

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR
PROPOSED CONSTRUCTION OF TWO STOREY SCIENCE
LABORATORY BUILDING AT PLOT NO. 903 AND 904, SHANGANI WEST
MTAA, SHANGANI WARD IN MTWARA-MIKINDANI MUNICIPALITY,
MTWARA REGION, TANZANIA.**

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EXECUTIVE SUMMARY

Introduction

The Open University of Tanzania (OUT) is a Public Higher Learning Institution established by an Act of Parliament No. 17 of 1992. It was replaced by the Open University of Tanzania Charter, effectively from January 1st, 2007, which is in line with the University Act No.7 of 2005. The OUT is currently a single comprehensive and dedicated Open Distance Learning university in Tanzania and the East Africa region. It operates through 28 regional centers, and 6 coordination centers in the country as well as 62 examination centers scattered inside and outside the country.

The OUT is one of the universities which has benefited from the Higher Education for Economic Transformation (HEET) (P166415) project. HEET is a five-year project, which is financed by the World Bank through the Ministry of Education, Science and Technology (MoEST). The HEET project aims at promoting higher education as a catalytic force for the new industrial based economy of Tanzania. Thus, the project is designed to revitalize and expand the capacity of universities to contribute to key areas for innovation, economic development, and labour market relevance, by investing in requisite infrastructure for modern and effective teaching and research.

Thus, the OUT has set aside the fund for construction of multipurpose science laboratories in seven regions of Tanzania namely Pwani, Dodoma, Mwanza, Arusha, Kigoma, Njombe and Mtwara. The laboratories will be used as zonal science laboratories for science students, researchers, secondary schools and community in the project's priority areas. The laboratory buildings will also include ICT facility, pantry for hospitality and tourism hands-on practicals and also stores, and office for the laboratory staff. Each building will be built with partitions for six (6) laboratories in the discipline of:- Botany and related disciplines; Chemistry, environmental and related disciplines; Physics, energy and related disciplines; Food product development and pantry for Tourism and Hospitality; ICT, e-Learning, e-Teaching and data management and Zoology, biotechnology and related disciplines.

In Mtwara region, the laboratory building will be of two storeys that will be constructed at Plot No. 903/904, Shangani West *Mtaa*, Shangani Ward in Mtwara-Mikindani Municipality. The OUT is having title deed of the two adjoining plots with a total of 8285 square meters. The designated land use of the plots is Public Building Purpose only hence compatible with the proposed development. The building will consist of four laboratories of Biology, Chemistry, Physics and ICT Multimedia. Also there will be Conference room, Library and offices (Director and staff offices) and other supporting facilities i.e. pantry, sanitary areas and circular ramp for people with physical disabilities. The built up area will be 13% of the total area while the other area will be left for future development, lawn area and parking space.

The construction of new building will involve various site activities including clearance of vegetation and excavation. Building construction and associated activities will 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.

In fulfilment of the above, the OUT undertook groundwork and prepared EIA application documents which included Scoping Report and Terms of Reference (TOR) as a first step in the environmental assessment process. The documents were submitted to the Council (NEMC) and the TOR were approved. The ToR provided guidance under which the environmental and social assessment was

done. The 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) were observed in the study. In addition, this ESIA has been guided by the Project Appraisal Document (PAD) and Project Operational Manual (POM) both of 2021.

Policy and legal framework

Tanzania is committed to attaining sustainable development goal. Some of the Tanzanian policies, laws and legislation that have a close bearing to this project have been discussed in this report.

Furthermore, this ESIA study has also complied with the following tools:

- i) World Bank's new Environmental and Social Framework (ESF);
- ii) The World Bank Environmental and Social Safeguarding Policy for Investment;
- iii) WB relevant Environmental and Social Standards. This ESIA study has applied 5 relevant standards out of 10 Environmental and Social Standards (ESSs), which are:
 - ESS1- Assessment and Management of Environmental and Social Risks and Impacts;
 - ESS2 - Labor and Working Conditions;
 - ESS3 - Resource Efficiency and Pollution Prevention and Management;
 - ESS4 - Community Health and Safety;
 - ESS10 - Stakeholder Engagement and Information Disclosure.

