or international consequences. The effects are likely to be long-term, considering the continuous operation and maintenance of wastewater stabilization ponds. The impact is direct, as it directly influences local employment and community well-being. While the impact is reversible with proper mitigation measures, it requires careful consideration to prevent potential harm.

Enhancement/ Mitigation Measures

Mitigation measures should include;

- The implementation of strict environmental and health regulations to ensure the safe operation of wastewater stabilization ponds.
- Community engagement and awareness programs can address concerns and involve local residents in the decision-making process.
- Proper training for employees in waste management and regular monitoring of the ponds can contribute to minimizing negative impacts.

6.6.3 Educational Opportunities

The proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, carries significant environmental and social implications. On the positive side, the university's involvement in the project opens avenues for educational opportunities and research initiatives focused on wastewater treatment and environmental conservation. Students

and researchers can gain hands-on experience and contribute to advancements in sustainable practices. However, during the operational and maintenance phases, there are potential negative social concerns.

The project may impact the local community from Changarawe and Vikenge Village in terms of noise, traffic, and potential odors associated with wastewater treatment. Additionally, there might be concerns about the release of treated water into nearby ecosystems.
In terms of significance, the impact is moderate, primarily affecting the local community and the university's immediate surroundings. It is long-term as the wastewater stabilization ponds will operate continuously. The impact is both direct, involving the local environment and community, and indirect, as it contributes to broader environmental and educational outcomes.

Enhancement/ Mitigation Measures
Mitigation measures should include;

- Community engagement to address concerns, implementing technologies to minimize odors and noise, and regular monitoring of water quality to ensure minimal environmental impact.
- Furthermore, the university can enhance the positive impact by actively involving the local community in educational programs and initiatives related to environmental conservation.
- Promote research collaborations between the university and local schools or research institutions to study the pond's performance and environmental impacts.
- Offer internships and practical training opportunities for students interested in environmental science and wastewater management.

6.6.4 Reduced Health Risks

The proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, carries significant positive impacts on both environmental and social fronts, particularly in terms of reducing health risks. The proper treatment of wastewater is instrumental in minimizing the risk of waterborne diseases, thereby positively influencing the health of persons from Changarawe and Vikenge Village. This is of high significance, primarily on a localized scale, as the impact is concentrated around the university campus and its immediate vicinity. The positive influence on health is a long-term, direct effect that enhances the overall well-being of the community.

Enhancement/ Mitigation Measures
Mitigation measures could include.

- Stringent wastewater treatment protocols, regular monitoring, and community education on proper water usage and hygiene practices. These measures can ensure that the positive impact remains sustained, and the potential negative consequences are minimized.

B. NEGATIVE SOCIAL IMPACTS

6.6.5 Disruption of social economic activities

The proposed development of two units of WSP at MU-Main Campus in Changarawe Village, is anticipated to have both positive and negative social impacts during its operational and maintenance phases. The construction and maintenance activities associated with the project may lead to temporary disruptions in social and economic activities for individuals within the project area and nearby communities which are Changarawe and Vikenge Villages, impacting their daily lives and restricting access to certain areas.

On the positive side, the project aims to enhance wastewater treatment capabilities, contributing to environmental protection. However, the negative aspects involve the inconvenience caused by the construction process.
In terms of significance, the social impact is likely to be moderate, considering the temporary nature of the disruptions. The impact is localized to the project area and nearby communities, making it a regional concern. The disruption is expected to be short-term, occurring primarily during the construction and maintenance phases. The impact is direct, as it directly affects the individuals and communities within the project area.

Mitigation Measures
Mitigation measures could include;

- Effective communication and engagement with the affected communities to minimize inconveniences, scheduling construction activities during non-peak hours, and providing alternative access routes where possible.
- Establish a community liaison or communication mechanism to keep nearby communities informed about the project's schedule and potential disruptions.
- Coordinate construction and maintenance activities to minimize disruptions during peak economic or social activities.
- The implementation of awareness campaigns and compensation measures for affected individuals can help mitigate negative social impacts. Enhancement measures may involve incorporating sustainable practices in construction and maintenance activities to promote long-term positive social outcomes.

C. POSITIVE ENVIRONMENTAL IMPACTS

6.6.6 Improved Water Quality

The WSP will play a crucial role in treating and cleaning wastewater before discharge, thereby reducing pollution in nearby water bodies. This improvement in water quality is essential for maintaining the health of ecosystems and safeguarding the well-being of communities relying on these water sources particularly Changarawe and Vikenge Village. The positive social concerns during the operational phase include enhanced access to clean water, promoting public health, and supporting sustainable development.

On the negative side, there might be some concerns during both the operational and maintenance phases. Operational challenges could include potential disruptions to the local environment during construction and initial operation. Additionally, the maintenance phase may pose risks if proper upkeep is not ensured, leading to potential environmental harm and public health issues. Furthermore, there may be resistance or concerns from the local community during the construction and operation phases.
In terms of significance, the impact of improved water quality is high, as it directly addresses environmental and public health issues. The impact is localized to the immediate surroundings of Mzumbe University's main campus. The improvement in water quality is a long-term benefit, contributing to sustained environmental health and community well-being. The impact is primarily direct, focusing on the direct benefits of wastewater treatment.

Enhancement/ Mitigation Measures
Mitigation measures should be implemented to address potential negative impacts. These may include;

- Thorough community engagement, and monitoring during both the operational and maintenance phases.
- To enhance positive impacts, ongoing community education and involvement in water quality monitoring can be implemented, ensuring the sustained success of the wastewater stabilization ponds.
- Regular maintenance and oversight should be in place to prevent any potential negative consequences. Overall, a comprehensive and sustainable approach is necessary for ensuring the success of the project and minimizing any adverse effects.

6.6.7 Water Conservation

The proposal for the development of two units of WSP at MU-Main Campus in Changarawe Village, highlights a potential positive impact on water conservation. By reusing treated wastewater for irrigation or non-potable purposes, the project has the potential to significantly reduce the demand for freshwater resources, contributing to sustainable water management. This approach aligns with environmental and social concerns related to water scarcity and quality.
However, the social concerns during the operational and maintenance phases of the project must be carefully considered.

On the positive side, water conservation can lead to enhanced availability of freshwater for domestic use, agriculture, and other essential needs, benefiting local communities. On the negative side, there may be concerns related to the perception of using treated wastewater, as well as potential health and safety issues if not managed effectively.
In terms of significance, the impact of water conservation through wastewater reuse at MU can be considered moderate. The impact is primarily localized, as it directly affects the university campus and the surrounding community. It is a long-term impact, as the benefits of reduced freshwater demand and enhanced water conservation will likely persist over an extended period. The impact is both direct and indirect, addressing the immediate need for water resources and indirectly contributing to broader environmental and social sustainability goals.

Enhancement/ Mitigation Measures

Mitigation measures should focus on

- Community engagement and education to address concerns related to treated wastewater usage.
- Implementing robust safety and quality control measures during the operational and maintenance phases is essential to minimize health risks.
- Continuous monitoring, regular maintenance, and periodic reviews of the wastewater treatment process can ensure the long-term effectiveness and safety of the project.
- Additionally, ongoing collaboration with local authorities and stakeholders can help address any emerging issues and enhance the positive social impact of the water conservation initiative.

D. NEGATIVE ENVIRONMENTAL IMPACTS

6.6.8 Foul smell (Odor)

The proposed WSP project at MU-Main Campus may introduce a notable environmental and social impact in the form of foul smells or odors during its operational phase. This impact stems from the decomposition of organic matter within the ponds. The extent of this odor issue depends on factors such as the design and location of the ponds, potentially affecting the quality of life for nearby

residents. The positive aspect is that the project addresses wastewater management, contributing to environmental sustainability. However, the negative side involves potential discomfort for the local community due to unpleasant odors.
In terms of significance, the impact of foul smells is likely to be moderate, as it directly affects the local community but may not have widespread regional or international consequences. The impact is mainly localized, affecting nearby residents and the immediate vicinity. It is expected to be a long-term effect, persisting throughout the operational phase. The nature of the impact is direct, as it directly influences the olfactory environment of the surrounding area.

Mitigation Measures
To mitigate the foul smell impact, the project should;

- Incorporate odor control technologies or design features to minimize the release of unpleasant odors.
- Periodic monitoring and maintenance should be implemented to ensure the effectiveness of these measures.
- Communication and community engagement strategies can also play a crucial role in addressing social concerns by keeping residents informed about the project and its potential impacts, fostering a collaborative approach to minimize any negative repercussions on their quality of life.

6.6.9 Increased Water Pollution
The discharge of treated effluent from WSP into the receiving environment poses a significant environmental and social impact, with both positive and negative consequences during the operational and maintenance phases. On the positive side, the WSP helps in treating wastewater, contributing to pollution reduction. However, the negative aspect is that the discharged effluent may still contain traces of pollutants or pathogens, posing a risk to downstream water bodies and leading to water degradation.

This impact is considered high in significance, localized, and long-term. The significance is high due to the potential harm to the environment and communities relying on the affected water bodies. The impact is localized as it primarily affects the immediate vicinity of the discharge site. It is also long-term, indicating a persistent and enduring consequence. The impact is direct, as the treated effluent directly influences the downstream water quality.

Mitigation Measures
Mitigation measures should be implemented to address this impact.

- Enhanced treatment processes or additional filtration systems can be employed to reduce the concentration of pollutants in the effluent before discharge.
- Regular monitoring and testing should be conducted to ensure compliance with water quality standards.
- Community awareness programs can be initiated to educate the local population about the potential risks and promote responsible water use. Moreover,
- The implementation of sustainable practices, such as the use of eco-friendly technologies, can contribute to minimizing the long-term impact on the environment.

By integrating these measures, the negative social concerns associated with increased water pollution can be mitigated, allowing for a more sustainable and environmentally friendly wastewater management system.

6.6.10 Mosquitoes breeding

During the operational and maintenance phases, the presence of wastewater can attract vectors such as mosquitoes and flies, posing a potential health risk by increasing the transmission of diseases. On the positive side, the development contributes to wastewater treatment, addressing environmental concerns associated with improper disposal. However, the negative impact on public health due to the potential breeding of disease vectors is a significant social concern.

In terms of significance, the impact of disease vectors breeding is considered moderate, as it directly affects the local community from Changarawe and Vikenge villages, and campus inhabitants. The impact is localized, primarily affecting the immediate vicinity of the wastewater stabilization ponds. It is expected to be long-term, persisting throughout the operational and maintenance phases. The impact is both direct and indirect, directly affecting the health of individuals in the vicinity and indirectly influencing the overall community well-being.

Mitigation Measures

Mitigation measures should be implemented to address these concerns. These may include;

- Implementing mosquito control measures, such as the use of larvicides and ensuring proper pond maintenance to minimize the risk of vector breeding.
- Community awareness programs on disease prevention and proper hygiene practices can be employed to further reduce the negative social impact.
- Incorporating sustainable design features into the wastewater treatment system to minimize environmental and social impacts.
- Regular monitoring and evaluation should be conducted to assess the effectiveness of these measures and make adjustments as needed.

6.6.11 Overflowing of sludge into the surrounding environment

The proposed development of two units of wastewater stabilization ponds at MU-Main Campus in Changarawe Village, has the potential to cause both positive and negative social concerns during its operational and maintenance phases. The positive impact includes improved wastewater treatment, which can enhance environmental sustainability and public health. However, the negative impact involves the risk of sludge overflowing into the surrounding environment. This could result in contamination of local water sources and soil, posing health hazards to nearby communities. The significance of the impact is considered moderate, as it primarily affects the local area. It is a long-term concern, especially if not adequately managed. The impact is direct, as it directly affects the local environment and communities.

Mitigation measures: Should include robust sludge management systems, regular monitoring, and community awareness programs to minimize the risk of overflow and ensure timely response in case of incidents. Enhancements can involve incorporating eco-friendly technologies in wastewater treatment to reduce overall environmental impact.

6.7 Possible Potential Impacts during Decommissioning Phase

Decommissioning will occur after the construction and operation of this WSP. During this period, it is possible that ponds and infrastructure facilities will be retrofitted at the sites, so major changes and expansions may be necessary. At the end of the WSP life, a scheduled plant will be necessary to remove the site component, a process referred to as decommissioning.

A. POSITIVE SOCIAL IMPACTS

6.7.1 Improved Aesthetics

The decommissioning of wastewater stabilization ponds can have a significant positive impact on the visual aesthetics of the surrounding area, potentially leading to an enhanced quality of life for local residents. The removal of these ponds can contribute to improved landscape and overall environmental aesthetics, creating a more pleasant and visually appealing environment. This positive change is particularly relevant in the context of the proposed development of two units of WSP at MU, where the removal of such infrastructure could positively transform the Changarawe Village and Mzumbe Ward in the Morogoro Region.

In terms of significance, the impact of improved aesthetics is generally moderate, given its localized nature within the specific area affected by the decommissioning. The impact is primarily short-term, occurring as a direct result of the removal of the wastewater stabilization ponds.

Mitigation/Enhancement Measures

Mitigation measures could include;

- Landscaping and green infrastructure projects to further enhance the visual appeal of the area.
- Additionally, community engagement and awareness programs can help manage any potential concerns or resistance from local residents during the decommissioning phase. While the positive impact on aesthetics is notable, it's essential to consider the potential negative aspects, such as the disruption caused during the decommissioning process and the need for careful planning to ensure minimal disturbances to the community and ecosystem.

B. NEGATIVE SOCIAL IMPACTS

6.7.2 Disruption to Local Community

The decommissioning process of two units of wastewater stabilization ponds at MU, located in Changarawe Village, may lead to temporary disruptions within the local community. Construction and removal activities can introduce noise, dust, and increased traffic, impacting the daily lives of residents. On the positive side, the decommissioning is a step towards environmental improvement and reflects a commitment to sustainable practices. However, the negative aspects involve the inconvenience and potential discomfort experienced by the local population during the construction phase.

In terms of significance, the impact is likely to be moderate, considering it is a localized disturbance within the immediate vicinity of the university. The impact is short-term, occurring during the decommissioning process. It is a direct impact as it directly affects the local community through construction-related activities.

Mitigation Measures

Mitigation measures should include.

- Establish effective communication channels with the local community to inform them about the decommissioning activities, expected disruptions, and timelines. Provide regular updates and address community concerns promptly.
- Implement noise and dust control measures, such as using quieter equipment, scheduling noisy activities during daytime hours, and applying dust suppressants to minimize inconvenience to residents.

- Develop a traffic management plan to minimize congestion and ensure the safety of both residents and workers. Use signage and designated routes to guide construction and removal traffic.
- Additionally, involving the community in the planning process and seeking their input can contribute to a more harmonious decommissioning phase.

6.7.3 Loss of Community Assets

The decommissioning of wastewater stabilization ponds, particularly if they serve recreational or cultural purposes, can have a significant impact on communities. These ponds may function not only as crucial wastewater treatment facilities but also as community assets and amenities. The loss of such assets during the decommissioning phase could result in negative social consequences. On the positive side, decommissioning may lead to environmental improvements and the implementation of more advanced wastewater treatment methods. However, the negative impact involves the potential disruption of community activities, loss of cultural spaces, and diminished recreational opportunities.

In terms of significance, the impact is likely to be moderate, as it affects a specific community rather than a larger region or the international community. The impact is localized, as it directly affects the community in the vicinity of the MU-Main Campus. The consequences are more likely to be long-term, as the loss of community assets may persist over an extended period. The impact is both direct and irreversible, given that once the ponds are decommissioned, the loss of cultural and recreational spaces cannot be easily reversed.

Mitigation Measures

Mitigation measures could include.

- Engaging the community in the decommissioning planning process, seeking alternative locations for recreational activities, and documenting cultural significance before decommissioning.
- Enhancement measures may involve creating new community spaces or facilities and implementing educational programs to raise awareness about the benefits of advanced wastewater treatment methods.

6.7.4 Health and Safety Concerns

The decommissioning phase of the proposed development of two units of WSP at MU in Changarawe Village, has significant health and safety concerns. Depending on the nature of the decommissioning activities and the presence of hazardous materials, there is potential risk to both workers and nearby residents from Changarawe and Vikenge Village. The positive side lies in the necessity of decommissioning for environmental protection, while the negative side involves the potential exposure to harmful substances. The impact is considered moderate in significance, localized to the project site, and potentially long-term. It is both direct, as it affects workers and residents in the immediate vicinity, and indirect, as it may have broader implications for the environment.

Mitigation Measures

Mitigation measures should include;

- Develop and enforce stringent health and safety protocols for workers, including the proper handling of hazardous materials and protective gear. Regularly train workers on safety procedures.
- Workers should be equipped with appropriate protective gear, and the community should be informed and involved in the decommissioning process.
- Develop and implement Health and Safety Management Plan
- Establish a robust emergency response plan to address any accidents or hazardous material releases promptly. Ensure that local residents are aware of this plan and know how to respond in case of an emergency.
- Enhancements could involve the implementation of advanced technologies to minimize the release of hazardous substances and the promotion of sustainable practices during and after decommissioning.
- Regular training programs on safety measures should be conducted to ensure the well-being of both the workforce and the community.

C. POSITIVE ENVIRONMENTAL IMPACTS

6.7.5 Improved Water Quality

The decommissioning of wastewater stabilization ponds can have a significant positive impact on water quality in nearby rivers or streams. As part of the decommissioning process, accumulated sludge and waste are removed and properly disposed of, reducing the risk of contamination. This improvement in water quality is crucial for the health of aquatic ecosystems and the overall well-being of communities that rely on these water sources. On the positive side, the decommissioning can lead to a cleaner and healthier environment, benefiting both human and ecological systems. However, on the negative side, the decommissioning process itself may involve some environmental disruption and potential short-term disturbances to the local ecosystem.

In terms of significance, the impact of improved water quality is high, especially for the local communities and ecosystems that directly depend on the affected water bodies. The impact is localized, as it primarily affects the immediate vicinity of the decommissioned ponds. The improvement in water quality is a long-term effect, contributing to sustained environmental health. The impact is direct, as it directly addresses and mitigates the contamination risk associated with wastewater stabilization ponds.

Mitigation/Enhancement Measures

Mitigation measures during the decommissioning phase may include;

- Careful planning to minimize environmental disruption, proper disposal of sludge and waste, and implementation of erosion control measures.
- Additionally, enhancement measures could involve the restoration of natural habitats in the affected areas to promote ecological resilience.
- Community engagement and awareness programs may also be implemented to ensure that local communities understand the positive long-term benefits of the decommissioning process and participate in its success.

D. NEGATIVE ENVIRONMENTAL IMPACTS

6.7.6 Release of Contaminants

The decommissioning process of WSP poses a significant environmental risk, with the potential release of contaminants such as nutrients, heavy metals, and other pollutants into the surrounding environment. This could adversely impact water quality and ecosystems. On the positive side, if

handled correctly, the decommissioning phase provides an opportunity to implement mitigation measures and enhance environmental safeguards. However, the negative aspect lies in the potential harm to local ecosystems and water quality if contaminants are released during the decommissioning process.

In terms of significance, the impact is considered moderate, as it has the potential to affect local ecosystems and water quality but may not have widespread regional or international consequences. The impact is primarily localized, as it directly affects the immediate surroundings of the wastewater stabilization ponds. The duration of the impact is likely to be short-term, occurring during the decommissioning process. The nature of the impact is direct, as it involves the immediate release of contaminants into the environment.

Mitigation Measures

Mitigation measures during the decommissioning phase should focus on;

- Develop a comprehensive plan for handling and disposing of contaminants from the wastewater stabilization ponds. This plan should include measures for the safe removal, transportation, and disposal of hazardous materials.
- Enhanced monitoring and testing can be employed to ensure that any potential contaminants are detected and addressed promptly.
- Revegetation and habitat restoration efforts may also be part of the mitigation strategy to restore the affected areas. The goal is to minimize the negative environmental impact and promote the sustainable decommissioning of WSP.
- Implement containment measures, such as impermeable liners or barriers, to prevent the spread of contaminants during decommissioning. Continuously monitor water quality in nearby water bodies to detect any signs of contamination promptly.

6.7.7 Water pollution

The discharge of untreated or poorly treated wastewater during the decommissioning phase poses a significant environmental and social impact, particularly on water bodies. This can result in water pollution, adversely affecting aquatic ecosystems and potentially jeopardizing human health. The proposed development of two units of WSP, raises concerns about the release of contaminants into nearby water sources. The impact is considered high in significance, localized to the immediate vicinity of the university campus. The consequences are likely to be long-term, as water pollution can persist and have lasting effects on both the environment and public health. This impact is direct, as the discharge directly influences the quality of the nearby water bodies.

Mitigation Measures

Mitigation measures for this impact should include;

- The implementation of advanced wastewater treatment technologies to ensure the proper removal of pollutants before discharge.
- Establishing monitoring programs to regularly assess water quality and implementing measures to contain and manage any accidental spills or leaks during the decommissioning process are crucial.
- Educational outreach and community engagement programs can enhance awareness about the importance of responsible wastewater management practices and foster a sense of environmental responsibility among the local population.
- Collaborating with relevant regulatory bodies to ensure compliance with environmental standards and regulations is also essential for minimizing the negative impact on social and ecological systems.

6.7.8 Soil pollution

The improper handling and disposal of sludge or other solid waste generated during the decommissioning of WSP, can result in soil contamination, posing a threat to soil fertility and plant growth. This soil pollution can have long-term consequences, affecting the local ecosystem and agricultural activities. The positive side of this concern lies in the potential for implementing effective waste management and decommissioning practices, ensuring minimal impact on the soil and surrounding environment. On the negative side, if not addressed properly, it may lead to a decline in agricultural productivity and the overall well-being of the community of Changarawe village.

In terms of significance, the impact of soil pollution during decommissioning is considered moderate, as it directly affects the immediate vicinity of the decommissioned site but may not have widespread regional or international implications. The impact is mainly localized, with the potential for some regional effects depending on the scale of contamination. It is a long-term concern, as soil recovery and restoration may take a considerable amount of time. The impact is primarily direct, resulting from the improper handling and disposal of waste during the decommissioning process.

Mitigation Measures

Mitigation measures should include;

- The implementation of proper waste disposal procedures, such as secure containment and treatment of sludge, to prevent soil contamination.
- Additionally, soil remediation techniques, such as phytoremediation or soil amendments, can be employed to enhance the recovery of affected areas.
- Public awareness campaigns and community involvement can contribute to responsible waste management practices, ensuring the long-term health of the soil and surrounding environment.
- Regular monitoring and assessment of soil quality should be conducted to track the effectiveness of mitigation measures and make adjustments as necessary.

6.7.9 Air pollution

The proposed development of two units of WSP at MU-Main campus in Changarawe Village, has both positive and negative social concerns during the decommissioning phases. On the positive side, the project aims to enhance wastewater management, addressing environmental concerns and potentially improving the overall hygiene and sanitation of the local community. However, the negative aspects may include disruptions to the local ecosystem during the decommissioning phases, affecting environment and possibly causing inconvenience to nearby residents. The impact significance is moderate, as it primarily affects the local area. It is short-term during the decommissioning phases but may have long-term positive effects on the environment. The impact is both direct, involving immediate changes to the local ecosystem, and indirect, as it contributes to broader environmental sustainability goals.

Mitigation measures

- Careful planning and execution of the decommissioning phases to minimize disruption to the local ecosystem.
- Efforts should be made to engage and communicate with the local community to address any concerns and ensure their well-being during the project.

- Reversible measures such as restoring disturbed areas post-decommissioning should be implemented, and regular monitoring can help track the effectiveness of mitigation efforts.
- Additionally, community education programs can be initiated to raise awareness about the project's positive environmental impact and foster a sense of ownership and responsibility among the local population.

6.7.10 Noise and vibration pollution from demolishing works

This impact has both positive and negative aspects concerning social concerns. On the positive side, the demolition is a necessary step for the advancement of new projects that contribute to environmental sustainability. However, the negative consequences involve potential disturbances to nearby communities, wildlife, and ecosystems. The significance of this impact is likely to be moderate, given that it primarily affects the immediate vicinity of the project. It is a localized impact, with short to medium-term duration. The impact is direct, as it directly affects the surrounding environment through noise and vibrations.

Mitigation Measures

Mitigation measures to address these concerns could include;

- Implementing strict construction schedules to limit noise during sensitive hours, employing noise barriers and damping materials to reduce sound propagation, and monitoring the environment to promptly address any adverse effects.
- Additionally, community engagement and communication strategies can be employed to keep the local population informed about the project's progress and potential disruptions, fostering a sense of understanding and cooperation during the decommissioning phase.

6.8 project alternatives

Alternatives to projects are different ways to achieve the same purpose that the project intends to achieve. Environmental and Social Assessments require looking into alternatives to the projects in order to make prudent decisions.

The project alternatives are a part of the ESIA process to select the best among all possible project options. The alternatives of a project are defined as the options that can help to meet the objectives of a project by different means including an alternative project site, technology or material, waste management, design or inputs and roofing materials. The key criteria when identifying alternatives is that they should be feasible and reasonable.

Factors Considered

- **Existing policies, legislation and standards regarding construction project based on wastewater stabilization ponds and other infrastructures in Tanzania;** A review of available policies, legislation and standards of construction industry in Tanzania was carried out to ensure that construction of the WSP conforms with the required standards. This was done to ensure the safety of the proposed WSP.
- **Environmental considerations;** Environmental factors were also considered in the choice of construction materials, citing of other facilities such as wastewater stabilization ponds facilities and choice of wastewater stabilization ponds technologies. This was done in order to ensure that the project does not cause irreparable damage to the environment.
- **Cost benefit analysis;** An analysis of technologies to be used was done to ensure that the amount of money that was budgeted for the project is adequate. However, this was done without compromising the quality or safety of the WSP.

- **Location and layout alternatives;** The location and layout alternatives were not considered since the construction works will take place within the premises where other structures for MU, Main campus exist and therefore alternative sitting and layout was not an option.
- Below is the discussion of project alternatives that has been considered in relation to the proposed project.

6.8.1 No Project Alternative

The no project alternative entails retaining the current status quo (No construction of the proposed 2 Unit of WSP at MU, Main campus). Adopting the No Project alternative, this option would mean avoiding the predicted impacts of the project implementation and missing the predicted positive impacts of the project. The HEET project at MU is designated to revitalize and expand the capacity of the University to contribute to key areas for innovation, economic development and labour market relevance. The proposed project is expected to enable effective teaching and research and produce graduates who could become a catalytic force for the new industrial based economy of Tanzania.

Hence, the proposed project has many potential benefits as compared to negative ones that can be easily mitigated.

6.8.2 Alternative Site

As presented in Chapter 2 of this report, the proposed four structures will be located within the MU Main Campus. The option of utilizing an alternative site out of the campus was considered but over-weighted by the existing land at the university due to the following advantages over other;

- The site is within MU campus (No need to buy a new piece of land)
- The selected area is compatible with the land use proposed by the MU master plan.
- The site is located on a favorable piece of land; large area with a clear view.
- The site is well served with road network, and it is easily accessible to public transport and

Even within the campus, several locations were considered against provision/availability of services such as waste management, water, and power supply; location with respect to location of other structures and environmental protection. The following are the advantages of the selected sites over any other location within the campus.

- The selected sites allow integrated management of generated solid and liquid wastes (both onsite and offsite);
- Site selection considered areas, which have less vegetation cover, and avoided densely dares. The proposed site is already a disturbed area.

6.8.3 Water supply Alternative

6.8.3.1 Water Supply (surface water) from the MU Independent water source (Tangeni river)

Water supply from MU Independent source (Tangeni river) is the option considered to be appropriate as the water supply network is within the campus and therefore can guarantee reliable, clean, and safe water supply to the proposed construction of WSP during construction period.

6.8.4 Alternative of liquid waste management

During the construction phase, it is anticipated that the wastewater will be produced. The estimation is based on the assumption that an average individual generates approximately 90% of wastewater per day. Therefore, it is crucial to address the appropriate management and disposal of

this wastewater volume. Given that the majority of areas in Mzumbe lack connections to a sewerage system for this wastewater stabilization ponds, alternative options such as utilization of temporary pit latrine and disposed into existing WSP during demobilization phase have been considered and will be discussed as follows:

6.8.4.1 Use of wastewater stabilization ponds

Use of wastewater stabilization ponds is one of the commonly methods used of treating wastewater. Although this is one of the cheapest ways of treating wastewater, the method requires more space than the other WSP facilities. Since space is not a limiting factor for the project, this is a preferred option.

Advantages of using WSP include:

- As compared to septic tanks, WSP do not require emptying of wastewater as it is discharged into the environment after its treatment;
- Cheap and easy to operate:

Disadvantages of using WSP include:

- WSP require more space than other wastewater treatment facilities;
- If not properly managed, wastewater stabilization ponds result into breeding grounds for mosquitoes;
- Can generate odour if the system is not operating effectively; and
- Has the potential to pollute recipient water body if there is system failure as such it needs personnel to manage to ensure that it operates effectively and efficiently;

Considering that the campus has enough space to accommodate the wastewater stabilization ponds away from other structures such as classrooms, students' hostels and the administration block, the alternative was preferred.

6.8.5 Alternatives construction materials

- It is estimated that construction materials account for more than 70% of the total project cost, therefore, the selection of affordable construction materials is critical important.
- MU considered all these and looked into a variety of construction materials for different aspects of the proposed WSP. Architects consulted with structural engineers on the load-bearing capabilities of available materials. Five common materials namely *concrete, masonry and stone* were considered as briefly described hereunder:
- ***Concrete:*** Concrete is a composite material made from fine and coarse aggregates, bonded together with cement. Its versatility, cost and strength make it the ideal material for foundations of WSP. It is most preferred since it can carry heavy load and withstand harsh environmental conditions its
- ***Stones:*** The longest lasting building material available is the one that's been here for thousands of years: stone. In fact, the most ancient of any constructed structures still in existence in the world are made of stone.