Description of the Environment

The project site is about 16m above the mean sea level. Generally it is a coastal urban area and the sea is about 1.1 kilometres to the north where there is Mikindani bay. The terrain is almost flat with little variation in altitude between points. Exception is observed to the east northern corner where it is relatively lower area that acts as depository area of surface run off from the nearby area. During the heavy rains the area holds water for few days. This is common phenomenon in Mtwara urban area where there are a number of water depository areas that floods during heavy rains, as there are few and minor natural drainage to drain the water from the area. The dominant soil in the area is sand underlying the coral limestone while brownish to blackish clay soils also feature in some areas and black alluvial soils are common in lower areas. The site is covered by grasses and few scattered trees species mainly of Neem (*Azadirachta indica*) some of which were sprouting and bushes. Near the eastern corner there is African Mahogany (*Azalia africana*) which is matured tree and regarded as vulnerable species as per IUCN list.

The surrounding areas are characterized with exotic trees species mainly for ornamental and/or fruits. The common trees in the area are Madras thorn (*Pithecellobium dulce*), Ashoka (*Saraca asoca*) Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Coconut (*Cocos nucifera*) and other Palm family trees. Also there are some garden with planted seasonal crops such as Banana, Peas, and Pawpaw. The vegetation of the area gives the indication for habitat for fauna and based on the urban nature of the area there was no indication for large wild animal. The common urban birds are observed in the area while small reptiles, some amphibians, insects and other invertebrates are present in the undeveloped areas with some vegetation cover.

Stakeholder Engagement

Stakeholder consultations were carried out, including interviews and meetings with officials from Government departments and Local authorities. Officials from Mtwara-Mikindani Municipal Council, the Shangani Ward and Shangani west Mtaa Offices as well as the community around were involved in the EIA process. Other stakeholders involved include GCLA, OSHA, Fire Department, MTUWASA, TARURA,

TANESCO, and Ruvuma and Southern Coast Basin Water office. A multidisciplinary team including environmental experts considered all aspects of the project that can cause environmental or socio-economic changes at a public and stakeholders' consultation and meetings. The team evaluated the significance of each aspect of the project in terms of defined criteria, which take account of the scale, extent, duration, the potential to implement mitigation measures and controls and the likelihood and timescale of environmental recovery.

Consultation with stakeholders indicate that the proposed science laboratory building is generally viewed as positive development for provision of better educational services for students of the area. Further, some stakeholders were worried of some issues/impacts associated with the project during construction and operation activities and specific identified issues are integrated in the ESMP as outlined in the table summary below.

Environmental and Social Management

The ESIA study identified a number of environmental and social impacts for the entire life cycle of the project. The assessment followed specific procedures set by the Environmental Impact Assessment and Audit (Amendment) Regulations 2018 and as indicated in the ESIA Terms of Reference. Further World Bank Environment and Social Framework (ESF) and the project's Environmental and Social Management Framework (ESMF) were observed in the study. The significant impacts and measures to mitigate the negative impacts are summarized below:-

Mobilization/Construction Phase
<i>Environmental negative impacts</i>
<p><i>Loss of vegetation</i></p> <ul style="list-style-type: none"> ▪ Clearance will be restricted to areas with physical structures and supporting facilities only. ▪ The trees around the project footprint will be maintained accordingly including the mature remnant tree of <i>Azelia africana</i> species. ▪ After construction the OUT shall plant ornamental trees and other vegetation as part of beautification of the area.
<p><i>Accelerated soil erosion</i></p> <ul style="list-style-type: none"> ▪ Major civil and/or earth work shall be done during dry season. Should there be a need to conduct civil works during wet season, the contractor shall take appropriate mitigation measures to prevent accelerated soil erosion. ▪ The contractor shall ensure that backfilling is done adequately, compacted, and the site restored. The backfilling operation will be performed in such a manner so as to prevent washing away of soil.
<p><i>Air pollution due to dust emission</i></p> <ul style="list-style-type: none"> ▪ All trucks carrying the fine earth materials will be enclosed during transportation to the construction site to prevent dust generation along the route. Trucks used for that purpose will be fitted with tailgates that close properly and with tarpaulins to cover the materials. ▪ Measures to suppress dust shall be applied to include watering the area vulnerable for dust including routes/earth roads (3 times a day) ▪ Washing of Trucks each morning to remove mud on mudguard and tires to reduce dust on routes ▪ Watering on dry excavated areas to reduce fugitive dust ▪ Speed limits will be instituted to drivers and especially in routes passing in community centers areas. ▪ Covering stockpile that have potential to generate fugitive dust at site
<i>Air pollution due to exhaust emission</i>

- Equipment maintenance to be undertaken in accordance with manufacturer's instructions and at the specified maintenance interval to reduce exhaust emission;
- Equipment operators will be trained in and will follow equipment operational procedure.
- Load limit shall be specified to type of vehicle to avoiding overloading that causes excessive exhaust emission.
- Timely maintenance of the trucks through regular inspection on the need for maintenance.

Noise pollution and Vibration

- Construction activities will be restricted to daytime hours only.
- Vehicles and machines will be maintained and serviced as required to ensure they do not generate excessive noise. Among others shall have properly functioning exhaust mufflers.
- Installation of portable barriers to shield compressors and other small stationary equipment shall be done
- Enforced vehicle load restrictions to avoid excess noise emissions from engine overloading shall be done.
- Speed limits will be instituted to drivers and especially in routes passing in community areas.
- No huge compactors that generate excessive vibration shall be used at site.
- Training to drivers on safe driving habits that also control noise levels shall be done

Land degradation at source of construction materials

- Earth nature construction materials will be obtained from authorized/permitted sources
- The contractor will be encouraged to make use of premix concrete suppliers for those major construction works requiring concrete.

Land and water pollution from construction wastes

- A site waste management plan shall be prepared and followed. This will include designation of appropriate waste storage areas, collection and removal schedule, and a system for supervision and monitoring.
- The contractor shall provide different waste bins for segregation on site and to discourage uncontrolled waste disposal.
- No, on site burial or open burning of solid waste shall be permitted at the project site.
- The contractor will make use of the existing solid waste disposal and collection system by approved contractors by the Municipality.
- All the waste will be managed within the fenced area before collection

Public Health Hazards due to Liquid Wastes

- A temporary pit latrines will be established for the construction workers at the site to include for both male and female.

Disruption of public utilities along the road reserve

- TARURA and infrastructures owners (i.e. TPDC, MTUWASA etc.) within the road reserve will be contacted before starting any excavation works in the road reserve area close to the site.

Occupational health and safety hazards

- Accidents will be minimized through proper maintenance of the machines, protecting or guarding the cutting edges, and awareness of the people including workers on the dangers and make them understand how to protect themselves and others.
- The supervisors shall ensure that safety procedure and measures are in place and are enforced (implemented) including appropriate safety gears (PPEs) e.g. eye glasses and dust masks will be ensured in order to reduce risks associated with dust.
- The contractor shall provide adequate training to workers on the OHS of the construction works
- Approved working hours shall be observed in order to avoid careless mishandling due to fatigue.
- Medical checks pre & post-employment as well as mandatory once a year checks shall be done

- Undertake site specific risk assessment and developing mechanism to avoid or reduce the risks. This shall be done per each new work to be undertaken and a safety procedure shall be developed and implemented by dedicated project HSE officer.
- The contractor shall also prepare Health and Safety Management Plan for implementation of OHS issues at site.

- Contamination of land and water from accidental spills and leakages of hydrocarbon*
- Re-fueling and services for vehicles will be done off site.
 - Spill control measures such as storage and handling of hydrocarbons such as oil shall be done to include storage on impervious areas (such as concrete surfaces with bund wall).
 - Heavy equipment will be checked for lubricant leaks before starting the work,
 - workers will be trained on proper storage of hydrocarbons.
 - Emergency response measures will be put on site in case of accidental oil spill that will include having absorbent materials, sand kits at site, and alike.

Social negative impacts

- Traffic accidents*
- Only qualified drivers with appropriate driving license shall be engage.
 - Induction course shall be done to all drivers prior starting driving
 - Drivers shall be sensitized on maintaining speed limits for main roads and on access roads.
 - Promoting safe drive with specified hours for long drive to avoid fatigue
 - Provision of road and safety signs at site or access roads shall be done.

- Public Health Hazards (HIV/AIDs and STDs spread)*
- Awareness raising on the dangers of the HIV/AIDS within the project premises especially to those who are vulnerable and to empower women for they compose one of the most vulnerable groups. When the need arises OUT and Contractor will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace. The contractor shall also prepare HIV/AIDS Management Plan for implementation of HIV/AIDS issues at site.

- Increased local population due to labour influx*
- Semi-skilled and unskilled labour required by the project will be sourced locally to provide communities with employment and the opportunity to earn an income during the construction phase. Local communities will be given prior information through local government offices on available employment opportunities and required qualifications. A special clause that requires local peoples to be employed as labourers during construction will be included in the contract.