CHAPTER 7: ENVIROMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 Introduction

Mitigation measures are presented in the following ESMP (Table 7.2) that is to be implemented by MU and during construction, operation and decommissioning phases, and Contractor during construction phase. Plans for the implementation of mitigation measures for the proposed project are provided in this Chapter. The Plans indicate institutional responsibilities, time to take the action, monitoring frequency and estimated costs. The proposed costs are only indicative, should the proposed development proceed with the suggested changes, the developer will estimate actual costs and include them in the overall cost of the project. Based on the EMA of 2004, NEMC is required to Environmental and Social Impact Management Plan (ESMP).

7.2 Purpose of the ESMP

The purpose of the ESMP is to describe the measures that should be implemented by the proponent during the implementation of the project to eliminate or reduce to acceptable levels key potential impacts, social and health impacts related to project activities. The specific measures set out in the ESMP must be fully adhered to by all the project parties. In particular, the project must strive to avoid significant impacts on the bio-physical, socioeconomic or health aspects during implementation. Avoidance through good, detailed design of site-specific works and through preparation of the detailed site specific ESMPs will be key to success in this area. Where impacts cannot be avoided, they must be mitigated against using appropriate measures. The ESMP has been developed:

- To bring the project to comply with Government of Tanzania applicable national environmental and social legal requirements social policies and procedures;
- To outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts.
- To provide an operational reference and tool for environmental management during project rehabilitation and operation activities.

7.3 Implementation Responsibility of the Management Plan

The environmental and social mitigation measures incorporated in the detailed engineering design shall be handed over to the contractor during construction period. The Contractor shall take stock of the contents of the Environmental and Social Management Plan of the Project. MU holds the ultimate responsibility for meeting the requirements outlined in EMA of 2004, Tanzania's Environmental Legislation. The primary obligation for executing these requirements rests with the contractor, who will appoint safeguard specialists overseen by a contractor resident engineer. The project proponent is tasked with ensuring the presence of adequate resources, skills, training, capacity-building programs, communication processes, and documentation control systems to ensure the effective implementation and integration of ESMP requirements. This involves having competent staff with sufficient training and experience to cover the ESIA requirements for the HEET project in the designated project area (Table 7.1).

MU Project Implementation Unit (PIU) is responsible for assessing the management and execution of the ESMP through monitoring and environmental audits. Any identified non-compliance during the evaluation requires corrective action by the contractor. The PIT oversees the implementation

and monitoring of the ESMP, with overall responsibility for supervising all environmental management activities, aided by consultants (WB POM, 2021).
It is essential to note that the ESMP is not the sole document or management system tasked with addressing project impacts. Instead, each project-related subcontractor or material supplier must establish their own management systems to minimize and prevent environmental and social risks.

Therefore, the contractor must integrate the ESMP into their "project management system," which serves as the framework for managing their activities and prepare C-ESMP. This system defines responsibilities, internal reporting requirements, relationships for mitigation and monitoring actions related to the ESMP, and precise mechanisms for monitoring and evaluating the implementation of various ESMP requirements. The contractor is also obligated to ensure that project implementation complies with national and international EHS legislation and regulations, as well as contractual technical and quality specifications in line with the project's quality plan if required. Also, the contractor shall appoint an Environmental, Social, Health and Safety Officer to oversee the E&S aspects who are familiar with the compliance requirements, including WB EHS guidelines (POM, 2021).

The successful execution of this plan will necessitate extensive self-monitoring and regular reporting to the PIT. It is anticipated that, throughout the project implementation stage (construction), both the MU and contractor will enlist the services of consultants, including environmental and social specialists, as well as environmental health and safety officers (EHS). These personnel will be appointed based on the specifications outlined in the following table for effective management and monitoring.

Table 7.1: Roles with respective responsibilities

Function	Responsibilities
Project Implementation Team (PIT)	○ Refer Table 3.5
NEMC	○ Refer Table 3.5
Design Consultants	○ Refer Table 3.5
Contractor	○ Refer Table 3.5
Supervision Engineer/Consultant	○ Refer Table 3.5

7.4 Environmental and Social Cost

The costs for implementing the mitigation measures have been estimated based on previous similar projects and engineering judgment. The estimated cost for environmental and social management of an establishment is to be included in the Contractor's Bill of Quantities (BoQ) during decommissioning. Also, the principal environmental and social cost includes the cost for implementing the mitigation measures proposed. Additional costs for implementing environmental and social management measures have been estimated and MU shall cover all the costs proposed in the ESMP.

Table 7.2: Proposed Environmental Social Management Plan (ESMP) for Mobilisation phase, construction phase, demobilization phase and operation phase, Decommissioning Phase.

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
MOBILISATION AND CONSTRUCTION PHASE				
SOCIAL IMPACT				
1	**Job Creation and Employment opportunities**	○ Invest in training and skill development programs for local residents, equipping them with valuable skills that can be applied beyond the construction phase, potentially leading to sustainable employment opportunities. ○ Promote diversity and inclusion in the workforce by actively recruiting and providing equal opportunities to underrepresented groups, such as women and minority communities. ○ Communities close to the project site will be urged to develop high-quality goods and services. ○ Opportunities for employment will be made available in accordance with qualifications, accepted interviewing procedures, and grading systems. ○ Conduct fair and transparent recruitment processes to ensure equal opportunities for all interested individuals, promoting inclusivity and diversity Local communities shall be encouraged to produce quality goods and services for the project. ○ Implement training programs to enhance the skills of the local workforce, ensuring they acquire the necessary qualifications for available job opportunities. ○ Ensure strict adherence to labor standards and regulations, providing a safe and supportive working environment for all employees. ○ Both professional and unskilled laborers hired for the project should receive fair remuneration.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
2	**Increased skills and impart knowledge to local communities**	○ Implement a formal certification process for the skills acquired during the construction phase. ○ Partner with relevant vocational training institutions to accredit the skills gained by local residents. ○ Create community-based skills development centers equipped with necessary resources. ○ Foster long-term partnerships with local schools and educational institutions. ○ Develop curriculum enhancements related to environmental sustainability, wastewater management, and infrastructure development, ensuring a sustained educational impact beyond the construction phase. ○ Establish job placement programs to assist locals, especially students, in finding employment opportunities related to their newly acquired skills. ○ Facilitate community-led initiatives that utilize the acquired skills for the betterment of the community. ○ Encourage the formation of local cooperatives or enterprises focused on environmental sustainability and infrastructure development. ○ Promote the integration of sustainable practices into the daily lives of community members.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Facilitate workshops and awareness campaigns on environmental stewardship, waste reduction, and responsible resource management.		
3	**Business opportunities in supply of materials and utilities**	○ Encourage the project to prioritize the procurement of goods and services from local businesses. This can include construction materials, equipment, and various services required during the mobilization phase. ○ Implement training programs to equip local residents with skills relevant to emerging market opportunities. This can include workshops on entrepreneurship, vocational training, and business management. ○ Promote environmentally and socially sustainable business practices to ensure that the increased market opportunities contribute to long-term economic and community well-being. ○ Implement fair and transparent procurement processes to ensure that local suppliers have equal opportunities to participate. This can include clear guidelines, open bidding processes, and fair evaluation criteria. ○ Ensure monitoring of labour standards among contractors, sub-contractors, workers and service providers; and ○ Qualified local vendors/ entrepreneurs should be given priorities to supply different goods and services to the project.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
4	**Population Pressure**	○ Enhance efforts to prioritize hiring from local communities (Mzumbe ward) to minimize external migration for employment. ○ Implement skills training programs for the local population to enhance their employability and competitiveness for construction-related jobs. ○ Organize job fairs and information sessions to ensure transparent communication about employment opportunities, reducing misinformation and speculation. ○ Establish regular communication channels with the local communities to address concerns, provide updates, and gather feedback on employment-related issues. ○ Collaborate with local authorities to develop and enforce policies that regulate the influx of people during construction, ensuring a balanced impact on the local population. ○ Implement monitoring mechanisms to ensure fair hiring practices and adherence to the preference for local employment, with penalties for non-compliance. ○ Implement job rotation programs and skill development initiatives to ensure a diverse range of individuals can participate in the construction activities, reducing intense competition for specific roles	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
5	**Health and Safety Risks**	○ Implement strict health and safety protocols on the construction site, including the use of personal protective equipment (PPE), safety barriers, and proper signage.	Contractor/ MU-PIU/ Consultant	10,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Provide comprehensive safety training to all construction workers to ensure they are aware of potential risks and know how to mitigate them. ○ Contractor shall develop and implement C-ESMP ○ Develop and follow the established emergency response plan to handle accidents or health emergencies promptly. ○ Implement safety measures to protect nearby residents, including fencing, warning signs, and traffic diversions to keep them away from potentially hazardous areas. ○ A well-stocked First Aid kit (administered by medical personnel) shall be maintained at the construction site. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing health education to the workforce. ○ The establishment of reporting systems for the public to voice concerns or grievances over perceived hazards to their health and safety caused by the construction operation. ○ There will be proper signs on site to warn workers of safety requirements as regards machines with moving parts and other equipment at site.		
6	**Traffic Congestion**	○ Develop a comprehensive traffic management plan that outlines construction-related traffic routes, parking areas, and schedules to minimize congestion on local roads. ○ Identify alternate routes for construction-related traffic to minimize disruption to the regular commuting patterns of residents. ○ Consider providing shuttle services for construction workers to reduce the number of individual vehicles traveling to and from the construction site. ○ Inform local residents and commuters about the construction-related traffic plan and any temporary road closures through community outreach and signage.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
7	**Community Health, Safety and Security**	○ Contractor should have registered and qualified health and safety personnel in the project during construction phase. ○ Develop and implement community health and safety management plan. ○ Establish a health and safety monitoring system to ensure that workers comply with health protocols and minimize the risk of communicable diseases, including regular health check-ups and screenings. ○ Implement a comprehensive training program for all construction workers, emphasizing the importance of adhering to safety protocols, respecting local communities, and following a code of conduct to minimize negative impacts. ○ Implement disease prevention programs, including awareness campaigns and access to healthcare facilities, to address potential increases in diseases such as COVID-19 and HIV/AIDS.	Contractor/ MU-PIU/ Consultant	15,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Collaborate with local law enforcement to enhance security around construction sites, addressing concerns related to crime, prostitution, and alcohol abuse. Implement security measures within labor camps to ensure the safety of workers and the community. ○ Develop a comprehensive traffic management plan to mitigate the risks associated with increased traffic volume during the construction phase. This includes speed limits, road signage, and coordination with local authorities to enforce safety measures. ○ Conduct regular health impact assessments to monitor and address any emerging health issues within the project area, ensuring a prompt response to potential risks. ○ Properly manage labor camps to ensure adequate living conditions, sanitation facilities, and medical services for imported skilled workers, reducing the likelihood of negative impacts on local communities. ○ Work closely with local authorities to monitor and regulate prices of goods and services to prevent unjustified increases, ensuring that the local community is not adversely affected by inflation. ○ Foster collaboration with local authorities, community leaders, and relevant stakeholders to jointly address emerging challenges, promote transparency, and ensure that the project's social impacts are effectively managed. ○ Creating drainage channels to direct storm water movement.		
8	**Conflicts and grievances**	○ Establish regular communication and engagement channels between the project management team and the local community to address concerns and grievances promptly. ○ Contractor shall develop and implement Grievance Redress Mechanism ○ Develop and communicate clear and accessible grievance mechanisms that allow community members to report issues related to construction worker behavior, dust, and other construction-related problems. ○ Provide training to construction workers on respecting local customs, cultural norms, and codes of conduct. Sensitize them about the importance of maintaining a positive relationship with the community. ○ Implement effective dust and debris control measures to minimize the impact on the local community, such as using dust suppressants, erecting barriers, and scheduling construction activities during less sensitive times. ○ Appoint a community liaison officer responsible for addressing and resolving conflicts and grievances. This individual should serve as a point of contact between the community and the project. ○ Ensure that grievances are addressed promptly to prevent delays in project activities and mitigate potential cost increases.	Contractor/ MU-PIU/ Consultant	6,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
9	**Gender Discrimination**	○ Develop and implement a gender equity policy that promotes equal employment opportunities for women and girls in the project. Ensure that this policy includes provisions to prevent sexual harassment and discrimination. ○ Conduct gender sensitivity training for all project staff, including male supervisors and decision-makers, to raise awareness about gender equality, respect, and the prevention of sexual harassment. ○ Establish confidential and safe reporting mechanisms for cases of sexual harassment and misconduct. Ensure that victims can report incidents without fear of retaliation. ○ Engage with local organisations and support networks to provide assistance and counseling for victims of sexual harassment. Create a safe and supportive environment for those affected. ○ Regularly monitor and enforce the gender equity policy to ensure that employment practices are in compliance. Take immediate action against any instances of sexual harassment or discrimination.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
10	**Child labour**	○ Implement rigorous age verification processes during the hiring of workers to ensure that no one under the age of 18 is employed in project activities. ○ Additionally, investing in community education programs and promoting alternative income-generating activities for adults can help alleviate the socio-economic conditions that often lead to child labor. ○ Collaborative efforts with local authorities, non-governmental organizations, and the community are essential to effectively implement and enforce these mitigation measures. ○ Collaborate with local educational institutions and organisations to promote and support the education of children in the community, ensuring that they are not engaged in project-related work. ○ Conduct awareness campaigns within the community to educate parents and guardians about the importance of children's education and the risks associated with child labor. ○ Develop and enforce a comprehensive Labor Management Plan that explicitly prohibits child labor and outlines consequences for non-compliance.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
ENVIRONMENTAL IMPACTS				
11	**Air pollution due to dust emission and gas from vehicle emission**	○ Implement effective dust suppression techniques, such as using water sprays or dust suppressants on construction sites to minimize the release of fugitive dust. ○ Prioritize the preservation of existing vegetation during construction to reduce the need for extensive clearance, minimizing the disturbance that contributes to dust emission. ○ Cover sand and aggregate stockpiles to prevent wind erosion and reduce the dispersion of particulate matter into the air.	Contractor/ MU-PIU/ Consultant	5,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Opt for construction practices that minimize soil disturbance and dust generation, such as limiting heavy machinery movement. ○ Provide workers with appropriate PPE, including masks and respiratory protection, to safeguard their health against potential exposure to airborne particulate matter. ○ Conduct awareness programs for the local community to educate them about the temporary nature of the air quality impact, its potential health risks, and the implemented mitigation measures. ○ Establish a monitoring system to regularly assess air quality during construction, ensuring that concentrations of PM2.5 and PM10 remain within acceptable limits. ○ Develop a responsive action plan to promptly address any exceedance of emission limits or unexpected air quality issues, ensuring a proactive approach to mitigation. Provide training to construction workers on respecting local customs, cultural norms, and codes of conduct. Sensitize them about the importance of maintaining a positive relationship with the community. ○ Implement effective dust and debris control measures to minimize the impact on the local community, such as using dust suppressants, erecting barriers, and scheduling construction activities during less sensitive times. ○ Appoint a community liaison officer responsible for addressing and resolving conflicts and grievances. This individual should serve as a point of contact between the community and the project. ○ Ensure that grievances are addressed promptly to prevent delays in project activities and mitigate potential cost increases.		
12	**Soil Erosion**	○ Implementing erosion control practices, such as installing silt fences and sediment basins, to prevent soil runoff. ○ Establish ground cover through the planting of grass or ground-covering plants in cleared areas to stabilize soil and reduce erosion. ○ Proper waste management during construction activities is crucial to prevent the introduction of pollutants into water bodies. ○ Additionally, the use of environmentally friendly construction materials and techniques can contribute to minimizing the overall impact. ○ Regular monitoring and enforcement of these measures are essential to ensure their effectiveness in mitigating the negative effects of soil erosion during construction. ○ Modify the construction site design to minimize soil disturbance and erosion risk. For example, use silt barriers around construction sites to contain sediment. ○ Construct sedimentation ponds to capture and treat runoff water, preventing sediment-laden water from reaching nearby water bodies.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Establish trenches to ensure proper flow of storm water during rain seasons to prevent overflow. ○ Continuously monitor erosion control measures to ensure their effectiveness and make necessary adjustments as construction progresses. ○ Provide construction workers with training on erosion control practices to minimize soil erosion risks.		
13	**Impact on change**	○ Develop and implement an emissions reduction plan that includes measures to minimize emissions from construction equipment and vehicles. This may involve using cleaner fuel, employing emission controls, and optimizing equipment. ○ Encourage the use of alternative transportation methods for workers, such as carpooling or public transportation, to reduce the number of vehicles on-site. ○ Utilize energy-efficient and low-emission construction equipment and machinery to reduce greenhouse gas emissions during construction. ○ Implement a monitoring and reporting system to track emissions and air quality during construction. Take corrective actions if emissions exceed predefined limits. ○ Consider participating in carbon offset programs or initiatives to compensate for any unavoidable emissions associated with the project.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
14	**Increased Noise and vibration level**	○ Scheduling construction activities during specific hours to minimize disruption to the community, employing noise barriers or soundproofing technologies, and providing adequate communication to the local residents about the construction timeline and potential disruptions. ○ Vehicles carrying construction materials shall be restricted to work during nighttime only; ○ Implement a construction schedule that restricts noisy activities to specific times of the day when they are least likely to disturb residents, such as avoiding noisy work during nighttime or early morning hours. ○ Utilize construction equipment that produces less noise and dust when possible and ensure that equipment is properly maintained to minimize noise emissions. ○ Establish effective communication channels with nearby residents to inform them of construction schedules and potential noise disruptions. ○ Implementing noise barriers, restricting construction hours, and using equipment with noise-reducing features can help mitigate the impacts of noise pollution. ○ Conducting vibration monitoring and implementing measures to minimize vibrations can also be beneficial.	Contractor/ MU-PIU/ Consultant	4,000,000
15	**Generations of Solid and Liquid Wastes**	○ The proper treatment and disposal of solid and liquid wastes in accordance with government regulations, ○ The use of environmentally friendly construction practices, and regular monitoring to ensure compliance.	Contractor/ MU-PIU/ Consultant	2,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Site housekeeping to minimise solid and liquid wastes generated from construction and other related activities. ○ Develop and implement waste management Plan. ○ All removed soil must be appropriately handled by either leveling it out or depositing it in low-lying or unused borrow areas. ○ Waste will be adequately gathered and transported away from the project site to the designated collection point within the district. ○ Biodegradable waste will be gathered and disposed of by an authorized contractor, then taken to an authorized dumpsite, particularly the Masika dumpsite in Morogoro Municipal Council. Plastics and other materials suitable for recycling will be collected separately and sent for recycling. ○ Consult Environmental Officer from Mvomero District Council/Morogoro Manicipal Council about the suitable waste dumping site. ○ Education and awareness programs for construction personnel and the local community can also contribute to minimizing the environmental and social impact of the project. Additionally, the construction project could invest in innovative technologies for waste management to enhance sustainability and reduce the overall impact on the environment.		
16	**Water Pollution**	○ Implementation of advanced wastewater treatment technologies to ensure the discharged water meets quality standards. ○ Regular monitoring and assessment of water quality, as well as the establishment of contingency plans for potential leaks or spills, are essential components of the mitigation strategy. ○ Implementing proper stormwater management practices, including the installation of sedimentation basins and sediment filters, can help prevent construction-related pollutants from reaching water bodies. ○ Proper storage and handling of construction chemicals and fuels, along with prompt cleanup of any spills, are also essential. ○ Additionally, community education programs can raise awareness about the importance of proper waste disposal practices, fostering a sense of responsibility among residents and reducing the likelihood of negative social impacts associated with water pollution. Engaging stakeholders in the planning and decision-making processes can also enhance the overall effectiveness of mitigation efforts.	Contractor/ MU-PIU/ Consultant	6,000,000
17	**Loss of Visual Aesthetics**	○ Incorporating landscaping plans to minimize the visual intrusion, ○ Ensuring the preservation of key landscape features and implementing lighting strategies to reduce light pollution during nighttime operations.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Additionally, community engagement and awareness programs could be implemented to address social concerns and gather input on aesthetic preferences, potentially leading to adjustments in the project design to better align with the community's values and expectations.		
DEMOBILIZATION PHASE				
1	**Loss of Employment**	○ Establish a transition assistance program to help local workers who will lose their jobs during demobilization. ○ Provide job counseling, training, and support in seeking alternative employment opportunities within the community. ○ Consider offering priority hiring for any ongoing maintenance or monitoring activities related to the WSP.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
2	**Health and Safety Risks**	○ Comprehensive safety training for workers, the implementation of strict safety protocols, and the use of proper equipment to minimize the potential risks associated with the removal of heavy equipment and materials. ○ Develop Health and Safety management plan. ○ Additionally, regular monitoring and reporting mechanisms should be established to ensure ongoing safety throughout the demobilization phases.	Contractor/ MU-PIU/ Consultant	8,000,000
3	**Potential for Noise and Disruption**	○ Develop a detailed demobilization schedule that minimizes noisy activities during sensitive times, such as early mornings or late evenings. ○ Communicate the demobilization schedule and expected noise levels to local residents well in advance to manage expectations. ○ Use noise barriers and soundproofing measures to reduce noise where feasible.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
4	**Waste Generation**	○ Develop a comprehensive waste management plan for demobilization that includes the proper sorting, disposal, and recycling of waste materials. ○ Prioritize the safe disposal of hazardous materials in accordance with environmental regulations. ○ Engage with local waste disposal facilities and ensure that waste is transported and disposed of responsibly. ○ Promote reuse and recycling of construction materials whenever feasible to minimize waste generation.	Contractor/ MU-PIU/ Consultant	N/A Part of its project cost
OPERATIONAL AND MAINTENANCE PHASE				
SOCIAL IMPACTS				
1	**Improved Health and Safety of the community**	○ Implement a comprehensive maintenance plan to ensure the continued effectiveness of the wastewater stabilization ponds. ○ Establish routine monitoring systems to promptly identify and address any potential issues related to facility operation.	MU-PIU	10,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
	members close to the project area	○ Conduct workshops and training programs for local communities on proper waste management practices, emphasizing the importance of continued adherence to guidelines. ○ Promote awareness about the link between proper waste disposal and improved health, encouraging sustainable behaviors. ○ Collaborate with local health authorities to establish ongoing health programs that address the specific needs of the communities. ○ Consider projects like the construction of sanitation facilities and access to clean water sources for a holistic approach to public health. ○ Focus on preventive healthcare measures, such as vaccination campaigns and regular health check-ups. ○ Encourage research initiatives to explore innovative technologies and practices that can enhance the effectiveness of wastewater treatment. ○ Foster collaboration with academic institutions for continuous improvement and adaptation of best practices. ○ Develop and communicate emergency response plans in case of unforeseen incidents or system failures to minimize potential health and safety risks. ○ Conduct drills and simulations to ensure that local authorities and communities are well-prepared for emergencies. ○ Consider the establishment of local committees or partnerships to oversee ongoing operations and community involvement.		
2	**Employment Opportunities**	○ Collaborate with local schools to introduce educational initiatives related to wastewater management, environmental conservation, and sustainable practices. This can create a pipeline of skilled individuals interested in contributing to the project. ○ Provide support for the development of small businesses that can cater to the needs of the facility, such as catering services, transportation, and maintenance. This can stimulate local economic growth and create additional indirect employment opportunities. ○ Implement employee well-being programs to ensure a positive working environment. This can include health and safety initiatives, recreational activities, and ongoing training. ○ Prioritize hiring from the local community to ensure that the immediate residents benefit directly from the project. This can be achieved through collaboration with local employment agencies, community leaders, and educational institutions. ○ Conduct awareness campaigns and informational sessions to inform the local community, particularly students and residents, about the employment opportunities available. This can include workshops, career fairs, and information sessions at local schools to prepare students for potential future roles.	MU-PIU	N/A Part of its project cost