- Risks and hazards associated with child labour*
- The OUT and Contractor will comply with the provisions in the Employment and Labour Relation Act,2004 and the ILO Convention No. 182. OUT will develop transparent human resources policies and procedures for recruitment process, working conditions, terms of employment wages, worker-employer relations, non-discrimination policy, monitoring, roles and responsibilities. The OUT expects its contractors to adhere to the principles set forth in the Contract which will cover inter alia, standards related to Labour and prohibition of Child Labour.

- GBV/SEA/SH related incidences*
- The OUT will draft, approved and implemented a GBV Action Plan and will assess the SEA/SH risks associated with the project based on existing data and input from key stakeholders. This will include identification of risks to workers and communities during construction as well as risks to students within operating institutions. The GBV requirements and expectations will be defined in the bid documents including codes of conducts (to be signed by workers), training, awareness raising for workers and the community, GBV responsive GRMs and approach to GBV case management.

Gender inequity in employment

- Women and men will be given equal employment opportunities during recruitment and job postings. Regular sensitization and awareness campaigns to the workers will be done to promote gender equity in employment during the construction works and during operation. Gender disaggregated data, separate bathing, changing room, sanitation facilities for men and women will be provided.

Social positive impacts

Employment

- The employment impact could be turned into a positive impact if the contractor constructing the building is both encouraged to and committed to hiring local labour, particularly when only semi-skilled or unskilled labour is required. This could be made clear during the tendering process for construction of the building. One way of promoting this would be for the Contractor to train local people to acquire the skills needed by these contractors to carry out the work.

Benefit to local producers and suppliers of goods and services

- The proponent/contractor shall strive to procure the required service and products from local suppliers and producers.

Operation Phase

Environmental negative impacts

Public health hazards from solid wastes.

- Designated area for wastes collection shall be established.
- Provision of wastes receptacles and labeling of these receptacles according to the type of wastes will be done.
- Only authorised waste collection agency by the Municipality will be engaged for collection of the waste.

Public health hazards from liquid wastes.

- The OUT will design a septic tank and soak away pit system for sewage management on site. The design will also take into account high water table of the area.

Public health hazards from hazardous wastes

- The OUT will design a waste water retention structures for the laboratory effluent. Two on series retention ponds will be designed for dilution of the effluent before final discharge to the open environment. The effluent on the retention ponds will be monitored to ensure it is safe for final disposal.

Floods hazards

- The OUT in course of project implementation will collaborate with TARURA and Mtwara-Mikindani Municipal Council for construction of the storm water drainage along the road for conveyance of the storm water to the natural or man-made drainage channels.

Fire Hazards

- There will be enough exit doors for evacuation in case of fire incidence. The corridors will be of sufficient widths and dimensions to enable easy and speedy evacuation. Provision will be made under the plumbing installation, for fire-fighting system. Further; -
- The OUT shall install with firefighting system among others portable fire extinguishers for emergency especially in the office side.
- Staffs will be trained on how to operate the firefighting equipment.
- Drawings shall be submitted to fire department for scrutiny and guidance on fire safety designs and shall adhere to the requirement(s).

Occupational health and safety hazards

- The final designs of the science laboratory building shall adhere to the required standards taking into account the nature of operations. Some of the key aspects to be considered include the ventilation of the chemistry laboratory, location of the gas to be involved in the process, storage room of chemicals requirements. Further, in order to mitigate the potential impacts due to laboratory fumes from complex chemical reactions the chemistry laboratory shall be equipped with fume hood built-in with scrubber which is acid and organic resistant to withstand the acid and organic fumes from the chemistry laboratory operations. Also, before operations of the laboratory building baseline risk assessment should be done in line with OHS Act of 2003 to identify OHS risks and hazards and thereafter to formulate the mitigation measures to be implemented during the operation.

Social positive impacts

Employment

- The employment impact could be turned into a positive impact if the proponent is both encouraged to and committed to hiring local labour. This could be made clear during the employment process to involve local community through local government offices for information sharing.

Benefit to local producers and suppliers of goods and services

- The proponent shall strive to procure the required service and products from local supplied and producers. This could also be advertised through local offices for information sharing for service providers within the local area.

Social Negative Impacts

Risk of SEA/SH

- The OUT will draft, approved and implemented a GBV Action Plan and will assess the SEA/SH risks associated with the project based on existing data and input from key stakeholders. This will include identification of risks to workers and communities as well as risks to students within operating institutions. The GBV requirements and expectations will be defined in the bid documents including codes of conducts (to be signed by workers), training, awareness raising for workers and the community, GBV responsive GRMs and approach to GBV case management. Also, GBV measures needed to protect students at the national level and the institutional level including the need for institutions to develop GBV policies to address SEA/SH, training and awareness raising, GBV responsive GRMs, educator/ staff codes of conduct (to be signed), student agreements, referral pathways etc., will be defined. The OUT will identify and create a partnership with a local organisation to report workers' misconduct and complaints/reports on GBV or harassment through the GRM.

Health Hazards due to social interaction among workers and users

- The project proponent will support already existing and new initiatives to sensitize/educate the people around the project on the HIV/AIDS pandemic. Also, the proponent will provide HIV/AIDS training/awareness campaign programmes to its employees and will encourage workers who know they are infected and receive care to break through the denial about HIV by talking with their fellow workers, friends and neighbours and reducing the discomfort associated with the subject. When the need arises, the OUT will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace.

Non-user-friendly building for Persons with Disabilities (PWDs)

- The building will be designed and built with ramps and other special facilities such as toilets to facilitate access and use by PWDs. Detailed consultation with the PWDs community will be undertaken during the design process to ensure key access and user-friendly facilities are designed

and constructed.

Monitoring and Auditing

The EIS presents an outline of the Environmental and Social Monitoring Plan (ESMoP) to record parameters to be monitored and frequency of monitoring.

Cost Benefit Analysis

The EIS presents an assessment of the project, in terms of negative impacts, compared to the socio-economic benefits that will not happen if the project is not implemented. Environmental cost benefit analysis has been assessed in terms of the negative versus positive impacts. The potential benefits of the project, in terms of financial and social benefit are substantial. Similarly, the environmental impacts can be reasonably mitigated and the financial resources needed to mitigate negative impacts, when compared to the required investment, are relatively small.

Decommissioning

A preliminary decommissioning plan has been developed. Should the decommission become inevitable the plan provides a general description of decommissioning methods considered feasible for the proposed project. The description is intended to demonstrate that the methods considered are practical and that they protect the health and safety of the public and decommissioning personnel. Project decommissioning has five phases: (1) pre-removal monitoring; (2) permitting; (3) interim protective measures; (4) Project removal and associated protective actions; and (5) post-removal activities, including monitoring of environment and socio-economic activities.

Conclusion

The study concludes that, the proposed project is in appropriate location as far as land use and interactions with human social and economic setting is concerned. Most of the environmental and social impacts have been identified and assessed and none of these are considered to be that severe after mitigation to prevent the further planning, design, and development of the proposed construction of the Science Laboratory Building at Plot No 903/904 at Shangani area in Mtwara-Mikindani Municipality. Thus, the project in the area can be considered suitable subject to implementing the mitigation measures as indicated in the Environmental and Social Management Plan. Further, to further sustainability of the project in the area, it is recommended that the proposed Monitoring Plan should be implemented accordingly for consistent efficacy of mitigation measures or timely corrective measures before significant impacts to the environment and social components.

THE NAMES OF ESIA TEAM



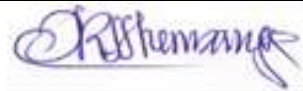



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3	Eng. Sam Shemsanga	Environmental Engineer	
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Other Experts			
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LIST OF ABBREVIATIONS AND ACRONYMS

CBD	Central Business District
CBO	Community Based Organisation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CRB	Contractors Registration Board
dBA	Decibel
DOE	Division of Environment
EIA	Environmental Impact Assessment
EM	Environmental Management
EMA	Environmental Management Act
EMP	Environmental Monitoring Plan
ERB	Engineers Registration Board
ESF	Environmental And Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and social standards
FGD	Focused Group Discussion
FIFO	First in First Out
GBV	Gender-based violence
GCLA	Government Chemist Laboratory Authority
GDP	Gross Domestic Product
GN	Government Notice
HEET	Tanzania Higher Education for Economic Transformation
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
HSE	Health, Safety and Environment
IFC	International Finance Corporation
IUCN	International Union for Nature Conservation
MED	Municipal Executive Director
MMC	Mtwara-Mikindani Municipal Council
MTUWASA	Mtwara Urban Water Supply and Sanitation Authority
MTW	Mtwara
NBS	National Bureau of Statistics
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGOs	Non-Governmental Organisations
ODL	Open and Distance Learning
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Authority
OUT	The Open University of Tanzania
PM	Particulate Matter
PPE	Personal Protective Equipment
SEA	Sexual Exploitation and Abuse
SEP	Stakeholders Engagement Plan
SH	Sexual Harassment
SIDO	Small Scale Industry Development Organisation
STDs	Sexually Transmitted Diseases