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
3	**Educational Opportunities**	○ Collaborate with local schools and educational institutions to expand the reach of educational programs beyond the initially identified villages. ○ Introduce new topics and modules based on the evolving needs and interests of the community. ○ Establish regular community meetings to involve local residents in the planning and execution of educational programs. ○ Encourage active participation from community members in workshops and training sessions to foster a sense of ownership and sustainability. ○ Implement a contingency plan to continue educational outreach through virtual platforms in case on-site activities are disrupted. ○ Introduce skill development programs that empower community members with practical skills related to environmental science, water management, and sustainable agriculture, ensuring they can continue benefiting even if formal educational programs are temporarily halted. ○ Regularly assess the effectiveness of educational initiatives and make necessary adjustments based on feedback and changing circumstances. ○ Stay informed about advancements in environmental science, water management, and sustainable agriculture to provide cutting-edge knowledge to students and community members.	MU-PIU	N/A Part of its project cost
	Reduced Health Risks	○ Stringent wastewater treatment protocols, regular monitoring, and community education on proper water usage and hygiene practices. These measures can ensure that the positive impact remains sustained, and the potential negative consequences are minimized. ○ Regularly communicate water quality improvements to nearby communities to reinforce the importance of proper wastewater treatment. ○ Establish a mechanism for reporting and addressing any health-related concerns or incidents promptly.	MU-PIU	
4	**Disruption of social economic activities**	○ Effective communication and engagement with the affected communities to minimize inconveniences, scheduling construction activities during non-peak hours, and providing alternative access routes where possible. ○ Establish a community liaison or communication mechanism to keep nearby communities informed about the project's schedule and potential disruptions. ○ Coordinate construction and maintenance activities to minimize disruptions during peak economic or social activities. ○ The implementation of awareness campaigns and compensation measures for affected individuals can help mitigate negative social impacts. Enhancement measures may involve	MU-PIU	N/A Part of its project cost

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		incorporating sustainable practices in construction and maintenance activities to promote long-term positive social outcomes.		
5	**Improved Water Quality**	○ Thorough community engagement, and monitoring during both the operational and maintenance phases. ○ To enhance positive impacts, ongoing community education and involvement in water quality monitoring can be implemented, ensuring the sustained success of the wastewater stabilization ponds. ○ Regular maintenance and oversight should be in place to prevent any potential negative consequences. Overall, a comprehensive and sustainable approach is necessary for ensuring the success of the project and minimizing any adverse effects.	MU-PIU	4,000,000
6	**Water Conservation**	○ Community engagement and education to address concerns related to treated wastewater usage. ○ Implementing robust safety and quality control measures during the operational and maintenance phases is essential to minimize health risks. ○ Continuous monitoring, regular maintenance, and periodic reviews of the wastewater treatment process can ensure the long-term effectiveness and safety of the project. ○ Additionally, ongoing collaboration with local authorities and stakeholders can help address any emerging issues and enhance the positive social impact of the water conservation initiative.	MU-PIU	N/A Part of its project cost
ENVIRONMENTAL IMPACTS				
7	**Foul smell (Odor)**	○ Design and construct the WSP to minimize odor emissions, such as using baffles or covers or vegetation around the WSP to reduce the release of odorous gases. ○ Implement regular maintenance and sludge removal to prevent excessive organic matter accumulation. ○ Conduct odor control measures, such as using odor-neutralizing agents or planting vegetation around the ponds to absorb odors.	MU-PIU	N/A Part of its project cost
8	**Increased Water Pollution**	○ Enhanced treatment processes or additional filtration systems can be employed to reduce the concentration of pollutants in the effluent before discharge. ○ Regular monitoring and testing should be conducted to ensure compliance with water quality standards. ○ Community awareness programs can be initiated to educate the local population about the potential risks and promote responsible water use. Moreover, ○ The implementation of sustainable practices, such as the use of eco-friendly technologies, can contribute to minimizing the long-term impact on the environment.	MU-PIU	5,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
9	**Mosquitoes Breeding**	o Implement mosquito control measures such as the use of larvicides or biological controls to manage mosquito populations and to prevent mosquito breeding in and around the wastewater stabilization ponds. o Maintain proper pond operation and maintenance practices to reduce stagnant water areas that are conducive to mosquito breeding. o Educate the local community about personal protective measures to reduce the risk of diseases transmitted by mosquitoes. o Implement proper maintenance of the ponds to minimize stagnant water areas and control the growth of mosquito larvae. o Use larvicides or biological controls to manage mosquito populations. o Establish proper solid waste management practices to minimize food sources for flies.	MU-PIU	6,000,000
10	**Overflowing of sludge into the surrounding environment**	o Implement advanced design features such as overflow diversion channels and barriers to contain and redirect sludge in case of overflow. o Construct sludge storage facilities with adequate capacity to handle excess sludge during peak periods. o Install real-time monitoring systems to detect sludge levels and anticipate potential overflow. o Implement an automated early warning system to alert operators and relevant authorities in the event of abnormal sludge accumulation. o Establish a routine maintenance schedule for inspecting and cleaning sludge management infrastructure. o Conduct regular inspections of containment structures, pipes, and valves to identify and address potential issues proactively. o Conduct awareness programs for local communities about the risks associated with sludge overflow. o Foster community participation in monitoring activities and reporting unusual observations. o Develop and implement a comprehensive emergency response plan outlining procedures to be followed in the event of a sludge overflow. o Train facility operators and local authorities on emergency response protocols. o Collaborate with local authorities to incorporate the project into regional land-use plans, ensuring that potential impacts on agriculture and water sources are considered. o Avoid locating the facility in areas with high agricultural significance. o Integrate green infrastructure, such as vegetative buffers and wetlands, to naturally filter and absorb potential contaminants from sludge before reaching agricultural lands or water sources. o Establish mechanisms for ongoing communication with affected communities through regular meetings and feedback sessions.	MU-PIU	8,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Develop a grievance mechanism to address concerns raised by community members promptly. ○ Provide training to local farmers on sustainable agricultural practices and soil conservation to minimize the impact of potential sludge contamination. ○ Enhance the capacity of local water management committees to monitor water quality. ○ Support research initiatives to explore innovative technologies for sludge management that minimize environmental impacts. ○ Stay informed about advancements in wastewater treatment and implement relevant upgrades as necessary.		
DECOMMISSIONING PHASE				
SOCIAL IMPACTS				
1	**Disruption to Local Community**	○ Establish effective communication channels with the local community to inform them about the decommissioning activities, expected disruptions, and timelines. Provide regular updates and address community concerns promptly. ○ Implement noise and dust control measures, such as using quieter equipment, scheduling noisy activities during daytime hours, and applying dust suppressants to minimize inconvenience to residents. ○ Develop a traffic management plan to minimize congestion and ensure the safety of both residents and workers. Use signage and designated routes to guide construction and removal traffic. ○ Additionally, involving the community in the planning process and seeking their input can contribute to a more harmonious decommissioning phase.	MU-PIU	N/A Part of its project cost
2	**Loss of Community Assets**	○ Engaging the community in the decommissioning planning process, seeking alternative locations for recreational activities, and documenting cultural significance before decommissioning. ○ Enhancement measures may involve creating new community spaces or facilities and implementing educational programs to raise awareness about the benefits of advanced wastewater treatment methods.	MU-PIU	N/A Part of its project cost
3	**Health and Safety Concerns**	○ Develop and enforce stringent health and safety protocols for workers, including the proper handling of hazardous materials and protective gear. Regularly train workers on safety procedures. ○ Workers should be equipped with appropriate protective gear, and the community should be informed and involved in the decommissioning process. ○ Develop and implement Health and Safety Management Plan	MU-PIU	10,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Establish a robust emergency response plan to address any accidents or hazardous material releases promptly. Ensure that local residents are aware of this plan and know how to respond in case of an emergency. ○ Enhancements could involve the implementation of advanced technologies to minimize the release of hazardous substances and the promotion of sustainable practices during and after decommissioning. ○ Regular training programs on safety measures should be conducted to ensure the well-being of both the workforce and the community.		
4	**Improved Water Quality**	○ Careful planning to minimize environmental disruption, proper disposal of sludge and waste, and implementation of erosion control measures. ○ Additionally, enhancement measures could involve the restoration of natural habitats in the affected areas to promote ecological resilience. ○ Community engagement and awareness programs may also be implemented to ensure that local communities understand the positive long-term benefits of the decommissioning process and participate in its success.	MU-PIU	N/A Part of its project cost
ENVIRONMENTAL IMPACTS				
5	**Release of Contaminants**	○ Develop a comprehensive plan for handling and disposing of contaminants from the wastewater stabilization ponds. This plan should include measures for the safe removal, transportation, and disposal of hazardous materials. ○ Implement containment measures, such as impermeable liners or barriers, to prevent the spread of contaminants during decommissioning. ○ Continuously monitor water quality in nearby water bodies to detect any signs of contamination promptly.	MU-PIU	5,000,000
6	**Water pollution**	○ The implementation of advanced wastewater treatment technologies to ensure the proper removal of pollutants before discharge. ○ Establishing monitoring programs to regularly assess water quality and implementing measures to contain and manage any accidental spills or leaks during the decommissioning process are crucial. ○ Educational outreach and community engagement programs can enhance awareness about the importance of responsible wastewater management practices and foster a sense of environmental responsibility among the local population. ○ Collaborating with relevant regulatory bodies to ensure compliance with environmental standards and regulations is also essential for minimizing the negative impact on social and ecological systems.	MU-PIU	6,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
	Soil pollution	o The implementation of proper waste disposal procedures, such as secure containment and treatment of sludge, to prevent soil contamination. o Additionally, soil remediation techniques, such as phytoremediation or soil amendments, can be employed to enhance the recovery of affected areas. o Public awareness campaigns and community involvement can contribute to responsible waste management practices, ensuring the long-term health of the soil and surrounding environment. o Regular monitoring and assessment of soil quality should be conducted to track the effectiveness of mitigation measures and make adjustments as necessary.	MU-PIU	4,000,000
7	**Air pollution**	o Install and utilize effective emission control systems during the decommissioning process to capture and treat airborne pollutants. This may include the use of filters, scrubbers, and other technologies to minimize the release of contaminants into the air. o Implement a comprehensive waste segregation plan to separate materials that can be recycled from those that need disposal. Recycling reduces the need for combustion, minimizing air pollution associated with the burning of waste materials. o Explore alternative disposal methods, such as incineration with energy recovery or safe burial, that minimize the release of pollutants into the air. This may involve choosing methods that have lower environmental impacts and are consistent with regulatory standards. o Implement dust control measures, including the use of water sprays or other suppressants, to minimize the dispersal of particulate matter during the decommissioning activities. o Prioritize the prompt removal and safe disposal of hazardous materials to prevent their release into the air during decommissioning. o Establish a robust environmental monitoring program to regularly assess air quality during the decommissioning phase. This will allow for early detection of any deviations from acceptable standards, enabling prompt corrective actions.	MU-PIU	4,000,000
8	**Noise and vibration pollution from demolishing works**	o Restrict demolition activities to specific time periods during the day when noise impact is likely to be less disruptive, such as during normal working hours. This can help minimize the disturbance to both site workers and residents. o Inform and engage with residents and workers in the surrounding areas about the timing and nature of the demolition work. Providing regular updates and addressing concerns can contribute to better community understanding and cooperation. o Implement a comprehensive air quality monitoring system to track the emission of dust particles during demolition. This can help identify any exceedances of air quality standards and trigger immediate corrective actions.	MU-PIU	4,000,000