TAC	Technical Advisory Committee
TANESCO	Tanzania Electric Supply Company
TARURA	Tanzania Rural and Urban Road Agency
TCU	Tanzania Commission for Universities
TMA	Tanzania Metrological Authority
ToR	Terms of reference
TPDC	Tanzania Petroleum Development Corporation
TTCL	Tanzania Telecommunication Company Limited
TZS	Tanzania Standards
UNESCO	United Nations Educational, Scientific and Cultural Organization
URT	United Republic of Tanzania
USD	United States Dollar
VAT	Value Added Tax
VPO	Vice President Office
WB	World Bank
WHO	World Health Organization

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Open University of Tanzania (OUT) is a Public Higher Learning Institution established by an Act of Parliament No. 17 of 1992. The Act became operational on 1st March, 1993 by publication of Notice No. 55 in the official gazette. The Act No.17 of 1992 was replaced by the Open University of Tanzania Charter, effectively from January 1st, 2007, which is in line with the University Act No.7 of 2005. The OUT offers its certificate, diploma, degree and postgraduate courses through the Open and Distance Learning (ODL) system which includes various means of communication such as face-to-face, broadcasting, telecasting, correspondence, seminars, e-learning as well as a blended mode which is a combination of two or more means of communication. The OUT's academic programmes are quality-assured and centrally regulated by the Tanzania Commission for Universities (TCU). It operates through 28 regional centers, and 6 coordination centers in the country as well as 62 examination centers scattered inside and outside the country.

The OUT is one of the universities which has benefited from the Higher Education for Economic Transformation (HEET) (P166415) project. HEET is a five-year project, which is financed by the World Bank through the Ministry of Education, Science and Technology (MoEST). The HEET project aims at promoting higher education as a catalytic force for the new industrial based economy of Tanzania. Thus, the project is designed to revitalize and expand the capacity of universities to contribute to key areas for innovation, economic development, and labour market relevance, by investing in requisite infrastructure for modern and effective teaching and research.

Thus, the OUT has set aside the fund for construction of multipurpose science laboratories in seven regions of Tanzania namely Pwani, Dodoma, Mwanza, Arusha, Kigoma, Njombe and Mtwara. The laboratories will be used as zonal science laboratories for science students, researchers, secondary schools and community in the project's priority areas. The laboratory buildings will also include ICT facility, pantry for hospitality and tourism hands-on practical's and also stores, and office for the laboratories staff. Each building will be built with partitions for six (6) laboratories in the following disciplines:-

- i) Botany and related disciplines
- ii) Chemistry, environmental and related disciplines
- iii) Physics, energy and related disciplines
- iv) Food product development and pantry for Tourism and Hospitality
- v) ICT, e-Learning, e-Teaching and data management
- vi) Zoology, biotechnology and related disciplines

In Mtwara region, the laboratory building will be of two storey that will be constructed at Plot No. 903 and 904, Shangani West *Mtaa*, Shangani Ward in Mtwara-Mikindani Municipality. The OUT is having title deed of the two adjoining plots with a total of 8285 square meters (appendix 2).

The construction of these laboratories must abide to the Environmental Management Act of 2004 of Tanzania which requires the project developers to carry out Environmental and Social Impact Assessment prior to project implementation. The First Schedule of the Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018, categorize major urban projects including multistorey buildings as type B1 project (borderline project), which may or may not require ESIA study and upon screening the Council will guide the course of the study. Likewise the

World Bank's Environmental and Social Standards requires the borrower to identify, assess and manage potential environmental and social impacts and risks associated with the project. In view of the above, OUT carried out this environmental and social impact assessment (ESIA) for the proposed multipurpose science laboratories in the project areas while adhering to World Bank's Environmental and Social Frameworks and Standards and Policies for Investment projects financing.

In fulfilment of the above, the OUT undertook groundwork and prepared EIA application documents which included Scoping Report and Terms of Reference (TOR) (appendix 1) as a first step in the environmental assessment process. The documents have submitted to the Council (NEMC) for approval of the TOR. The prepared ToR provided guidance under which the environmental and social assessment was done. The 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) were observed in the study. In addition, this ESIA has been guided by the Project Appraisal Document (PAD) and Project Operational Manual (POM) both of 2021.