S/N	Impacts	Mitigation/ Enhancement Measures	Responsible Part	Estimated Cost (Tzs)
		○ Dust suppression techniques, such as water spraying or misting systems, to control the release of dust particles into the air. This can help mitigate the impact on air quality and reduce potential health hazards. ○ Provide site workers with appropriate PPE, such as masks or respirators, to minimize their exposure to airborne particulate matter and protect their health during the demolition activities. ○ Ensure strict adherence to local regulations and standards related to noise and air quality during demolition. This includes obtaining necessary permits and approvals, as well as complying with established limits for noise and air pollutant emissions.		
Total				**118,000,000**

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MONITORING PLAN

8.1 Introduction

Monitoring refers to the systematic collection of data through a series of repetitive measurements over a long period of time to provide information on characteristics and functioning of environmental and social variables in specific areas over time. There are four types of monitoring that are relevant to this ESIA.

- **Baseline monitoring**: the measurement of environmental parameters during a pre-project period and operation period to determine the nature and ranges of natural variations and where possible establish the process of change.
- **Impact/effect monitoring** involves the measurement of parameters (performance indicators) during establishment, operation and decommissioning phase in order to detect and quantify environmental and social change, which may have occurred as a result of the project. This monitoring provides experience for future projects and lessons that can be used to improve implementation methods and techniques.
- **Compliance monitoring**: takes the form of periodic sampling and continuous measurement of relevant parameter levels for checking compliance with standards and thresholds – e.g., for waste discharge, air pollution.
- **Mitigation monitoring** aims to determine the suitability and effectiveness of mitigation programs designed to diminish or compensate for adverse effects of the project.

Among the key issues to be monitored will be: (i) the status of the biological conditions; (ii) status of the physical works; (iii) the technical and environmental problems encountered; (iii) proposed solutions to the problems encountered; and (v) the effectiveness of environmental and social measures adopted.

To ensure that mitigation measures are properly done, monitoring is essential. Table 10.1 provides details of the attributes to be monitored, frequency, and institutional responsibility and estimated costs. These costs are only approximations and therefore indicative. Costs that are to be covered by the developer are to be included in the project cost.

8.2 Monitoring Frequency and reporting

Monitoring frequency is proposed for each critical parameter depending on the likelihood and level of change over time. Some parameters take longer time to show changes while others would change in very short time. Ambient air levels of pollutant gases in and around the project should be measured annually. Air emissions should be monitored after the air pollution control device for particulate matter (or alternatively an opacity level of less than 10%). Frequent sampling for parameters should be undertaken during start-up and continue throughout the operation and demobilization phase. Some monitoring may have to continue even beyond demobilization for impacts such as effects of the wastewater discharged into the environment.

Other parameters such as income, revenue, employment, changes in livelihoods, use of resources (water, energy) and changes in norms and values will be monitored on annual basis, so as to allow for change to take place.

Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions should be taken. Proponent is required

to maintain records of air emission, effluents, hazardous waste sent off site as well as other parameters, fires, emergencies, accidents, and ill health that may impact on the environment or workers. Records of monitoring results should be kept in an acceptable format and easily accessible, and information reviewed and evaluated to improve the effectiveness of the environmental protection.

8.3 Monitoring Plan

The proposed Environmental and Social Monitoring Plan (ESMoP) (Table 8.1) will be used by the proponent or the hired consultant for monitoring the proposed facilities during construction period and contains the following;

- The predicted impacts to be monitored as per schedule.
- Main parameters to be monitored.
- The sampling area.
- Where possible units or methods to be applied are indicated.
- The levels or target standards to be observed are also shown.
- The approximate costs. However, costs might change with the fluctuations of the shilling and cost escalations.

Table 8.1: Proposed Environmental and Social Monitoring Plan (ESMP) for mobilization/planning phase, construction phase, demobilisation phase and operation phase, and decommissioning phase.

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
MOBILIZATION AND CONSTRUCTION PHASE							
Influx of people/ labour	Number of people	○ Measure changes in the local population density during the mobilization and construction phase. ○ Monitor the demand for housing and assess the availability of accommodation for incoming workers. ○ Ensure that the influx does not lead to overcrowding or inadequate living conditions. ○ Monitor changes in traffic patterns and transportation infrastructure during construction. ○ Track the number of local residents employed during the construction phase. ○ Track the use of natural resources (water, energy, etc.) during the construction phase. ○ Monitor the capacity of local social services (healthcare, education, etc.) to accommodate the increased population. ○ Address any strain on existing social services to ensure the well-being of both the existing and incoming population.	Weekly	Inspection	N/A	Consultant/ MU-PIU / LGA	1,000,000
Community Health, Safety and Security impact	Inspection of the emergency and detection systems;	○ Number and nature of incidents related to health, safety, or security within the community. ○ Severity and response time to address reported incidents.	Weekly	Inspection	N/A	Consultant/ MU-PIU / LGA	3,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
	- Inspection of available health facility in the dispensary	○ Number and nature of incidents related to health, safety, or security within the community. ○ Severity and response time to address reported incidents. ○ Number and nature of incidents related to health, safety, or security within the community. ○ Severity and response time to address reported incidents. ○ Number and nature of incidents related to health, safety, or security within the community. ○ Severity and response time to address reported incidents. ○ Establishment of a feedback mechanism for the community to express concerns related to health, safety, and security. And analysis of feedback received, and actions taken in response					
Health and Safety Risks	- Number and type of safety equipment such as mask, helmet gloves and earplugs	○ Ongoing surveillance of construction activities to identify and mitigate potential hazards to both workers and the surrounding community. ○ Regular site inspections, safety audits, and the enforcement of safety protocols to ensure compliance with health and safety standards. ○ Emergency response plans should be in place, and incidents should be documented and analyzed for continuous improvement. ○ Community engagement should be implemented, with feedback mechanisms to	Quarterly	Inspection; Voluntary testing;	WHO/OSHA standards	Consultant/ MU-PIU	5,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
		address any health and safety concerns raised by local residents					
Traffic Congestion	Number of accidents or near miss	○ Regular monitoring of road infrastructure, traffic flow, and accident occurrences ○ Monitoring team will analyze data on traffic volume, road conditions, and incidents to identify trends and potential risks associated with the increased activity during the mobilisation phase.	Daily	Observation	No traffic/Accidents	Consultant/ MU-PIU	2,000,000
Conflicts and grievances	Number of meetings held during the mobilisation Phase and throughout the project Phases. -Number of complains and Incidences	○ Regular monitoring of community feedback, conducting stakeholder consultations, and maintaining open communication channels to promptly address and resolve any disputes. ○ The monitoring team will document and analyze reported conflicts, implementing mitigation measures as necessary, and ensuring that grievance resolution is fair, transparent, and culturally sensitive	Weekly	-Observation of records of complains -Analyse records of workers and community grievance	No complains	Consultant/ MU-PIU	2,000,000
Gender discrimination	Number of men and women employed	○ Ongoing data collection on the number of male and female workers employed, their job roles, and the wages they receive. ○ Assessing the working conditions to guarantee a safe and inclusive environment for all genders. ○ Periodic reviews should be conducted to identify any gender-specific challenges or issues that may arise during the construction activities	Monthly	Observation of records of complains	No Violations and harassments to vulnerable groups	Consultant/ MU-PIU	2,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
Child labor	-Adherence to and implementation of child labor policies on the construction site. -Verification of the age of all workers on the construction site. -Availability and participation of school-aged children in educational programs.	○ Regular audits and assessments to verify compliance with local and international child labor regulations. ○ Regular checks and documentation of workers' ages through official identification documents. ○ Regular monitoring of the enrollment and attendance of children in nearby schools during the construction phase. ○ Regular assessment of the effectiveness of awareness campaigns within the project's vicinity. ○ Evaluation of the incorporation and effectiveness of child labor prevention training in the overall workforce education.		Inspection	Compliance of local and international child labor regulations	Consultant/ MU-PIU	N/A
Air pollution due to dust emission and gas from vehicle emission	Measurement of ambient gaseous (Noxious gasses (CO, CO_2, NO, NO_X, SO_X)) and particulate matter (PM_{10} & $PM_{2.5}$)	○ The continuous measurement and analysis of emissions from construction activities that may release noxious gases into the atmosphere. ○ Monitoring stations will be strategically placed to capture data on air pollutants, and real-time monitoring devices will be employed to track levels of harmful gases. ○ Frequent inspections of dust control measures, such as water spraying and dust suppression systems, to ensure their effectiveness.	Quarterly	Measurement of ambient gaseous	TBS / WHO Standard	Consultant/ MU-PIU	3,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
		○ Real-time monitoring tools and periodic site visits will be employed to promptly identify any exceedances of acceptable dust levels through visual inspection. Also, the data collected shall inform timely corrective measures and adjustments to mitigate the impact of dust emissions on air quality, safeguarding both the environment and the well-being of the local community. ○ Periodic site inspections and air quality assessments to ensure compliance with established environmental standards and regulations. ○ If elevated levels of noxious gases are detected, immediate corrective actions should be implemented to mitigate the impact, and adjustments to construction practices may be made to minimize air pollution.					
Soil Erosion	-Regular checks on the effectiveness of sedimentation basins and barriers - Assessment of erosion control measures in place (e.g., check dams, silt fences, cover crops).	○ Sedimentation basins and barriers are installed to trap and control sediment runoff. Regular inspections will ensure they are functioning as intended. ○ Ensure that erosion control measures are installed and properly maintained to minimize soil erosion during construction activities. ○ Monitoring the establishment and maintenance of vegetative cover in disturbed areas. ○ Regular inspections by environmental and construction management teams to identify and address any erosion issues promptly.	Quarterly	Inspection	Loose soils and bare soils protected from erosion	Consultant/ MU-PIU	3,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
	- Participation in training programs on erosion control for construction personnel.	○ Construction contractors should provide regular reports on the status of erosion and sedimentation control measures, including any incidents and corrective actions taken.					
Water pollution due to oil/fuel leakage from vehicles and construction equipment	-Number of reported oil and fuel spill incidents. - Volume of oil and fuel spilled. - Time taken to respond to and address oil and fuel spill incidents. -Percentage of oil and fuel cleaned up after a spill incident.	○ Regular reporting and recording of any spill incidents. ○ Regular assessment and measurement of the quantity of spilled oil/fuel in case of incidents. ○ Measure the time between the occurrence of a spill incident and the initiation of response and cleanup activities. ○ Assess the effectiveness of response measures in terms of the percentage of spilled oil/fuel successfully cleaned up.	Daily	Observation	No spillage of oil/fuel	Consultant/ MU-PIU	2,000,000
Noise generation	Day and night noise levels	○ The use of sound measuring devices positioned strategically across the construction site and its immediate surroundings. ○ Track variations in noise levels to ensure compliance with established environmental regulations and standards. ○ Identification and implementation of mitigation measures if noise levels exceed permissible limits.	Monthly	Inspection	In compliance with WB and TBS standards: • Daytime noise levels < 60 dB • Night-time noise levels < 50 dB	Consultant/ MU-PIU	2,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
Solid and liquid waste generation	Solid and Liquid waste (Kg for Solid waste, Litres for Liquid waste)	○ Continuous observation and documentation of waste disposal practices, both solid and liquid, to assess their impact on the surrounding environment. ○ Routine inspections, data collection on waste quantities and types, and verification of adherence to waste management protocols. ○ Immediate corrective measures should be implemented if any deviations or non-compliance are identified, with ongoing reporting and communication to stakeholders to maintain transparency throughout the construction phase.	Weekly	Observation	Environmental compliance with The Environmental Management (Solid Waste Management) Regulation, 2009 as amended in 2016	Consultant/ MU-PIU	3,000,000
OPERATIONAL AND MAINTENANCE PHASE							
Foul smell (Odor)	Foul smell	○ Define a scale to measure the intensity of foul smells emitted from the wastewater stabilization ponds. ○ Establish monitoring points at different locations within and around the facility to assess the dispersion of odors. ○ Define a scale to measure the intensity of foul smells emitted from the wastewater stabilization pond. ○ Establish monitoring points at different locations within and around the facility to assess the dispersion of odors. ○ Establish a mechanism for the community and nearby residents to report instances of foul smells. ○ Keep a record of complaints and feedback to identify trends and areas that may require additional mitigation measures.	Quarterly	Observation/Inspection	No smell	MU-PIU	2,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
		○ Conduct regular assessments to identify specific sources of odors within the wastewater stabilization ponds.					
Mosquito Breeding		○ Establish a baseline mosquito population density in the project area before the facility becomes operational. ○ Regularly assess and monitor potential mosquito breeding habitats in and around the wastewater stabilization ponds. ○ Identify and address any stagnant water bodies, pools, or areas with poor drainage that could serve as breeding grounds for mosquitoes. ○ Conduct routine water quality tests in the stabilization pond to ensure that the water is treated effectively and does not create suitable conditions for mosquito breeding.	Quarterly	Observation/Inspection	No mosquito nuisance	MU-PIU	5,000,000
Water pollution	Overflow and measurement of Water parameter. (BOD, COD, TSS, NH3-N, Total Phosphorus (TP), pH, Dissolved Oxygen, Turbidity, Chlorine & Heavy metal	○ Regular testing for COD levels in the effluent to measure the amount of organic pollutants present. ○ Monitoring BOD levels to assess the impact on aquatic ecosystems. ○ Measuring the concentration of suspended solids in the effluent. ○ Monitoring concentrations of nitrogen and phosphorus, common pollutants that contribute to nutrient pollution. ○ Regular measurement of pH to ensure it falls within acceptable ranges, preventing adverse effects on aquatic life.	Quarterly	Measurement of treated effluent	Physical Components Below 30 mg/L of BOD5 at 20°C using TZS 861 (Part 3):2006 Five Day BOD method 100mg/L TSS using TZA 861(Part 1):2006 Gravimetric Method pH range of 6.5-8.5 using TZS 861(Part2):2006 –	MU-PIU	6,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
		○ Monitoring the flow rate of wastewater through the system to ensure it aligns with design parameters and prevents overloading. ○ Monitoring the time, it takes to respond to and address equipment failures to minimize potential environmental impacts. ○ Establishing a mechanism for community members to report any observed issues related to water pollution and addressing these concerns promptly.			Electrometric Method Inorganic Components Below 0.1mg/L Pb using TZS 861(Part 7):2006 Flame Atomic Absorption Spectrometry - Below 500mg/L		
Overflowing of sludge into the surrounding environment	Overflow	○ Monitor the effectiveness of overflow prevention measures such as berms, diversion channels, and other engineering controls. ○ Regularly inspect and maintain these measures to ensure they remain functional and can prevent sludge overflow into the surrounding environment.	Annually	Observation/Inspection	N/A	MU-PIU	10,000,000
DECOMMISSIONING PHASE							
Health and Safety Concerns	Number and type of safety equipment such as mask, helmet gloves and earplugs	○ Track and document any incidents related to health and safety during the decommissioning phase. This includes accidents, injuries, or any unexpected events that may pose a risk to the health and safety of workers, community members, or the environment. ○ Monitor the use of personal protective equipment by workers involved in the decommissioning process. Ensure that appropriate PPE, such as helmets, gloves,	Weekly	Inspection; Voluntary testing;	Zero incidence/ accident	MU-PIU	7,000,000

Potential Impacts	Monitoring Indicator	Monitoring Action	Monitoring Frequency	Means of verification	Target level/ Standards	Responsibility	Estimated cost (TZS) per annum
		masks, and safety boots, is worn consistently to minimize the risk of occupational hazards.					
Air pollution	Measurement of ambient gaseous (Noxious gasses (CO, CO_2, NO, NO_X, SO_X)) and particulate matter (PM_{10} & $PM_{2.5}$)	○ Implement air quality monitoring measures to assess potential exposure to harmful substances or dust particles released during decommissioning activities. This can involve the use of air quality sensors to detect and measure pollutants in the air.	Quarterly	Measurement of particulate matter and ambient pollutant gases	TBS / WHO Guidelines • SO2< 0.5mg/m3 • CO < 10 - 30mg/m3 CO2 <500-600 • NOx< 0.12-0.2	MU-PIU	4,000,000
Total							**64,000,000**

CHAPTER 9: COST BENEFIT ANALYSIS

9.1 Introduction

Cost Benefit Analysis (CBA) is the systematic process for calculating and comparing absolute costs and benefits of Business Resources. Costs and benefits are expressed in concrete monetary terms. The evaluation is often argumentative. However, CBA is a general method of project evaluation. This chapter describes the cost-benefit approach and estimation methods for the major costs and benefits of the proposed project. Cost benefit analysis estimates and compares the total benefits and costs of a project to the members of a specified community and project owner. CBA may be conducted at various geographical levels (international, national, state or regional). Critically, the principles and methods of CBA are the same at any spatial level. However, impacts that are transfers within one spatial level, such as the nation, may be benefits or costs at another spatial level, for example at regional level.

9.1.1 Relevance and challenges

Determining whether the proposed project is feasible in absolute terms benefits should outweigh the costs. The relevance and challenges of quantifying CBA lies within its relevance for business operations; help to compare and prioritize measures and identify the most suitable project if comparison has to be made. However, not all data/information necessary for the assessment is readily available to allow for an accurate and comprehensive assessment.

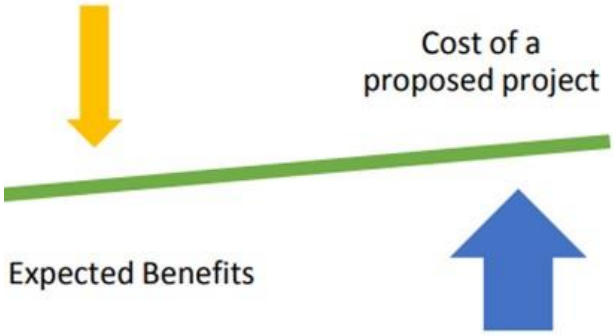


Figure 10.1: Cost and Benefit Analysis for CBA (Source: Author works through Google)

This section aggregates the costs and benefits as well as describes the following:

a. **Costs:**
   - Project investment
   - Environment
   - Socio-economic

b. **Benefits:**
   - Income
   - Environment
   - Socio-economic

9.2 Estimated Environmental and Social cost related to the project.

According to Chapters 8 and 9, the expected annual expenses for adopting enhancement measures, impact management, and monitoring processes are around TZS 182,000,000. The environmental costs could not be precisely calculated; hence they are not included in the anticipated expenditures

for mitigation. The expenditures for these will also be short term because some of the affects won't be seen until the construction phase, especially if mitigation measures are fully adopted. Bills of Quantities contain comprehensive information on the construction expenses for each project.

9.2.1 Environmental cost

Analysis of environmental cost-benefit tradeoffs is evaluated in terms of both adverse and advantageous effects. The examination also takes into account whether the effects are reversible and whether the associated expenses are reasonable. The annual costs for monitoring and mitigating the indicated consequences are TZS. 64,000,000 and TZS. 118,000,000, respectively.

9.2.2 Community cost

The neighboring communities will bear the costs of the project's adverse environmental and social effects, such as noise pollution, deteriorated air quality, and safety and health hazards. But the use of mitigating strategies will lessen the expected effects. Other than the aforementioned, no other community events will be interfered with. MU is dedicated to reducing the detrimental effects on society and the environment.

9.2.3 Government cost

Through the Ministry of Education, Science and Technology (MoEST), the Government of the United Republic of Tanzania has obtained funding from the World Bank to support higher education as a driving force in the country's emerging economy. The project aims to revive the crucial areas for innovation, economic growth, and relevance to the labor market. Additionally, as was already noted, taxes collected during both project phases will help the government both directly and indirectly. In addition to increasing tax revenue, the investment will boost corporate development, industrialization, and economic growth.

9.3 Benefits related to the proposed project.

The proposed project at the university brings about direct and indirect benefits to the university, neighboring community, and the government. However, the primary benefits of the project can be further categorized as direct and indirect. While construction projects of WSP may have negative impacts, they are generally higher compared to the positive benefits. Certain impacts resulting from the project cannot be precisely quantified and therefore cannot be included in benefit-cost analysis estimations. Overall, the benefits of the project are evident throughout all phases, including mobilization, construction, operation, and decommissioning. These benefits include environmental protection from wastewater, public benefits, revenue generation, and multiplier effects that create linkages with the local and national economy.

a) Direct Benefits

The project's implementation will result in numerous employment prospects, provide educational and research opportunities for different students, it facilitates wastewater treatment, generate entrepreneurial opportunities for the local community, and contribute to the growth of agricultural activities due to the reuse of treated effluent, also WSP it ensures sustainability and cost-effectiveness compared to other wastewater treatment plants. Many of these intangible benefits directly benefit the stakeholders involved in the project.

b) Indirect Benefits

The proposed project brings about indirect advantages, primarily seen in the form of environmental protection, educational opportunities, Water conservation and Aesthetic Enhancement of MU environment. It's important to note that the specific benefits may vary depending on the design, operation, and maintenance of the wastewater stabilization pond at MU. Regular monitoring and adherence to best practices are crucial to ensure optimal performance and maximize the indirect benefits associated with the system.

9.3.1 Benefits to MU

The proposed project will bring long-lasting benefits to MU throughout its lifespan. WSP can offer benefits to MU in terms of environmental sustainability, cost savings, educational opportunities, community outreach, water conservation, and regulatory compliance. The project will support MU in delivering high-quality education, conducting impactful research, and providing valuable public services. It will also contribute to the university's reputation and image, offering intangible benefits.

9.3.2 Benefits to the Local Community

The proposed project of WSP at MU benefits the local community by improving water quality, enhancing health and sanitation, preserving the environment, promoting sustainable development, create economic advantages and providing education and research opportunities. Through these benefits, the project contributes to the overall well-being and prosperity of the community, fostering a healthier and more sustainable future for all the necessary skills and experience.

9.3.3 Benefits to the Government

The project is expected to bring various benefits to the government. The project aligns with the government's commitment to sustainable development and environmental protection. By treating and managing wastewater effectively, the project helps to reduce pollution and safeguard local water bodies and ecosystems. This contributes to a healthier and more sustainable environment for communities in the region.

Furthermore, the project addresses public health concerns. Proper wastewater treatment significantly reduces the risk of waterborne diseases, protecting the health and well-being of people. Consequently, the government can allocate fewer resources to healthcare interventions related to waterborne illnesses, leading to potential cost savings and improved overall public health outcomes.

9.4 Conclusion on Cost Benefits Analysis

The project's environmental and social costs are relatively low in value when compared to the benefits it will bring. The option of not proceeding with the project is rejected as it is necessary and desirable to have institutions that help in delivering high-quality education, conducting impactful research, and providing valuable public services. The project will directly promote investment in different businesses and services, as well as improve Tanzania's reputation as a preferred investment destination. These factors will create more employment opportunities for Tanzanians and contribute to poverty eradication efforts. Therefore, the implementation of the project will bring overall benefits to the country.

CHAPTER 10: DECOMMISSIONING PLAN

10.1 Preliminary Decommissioning Plan

The project is anticipated to last for 99 years, and this document outlines an initial decommissioning plan. The plan aims to establish practical decommissioning approaches that can be executed safely, without endangering the public's health and safety, decommissioning personnel, or causing harm to the environment. It adheres to the guidelines and regulations set by relevant regulatory agencies. The purpose of this preliminary decommissioning plan is to ensure that the decommissioning and final disposition of the project though it's not expected to happen are taken into account during the project's initial design phase.

This preliminary plan will remain a dynamic document and undergo revisions throughout the operational life of the project. Regular reviews and updates will be conducted to incorporate any changes in facility construction or operation that may impact the decommissioning process.
The Contractor will be required to prepare a detailed Demolition Plan and Construction Management Plan to the satisfaction of the proponent and relevant Authorities prior to the commencement of works on site.

10.2 Objectives of the Plan

The initial plan aims to prioritize the inclusion of decommissioning as a crucial factor right from the beginning of the project, throughout the design phase, and during the operation phase. The plan serves the following objectives:

- The primary objective of the preliminary plan is to ensure that designers of the WSP are fully aware of decommissioning requirements during the initial project design. This means that if there are design options available for materials, system components, and component locations that can enhance decommissioning, those choices should be made.
- Another goal of the preliminary plan is to identify the potential decommissioning options and the final status of the WSP facility. These options will be evaluated and narrowed down to the preferred decommissioning method as the end of the project lifespan approaches.
- The final purpose of the preliminary plan is to demonstrate to regulatory agencies that important considerations regarding decommissioning are taken into account as early as possible during the initial project design.
- Additionally, the plan serves as a starting point to showcase various aspects related to decommissioning, such as methods, costs, schedules, and the operational impact on the infrastructure facilities.
- The plan acts as the initial reference to show that aspects like decommissioning techniques, expenses, timelines, and operational effects on decommissioning will undergo continuous evaluation and improvement throughout the operational lifespan.

The plan will outline feasible decommissioning methods for the project, providing a general description. This description should demonstrate the practicality of the considered methods and their ability to ensure the health and safety of the public and decommissioning personnel. Design personnel should thoroughly examine the proposed decommissioning methods and take measures to incorporate design features that will facilitate the decommissioning process. Key considerations include:

a. Estimating the required manpower, materials, and costs to support the decommissioning activities.

b. Describing the intended final disposition and status of the plant and site after decommissioning.
c. Discussing the commitment to allocate adequate financing for the decommissioning process.
d. Identifying the necessary records to be maintained throughout the construction and operation phases that will aid in decommissioning, such as a complete set of "as built" drawings.