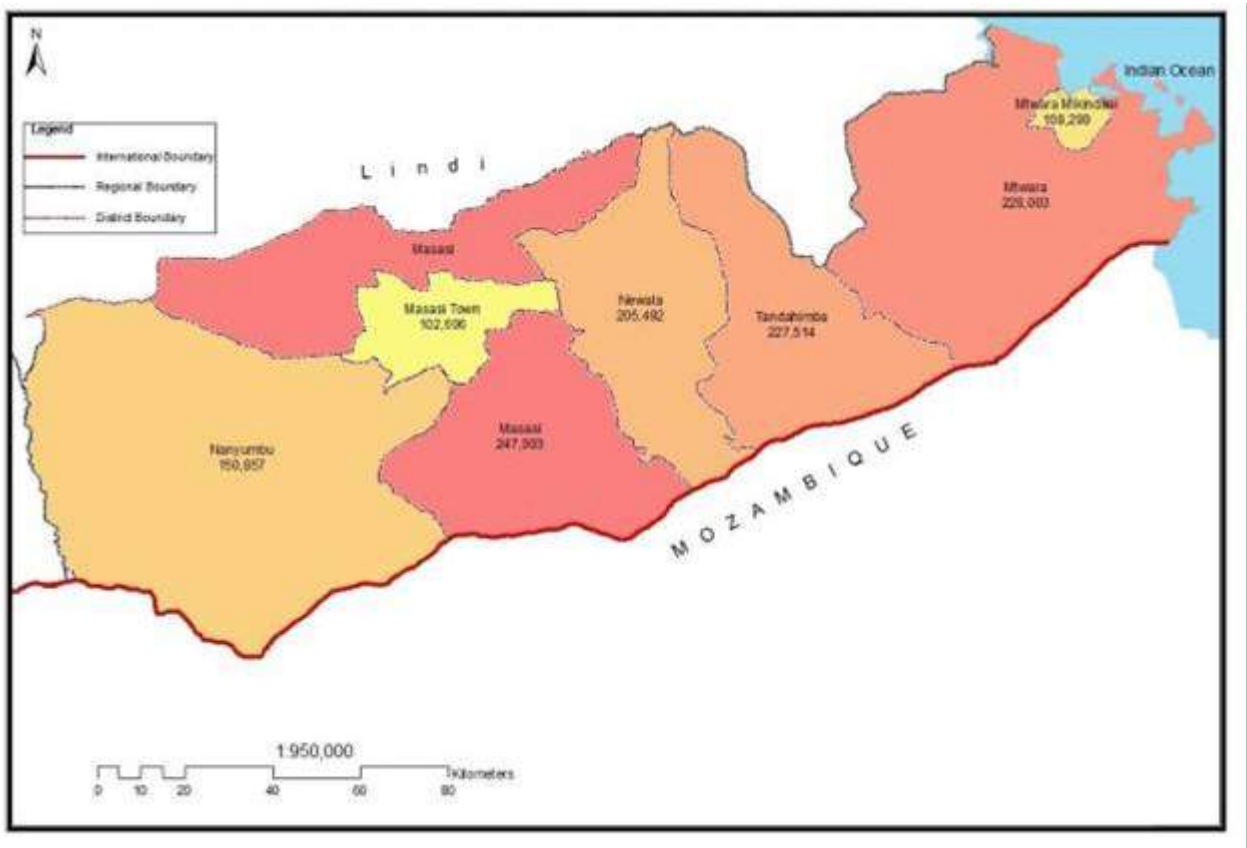


Figure 1.1: Map of Mtwara Region showing Mtwara-Mikindani Municipality where the project is located

Source: URT, 2013

1.2 PROJECT RATIONALE

The OUT due to lack of science laboratories, it has been hiring services for conducting practical sessions at Sokoine University of Agriculture (SUA), University of Dar es Salaam (UDSM) and Saint John's University of Tanzania (SJUT) in Dodoma. This exercise has become so costly to the OUT and at the same time denying its faculty members an opportunity to enhance their practical skills towards their academic career in general. Also, the Tanzania Commission for University (TCU) technical

accreditation team, strongly recommended for the establishment of science laboratories during the assessment of the faculty's operations in 2007. The generation of competent professionals who are well prepared to move the country forward in terms of science and technological development relies strongly on good and regular hands-on experience in the course of learning. The setting up of science laboratories will create a much more convenient learning environment for the OUT students; promote training in practical and conceptual skills in different scientific sub-disciplines and at the same time reduce the burden placed to our sister universities in handling the OUT students. Further, the involvement of the OUT academic staff in running practical sessions will enhance their professional skills through in-house exposure to knowledge and as well promote individual involvement in research activities.