10.3 Preliminary Plan

10.3.1 Project Removal Methodology and Schedule

The Proponent is responsible for financing and carrying out all aspects of project decommissioning, which includes engineering, environmental assessment, permitting, construction, and mitigation activities related to the removal of the WSP facilities, as outlined in this Plan. The Proponent must also address the environmental impacts during and after the project removal by promptly responding to defined events during the monitoring phase.

Furthermore, the university is obligated to safely remove the facilities and its accompanying structures in a manner that:

- Minimizes any adverse environmental effects.
- Meets the company's obligations under the Environmental Management Act (2004).
- Restores the site to a condition suitable for various uses.
- Pays all outstanding dues to workers, the government, suppliers, and other relevant parties.

The process of project removal will commence six months after closure and extend for a period of 2 years. During the initial six months following closure, the proponent will conduct an inventory of all components requiring removal or disposal. This inventory will encompass the identification of WSP facilities, to be demolished. Additionally, the method of disposal will be finalized. This information will be crucial for the development of the final decommissioning plan, which will then undergo approval by NEMC.

Upon approval of the decommissioning plan, the removal of some facilities will be prioritized within the first month to prevent any potential vandalism. Subsequently, in the second month of the decommissioning process, the focus will shift towards removing concrete foundations. The resulting debris will be repurposed as fill material for rural roads.

10.3.2 Component to be demolished.

The elements of the project that need to be demolished are typically built using load-bearing masonry walls along with roofs made of steel or timber frames, as well as metal roofs.

1. **Ponds and other infrastructure**
   - All construction materials equipment will be dismantled and secured to ensure safety. The areas previously occupied by these infrastructures will be restored and replanted with vegetation as necessary.
   - Equipment that is no longer functional will be sold through an auction process to scrap dealers.
   - The future utilization of the water pipeline will be determined in collaboration with the National and District Closure Committees. The project aims to transfer the pipeline infrastructure to the district for its ongoing use.

All disturbed areas will be landscaped and re-vegetated using indigenous trees.

11.3.3 Decommissioning Phase

Project decommissioning has five phases:

- Pre-removal monitoring;
- Permitting;
- Interim protective measures;
- Project removal and associated protective actions; and
- Post-removal activities, including monitoring of environment and socio-economic activities.

The initial three phases will occur before the Project is removed, specifically within the first six months. The fourth phase, which involves the removal of the project and necessary protective measures, will take place six months after project closure. The fifth phase will commence after complete removal of the project, and due to its medium scale and relatively moderate impacts, it will continue for at least two years.

The following description outlines the activities that will occur in each phase:

a. **Pre-removal monitoring:** This phase involves assessing the environmental and socio-economic conditions of the project and its surroundings. The purpose is to identify any environmental or social liabilities that need to be addressed before obtaining closure permits. Additionally, this period will include inventorying all assets and facilities that require disposal and preparing a final decommissioning plan for approval by the National Environment Management Council (NEMC).

b. **Permitting:** The proponent will acquire all necessary permits required for the project's removal. This includes permits from MoEST, TCU, NEMC, Local Government Authorities, and others as necessary.

c. **Interim Protective Actions:** This phase focuses on implementing any interim measures necessary to safeguard human health and the environment during the removal process.

d. **Project Removal:** As mentioned earlier, the project will be completely removed within a six-month timeframe.

e. **Post-Removal Activities:** Following the project's removal, monitoring activities will continue for a period of two years to assess any lingering impacts.

Detailed information regarding the decommissioning of the project and its associated impacts, as well as proposed measures to restore the site to its former state, are provided in Table 10.1. The estimated cost for the decommissioning plan is TZS 100,000,000, which is subject to change based on currency value and other economic factors at that time.

Table 10.1: Decommissioning and Closure Plan

Activity	Closure Plan	Responsibility	Estimated Budget
Take apart all the equipment and dismantle the structures.	○ Consult with (RUWASA /MORUWASA) to disconnect the pipeline supply for the WSP project. ○ All concrete will be demolished. ○ Warning signs will be displayed, and a fence will be erected around all area of WSP. ○ Qualified engineers will supervise all disassembling and demolition activities. ○ The Closure Committee will oversee and monitor all closure activities to ensure proper execution.	MU and Closure Committee	20,000,000

	○ Technical assistance during the closure phase will be sought by consulting relevant stakeholders.		
Personal Protective Equipment (PPE)	○ During the closure phase, it is mandatory for all workers to wear suitable personal protective equipment (PPE) such as a helmet, safety boots, dust mask, safety gloves, goggles, protective garments, and a safety vest.	MU and Closure Committee	10,000,000
Waste Management	○ During the closure phase, proper waste sorting will be implemented for efficient management. ○ A review process will be established to regularly update the waste management plan to adapt to changes in WSP plans, schedules, community standards, and recognized best practices. ○ Instead of being dumped on land, debris can be utilized to fill feeder roads, providing an alternative use. ○ All hazardous wastes discovered during the decommissioning of the WSP will be cleaned up and disposed of in accordance with regulations. ○ The closure committee will ensure that no waste is disposed of in water bodies.	MU and Closure Committee	20,000,000
Rehabilitation of project site	○ A suitable re-vegetation plan will be executed to restore the site to its original condition. ○ Measures will be implemented during the vegetation period to control surface water runoff and prevent erosion. ○ Regular monitoring and inspection of the area will be carried out to identify any signs of erosion, and necessary actions will be taken to rectify any occurrences. ○ Fencing and signage will be installed to limit access and minimize disturbances in newly vegetated areas.	MU and Closure Committee	50,000,000
Total			**100,000,000**

CHAPTER 11: SUMMARY AND CONCLUSION

11.1 Summary

The Environmental and Social Impact Assessment (ESIA) report for the proposed wastewater stabilization pond project at MU has been completed. The project aims to address the university's wastewater treatment needs while mitigating potential environmental and social impacts. The

ESIA study thoroughly evaluated the project's potential effects on the surrounding ecosystem, local communities, and the university campus.
The main findings of the ESIA report are as follows:

1. Environmental Impact: The construction and operation of the WSP will have limited negative impacts on the environment. The pond's design and location take into account the conservation of habitats and the reduction of pollutant discharges into receiving environment.
2. Social Impact: The project is expected to have positive social impacts on the local community and university. By improving WSP, it will contribute to a healthier and cleaner environment, benefiting the well-being of residents and students alike.
3. Mitigation Measures: The ESIA report recommends a set of mitigation measures to minimize any adverse effects identified during the assessment. These measures include proper waste management practices, regular monitoring, and community engagement to ensure that the project aligns with sustainable practices.
4. Stakeholder Engagement: Throughout the assessment process, stakeholders, including local communities, students, and university staff, were actively involved in consultations and public hearings. Their inputs were considered in the project's design and implementation, fostering a sense of ownership and accountability.

11.2 Conclusion

The ESIA report concludes that the proposed WSP project at MU is environmentally and socially viable. The potential negative impacts identified can be effectively mitigated through the recommended measures, ensuring sustainable WSP and contributing to improved water quality in the region. By involving relevant stakeholders in the decision-making process, the project can be implemented with broad support from the community and university stakeholders. The findings and recommendations of this ESIA report provide a solid foundation for responsible project development and environmental stewardship, safeguarding the ecosystem and the well-being of those who will benefit from this vital infrastructure.

REFFERENCE

1. Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations 2018.
2. Kayombo, S. T. S. A., Mbwette, T. S. A., Katima, J. H. Y., Ladegaard, N., & Jørgensen, S. E. (2005). Waste stabilization ponds and constructed wetlands design manual. *UNEP-IETC with the Danish International Development Agency (Danida)*, 1-59.
3. Mzumbe University Master Plan, 2015 – 2035.

4. Strategic Plan for Mvomero District Council, 2015
5. Social Economic profile for Mvomero District Council, 2017
6. The Population and Housing Census (National Bureau of Statistics), 2022
7. The Tanzania Development Vision 2025 of 2000.
8. World Bank Environmental and Social Standards (ESS) for HEET as stipulated in the Environmental and Social Framework (ESF) and other guiding tools such as Environmental and Social Management Framework (ESMF), Resettlement Plan Framework (RPF) and stakeholder Engagement Plan (SEP)
9. World Bank, Project Operation Manual (POM) 2021.
10. World Bank, Project Appraisal Document (PAD) 2021.
11. United Republic of Tanzania, 1992.Energy Policy (1992).
12. United Republic of Tanzania, 1995. Land Policy (1995).
13. United Republic of Tanzania, 1995. The Education (Amendment) Act, 1995
14. United Republic of Tanzania, 1997. National Environmental Policy (1997).
15. United Republic of Tanzania, 1997.The Contractors Registration Act (1997).
16. United Republic of Tanzania, 1997. The Architects and Quantity Surveyors Act (1997).
17. United Republic of Tanzania, 2000. The Tanzania Development Vision (2000).
18. United Republic of Tanzania, 2000.National Human Settlements Development Policy (2000).
19. United Republic of Tanzania, 2002. National Gender Policy (2002).
20. United Republic of Tanzania, 2003.Occupational Health and Safety (2003).
21. United Republic of Tanzania, 2003. Construction Industry Policy (2003).
22. United Republic of Tanzania, 2004. Employment and Labour Relations Act No. 6 (2004).
23. United Republic of Tanzania, 2004. Environmental Management Act No. 20 (2004), Cap. 191.
24. United Republic of Tanzania, 2005 Impact Assessment and Auditing Regulations (2005).
25. United Republic of Tanzania, 2005 Impact Assessment and Auditing Regulations (2005).
26. United Republic of Tanzania, 2007. Engineers Registration Act and its Amendments 1997, Dar es Salaam, Tanzania (2007)
27. United Republic of Tanzania, 2007. The Land Act, 1999 The Urban Planning Act (2007).
28. United Republic of Tanzania, 2007. Fire and Rescue Act (2007)
29. United Republic of Tanzania, 2007. The Urban Planning Act (2007).
30. United Republic of Tanzania, 2008. The Prevention and Control of HIV/AIDS Act (No. 28), 2008
31. United Republic of Tanzania, 2008. The Workers Compensation Act (No.20), 2008
32. United Republic of Tanzania, 2009. Public Health Act (2009).
33. United Republic of Tanzania, 2009. Water Supply and Sanitation Act No. 12 (2009).
34. United Republic of Tanzania, 2009. The Standard Act of 2009
35. United Republic of Tanzania, 2021. National Environmental Policy (2021).
36. World Bank Environmental and Social Standards (ESS) for HEET as stipulated in the Environmental and Social Framework (ESF) and other guiding tools.
37. World Health Organisation (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.

APPENDICES

Appendix 1: ***Certificate of Occupancy***

TANZANIA

Land Form 51

CERTIFICATE OF OCCUPANCY

(Issued under Section 9 of the Land Ordinance)

Date of Issue: 25/11/81

Title Number: 27828

Land Office Number: 54910

Land: 985.35 ACRES MZUMBE MOROGORO DISTRICT.

THE LAND REGISTRATION ORDANCE (CAP.334)
APPLICATION FOR REGISTRATION OF A TRANSMISION
BY OPERATION OF LAW.
(SECTION 71)

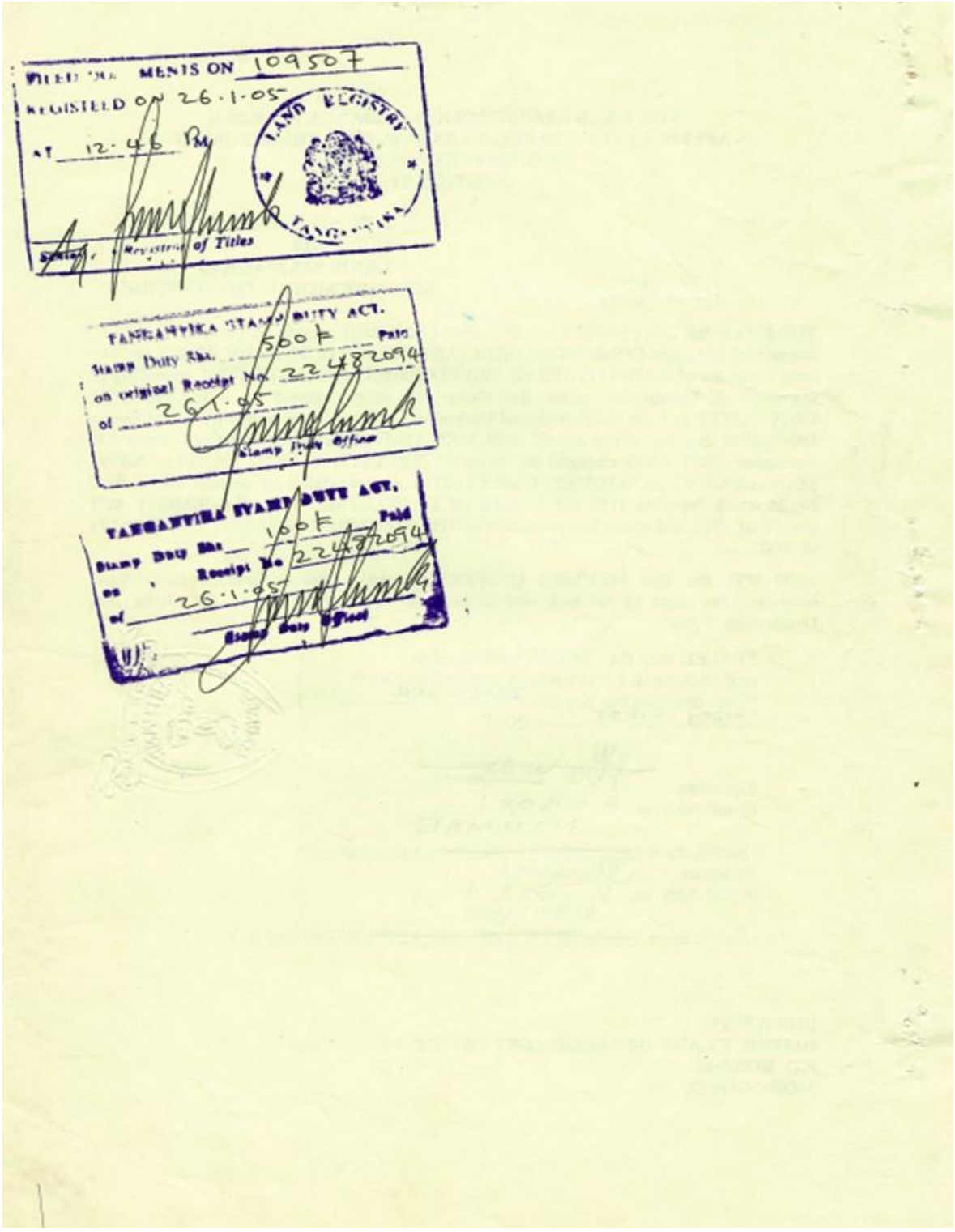
L. O. NO. 54910
C. T. 27828
LAND: 985.35ACRES
MZUMBE MOROGORO DISTRICT

THE MZUMBE UNIVERSITY, of P.O. Box 1 MZUMBE a body corporate Registered under the COMPANIES ORDINANCE (CAP.212, HEREBY APPLY to have the name of the INSTITUTE OF DEVELOPMENT MANAGEMENT appearing on the right of Occupancy under the above reference changed to THE MZUMBE UNIVERSITY as from the first day of December, 2001, and we, solemnly and sincerely DECLARE that by virtue of the MZUMBE UNIVERSITY ACT NO.21 dated 21st December, 2001 which changed the name of THE INSTITUTE OF DEVELOPMENT MANAGEMENT to MZUMBE UNIVERSITY, and provision of section 68 of ACT No.21 which repealed THE INSTITUTE OF DEVELOPMENT MANAGEMENT ACT No. 15 of 1972 and cause Incorporation of THE MZUMBE UNIVERSITY ACT NO.21 of 2001.

AND WE, the said MZUMBE UNIVERSITY make this declaration consciensily believing the same to be true and accordance with provisions of the Oaths Act, Declaration 1966.

SEALED with the COMMON SEAL of the)
said MZUMBE UNIVERSITY and DELIVERED)
in our presence this day of DECEMBER)
THIRTY FIRST 2004.)
)
)
Signature:.....)
Postal Address: P. O BOX 1)
MZUMBE)
Qualification: ~~CHAIRMAN/CHANCELLOR~~/VICE CHANCELLOR)
Signature:.....)
Postal Address: P. O. BOX 1)
MZUMBE)
Qualification: ~~DEPUTY VICE CHANCELLOR~~/REGISTRAR)

DRAWN BY:
DISTRICT LAND DEVELOPMENT OFFICE
P.O. BOX 853
MOROGORO.


MENTS ON 109507
REGISTERED ON 26-1-05
AT 12.46 PM
LAND REGISTRY
TANGANYIKA
Registrar of Titles
TANGANYIKA STAMP DUTY ACT.
Stamp Duty Rs. 500/= Paid
on original Receipt No 22482094
of 26.1.05
Stamp Duty Officer
TANGANYIKA STAMP DUTY ACT.
Stamp Duty Rs. 100/= Paid
on Receipt No 22482094
of 26.1.05
Stamp Duty Officer

TITLE No. 27828
REGISTERED
24th May 82
Land Form, 32.
At 11.00 A.M.
LAND REGISTRY

TANZANIA STAMP DUTY ACT
Stamp Duty Shs. 20/=
and L.O.NO.54910. 668053
of 28-6-80 Issued.
MG/L.D.NO/30.
Stamp Duty Officer

THE UNITED REPUBLIC OF TANZANIA

CERTIFICATE OF OCCUPANCY

(Section 9 of the Land Ordinance)

The 25th day of November One thousand nine hundred and eighty one

TITLE NO. 27828

THIS IS TO CERTIFY that THE INSTITUTE OF DEVELOPMENT MANAGEMENT MZUMBE a body Corporate established under the Institute of Development Management Act No.15 of 1972 of P.O.BOX 1 MZUMBE MOROGORO.----------

(hereinafter called "the Occupier") is entitled to a Right of Occupancy (hereinafter called "the Right") in and over the Land described in the Schedule hereto (hereinafter called "the Land") term of ninety nine years from the first day of July, One thousand nine hundred and eighty according to the true intent and meaning of the Land Ordinance and subject to the provisions thereof and to any regulations made thereunder and to any enactment in substitution therefor or amendment thereof and to the following special conditions:-

1. The Occupier having paid rent up to the thirtieth day of June, 1981, shall thereafter pay rent of shillings fourteen thousand five hundred eighty (Shs.14,580/=) a year in advance on the first day of July in every year of the term without any deduction PROVIDED that the rent may be revised by the Minister for the time being responsible for Lands (hereinafter called "the Minister") on the first day of July in each of the years 1990, 2000, 2010, 2020, 2030, 2040, 2050, 2060 and 2070 or within three years thereafter in each case.

2. The Occupier shall:-

(i) Maintain on the land buildings (hereinafter called "the buildings") in permanent materials designed for use in accordance with the conditions of the Right and which conform to the building line (if any) decided by the Morogoro District Development Council (hereinafter called "the Authority");

.....2/.....

TANZANIA STAMP DUTY ACT
Stamp Duty 370/=
on original receipt No. 668053
of 28-6-80

(ii) At all times during the term of the Right have on the land buildings as approved by the Authority and maintain them in good order and repair to the satisfaction of the Director of Land Development Services (hereinafter called "the Director");

(iii) Not erect or commence to erect on the land any building except in accordance with building plans and specifications which shall have been first approved by the Authority as hereinbefore provided;

(iv) Be responsible for the protection of all beacons on the land throughout the term of the Right. Missing beacons will have to be re-established at any time at the Occupier's expenses as assessed by the Director for Surveys and Mapping.

Approval of plans of any building by the Authority shall not imply that the construction of such a building will satisfy the Occupier's obligation under the conditions of the Right and shall not imply waiver or modification of any condition in the Right.

3. (i) The Occupier shall not subdivide the land or assign, sublet or otherwise dispose of or deal with the whole or any part of it or of any building on it without the previous written consent of the Director.

(ii) Occupation or use of the whole or any part of the land or buildings on it by any person other than the Occupier or her employees agents contractors or members of the household shall be deemed a dealing with land or buildings.

4. Except as hereinbefore provided the Director shall have an absolute discretion to give or withhold consent under condition 3 (i). Any dealing or agreement (other than a mortgage or charge) entered into before compliance with conditions 2 (iv) will not receive consent except in special circumstances of which the Director shall be the solejudge.

....3/....

-3-

5. The Occupier shall pay to the Minister on demand made by the Director on his behalf:-

(i) any further fees or stamp duties which may discovered to be payable by the Occupier in connection with the Right;

(ii) an amount equal to any contribution in lieu of rates which may be payable by Government for the land during the term of the Right;

(iii) such sum as the Director shall assess as a proper share payable for the land of the cost of making up the road or improvement of same upon which the land fronts, abuts or adjoins, whether such demand is made before during or after such making or improvement thereof. This condition does not oblige the Government to make or improve roads.

6. The land shall be used solely for EDUCATIONAL purposes and for other purposes ancillary thereto.

7. The President may revoke the Right for good cause and in public interest.

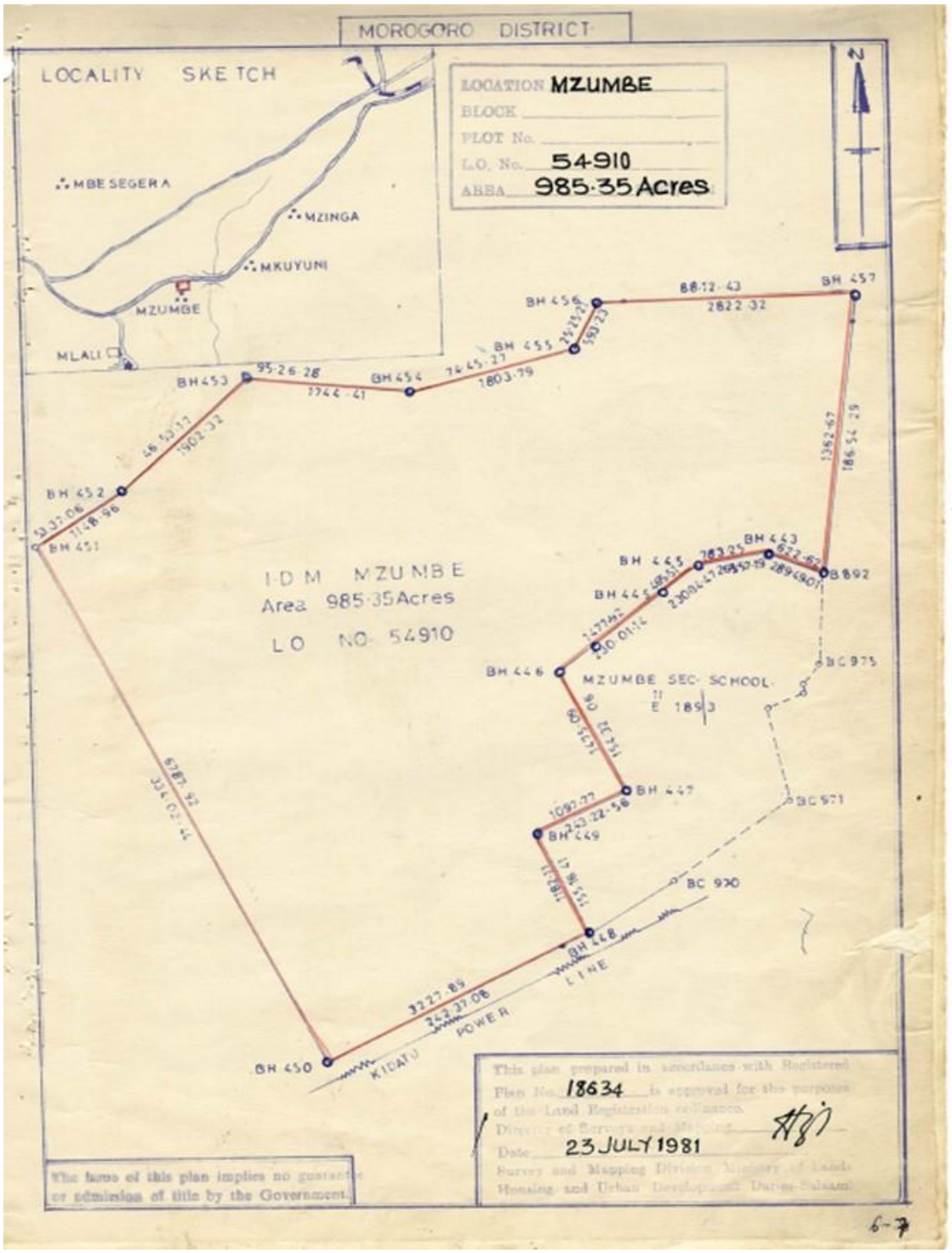
SCHEDULE

ALL that piece or parcel of land situate at Mzumbe Morogoro District having an area of nine hundred eighty five decimal point three five (985.35) acres, shown for identification only edged red on the registered surveys plan numbered 18634 deposited at the Office of the Director for Surveys and Mapping at Dar es Salaam.

GIVEN under my hand and seal and by Order of the Minister the day and year first above written.

DIRECTOR
LAND DEVELOPMENT SERVICES

DIRECTOR OF LAND DEVELOPMENT SERVICES


MOROGORO DISTRICT
LOCALITY SKETCH
MBE SEGERA
MZINGA
MKUYUNI
MZUMBE
MLALI
LOCATION MZUMBE
BLOCK
PLOT No.
L.O. No. 54-910
AREA 985-35 Acres
N
BH 457
BH 456
BH 455
BH 454
BH 453
BH 452
BH 451
BH 450
BH 443
BH 445
BH 446
BH 447
BH 449
BH 448
BC 975
BC 971
BC 970
MZUMBE SEC. SCHOOL
I.D.M. MZUMBE
Area 985-35 Acres
L.O. NO. 54910
KIDATU POWER LINE
This plan prepared in accordance with Registered Plan No. 18634 is approved for the purposes of the Land Registration ordinance.
Date 23 JULY 1981
Survey and Mapping Division, Ministry of Lands Housing and Urban Development, Dar-es-Salaam
The issue of this plan implies no guarantee or admission of title by the Government.
6-7

- 4 -

We, the within-named INSTITUTE OF DEVELOPMENT MANAGEMENT MZUMBE hereby accept the terms and conditions contained in the foregoing Certificate of Occupancy.

SEALED with the COMMON SEAL of the said INSTITUTE OF DEVELOPMENT MANAGEMENT MZUMBE and DELIVERED in our presence this 9th January day of 1982.

Signature:.....

Postal Address: IDM P.O. Box 1 Mzumbe

Qualification: Director IDM Board of Governors

Signature:.....

Postal Address: P.O. Box 1 MZUMBE

Qualification: Director IDM Board of Governors

LAND [illegible] DAR ES SALAAM

CHANGE OF NAME

Filed Document No. 109507

Date of Registration 26.1.05 time 12.46 P.m.

To THE MZUMBE UNIVERSITY of P.O. BOX 1, MZUMBE (By virtue of the MZUMBE UNIVERSITY Act No. 21 OF 2001.

Assistant Registrar of Titles

NOTE

In this document where [illegible] for Lands" and "Commissioner for Lands" should be read [illegible] the Commissioner of Lands [illegible] Commissioner of Surveys [illegible]

Appendix 2:

Code & Coordinate	Location	O_2 %	O_3 %	CO_2 %	CO mg/m^3	NO mg/m^3	SO_2 mg/m^3	H_2S %	CH4 %
AQMS1 (-6.92254& 37.55703)	WSP (1 UNIT)	20.6	0.0	0.04	0.00	0.00	0.0	0.00	0.00
AQMS2 (-6.93670 & 37.57076)	WSP (2 UNIT)	20.9	0.0	0.03	0.00	0.00	0.0	0.00	0.00
AQMS 3 (-6.913581 & 37.564768)	Residential area	20.9	0.00	0.05	0.00	0.00	0.1	0.00	0.00
AQMS 4 (-6.913581 & 37.564768)	Roadside along MU (Mzumbe – Morogoro road)	20.9	0.00	0.04	0.00	0.00	0.00	0.00	0.00
TBS Limits		**19.5**	**0.1**	***0.6**	**10**	**0.12**	**0.5**	**-**	**-**
WHO/IFC Guidelines		**23.5**	**0.12**	**0.5**	**30**	**0.2**	**0.5**	**20**	**-**

Appendix 3:

Code & Coordinate	Location	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	VOCs (mg/m^3)
AQMS1 (-6.92254 & 37.55703)	WSP (1 UNIT)	2	2	0.000
AQMS 2 (-6.93670 & 37.57076)	WSP (2 UNIT)	2	2	0.000
AQMS 3 (-6.913581 & 37.564768)	Residential area	3	3	0.008
AQMS 4 (-6.913581 & 37.564768)	Roadside along MU (Mzumbe – Morogoro road)	2	2	0.008
TBS Limits		**150**	**75**	**-**
WHO/IFC Guidelines		**50**	**25**	**-**

Appendix 4: Noise levels (in dBA) recorded at onsite and offsite.

Code & Coordinate	Location	Average Noise level in (dBA)
AQMS1 (-6.92254& 37.55703)	WSP (1 UNIT)	41.6
AQMS 2 (-6.93670 & 37.57076)	WSP (2 UNIT)	36.6
AQMS 3 (-6.913581 & 37.564768)	Residential area	51.3
AQMS 4 (-6.913581 & 37.564768)	Roadside along MU (Mzumbe – Morogoro road)	64.4
Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015		**60**
WHO/IFC Guidelines		**85**

Appendix 5: Vibration levels recorded at onsite and offsite.

Code & Coordinate	Location	Vibration (mm/s)
AQMS1 (-6.92254 & 37.55703)	WSP (1 UNIT)	<0.00
AQMS 2 (-6.93670 & 37.57076)	WSP (2 UNIT)	<0.00
AQMS 3 (-6.913581 & 37.564768)	Residential area	<0.00
AQMS 4 (-6.913581 & 37.564768)	Roadside along MU (Mzumbe – Morogoro road)	<0.00
Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015		**5**
WHO/IFC Guidelines		**5**