The implementation of this HEET project will cut down the ever-rising costs that the OUT has been incurring for over the years through outsourcing the facilities and at the same time build capacity of its faculty members in scientific research and investigations. It is the anticipation of the OUT that the HEET project will further create a breakthrough to more students towards accessing Science education at a more affordable cost. The laboratories will also be accessible to neighbouring Secondary School students; teachers and researchers thus stimulate and attract more students to pursue Science subjects. Thus, through HEET project, OUT will produce sufficient numbers of trained scientists who will safeguard the Industrialization agenda towards realizing the Country 2025 Vision.

1.3 OBJECTIVES OF THE HEET PROJECT

1.3.1 HEET Project main objective

According to Project Appraisal Document (PAD) of 2021, the main developmental objective of the HEET project is to strengthen the learning environment and labour market alignment of priority programs at beneficiary higher education institutions and improve the management of the higher education system. The project is geared towards meeting the following strategic objectives (i) to increase enrolment in priority disciplines, (ii) to improve the relevance and quality of programs at universities to meet the conditions and standards of the current and future labour market, (iii) to strengthen system-level coordination, management, and regulations to ensure quantity, quality and relevance of higher education in Tanzania, and (iv) to increase the rate and extent of graduate employability through improving the relevance of curricula and create new and demand driven programs.

1.3.2 Specific Objectives for OUT – Mtwara Zonal Laboratory Building project

In addressing the overall objective of the project, the OUT is also the beneficiary of the project had the following specific objectives:

- i) Construction of Science Laboratories buildings and associated facilities;
- ii) Updating curriculum and introducing innovative pedagogical methodologies
- iii) Promoting applied research and innovation capacity.
- iv) Promoting product/service development and or practical learning through partnership with private sector
- v) Enhance Moodle learning platform and digital technology applications
- vi) Promoting self-generating income
- vii) Building capacity of academic staff and university leadership

1.4 THE SCOPING STUDY

The Scoping study ensures that relevant key environmental and social economic issues are identified before the EIA is conducted to ensure that the study is focused and covers all important issues. The objectives of the scoping study for the proposed construction of Laboratory building were therefore to document key issues that are likely to be important during the EIA study and to identify and involve key stakeholders in the EIA process. This process afforded opportunity to the stakeholders to express their views and concerns to be included in the EIA study. The scoping study also involved:-

- Identification of project alternatives;
- Identification of EIA study boundaries;
- Identification of information requirements;
- Development of effective methods of approaching the EIA study;
- Defining the terms of reference for the EIA study.

The consulted stakeholders and the issues raised are presented in chapter 5 of this report.

1.5 THE ESIA STUDY

The overall objective of carrying out this ESIA was to identify, predict and assess both positive and negative environmental and social impacts associated with the project and propose mitigation measures to minimise the negative impacts and enhance the positive ones. The assessment used data and information on the physical, biological, and socio-economic environment to predict both negative and positive impacts of the project. The Environmental Management (EIA and Audit) (Amendment) Regulations, 2018 provides the general objectives for carrying ESIA, among others a list comprises the following:-

- i. To ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process;
- ii. To anticipate and avoid, minimise or offset the adverse significant biophysical, social and relevant effects of developmental proposal;
- iii. To protect the productivity and capacity of natural systems and ecological processes which maintain their functions
- iv. To promote development that is sustainable and optimises resources use and management opportunities;
- v. To establish and assess impacts that are likely to affect the environment before a decision is made to authorise the project;
- vi. Propose mitigation and socio-management procedures aimed at managing the proposed mitigation of the identified potential impacts and that will form part of the overall ESMP for the project operations.
- vii. To enable information exchange, notification and consultations between stakeholders;

The OUT undertook this Environmental and Social Impact Assessment to address the above objectives.

1.6 METHODOLOGY OF THE ESIA 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 the OUT staff, local government officials and communities in the vicinity of the project site. ESIA study was done both as a desktop study and field work. It involved the review of literature/documents including Environmental and Social Management Framework (ESMF) report, OUT project background reports, socio-economic profiles and field studies at the project site to gather information and data on various aspects of the project. The environmental assessment required consultations with a number of stakeholders, including responsible government agencies, Local Government Authorities (Mtwara-Mikindani Municipal Council), etc. The study adopted the following approach:

1.6.1 ESIA Team

A multi-disciplinary team of experienced scientists and environmental and social professionals was assembled to carry out the required resource assessment, generation of baseline data, determination of potential impacts and recommendation of mitigation measures. 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

1.6.2 Communication with Stakeholders

Identification of stakeholders

The stakeholders were identified based on the role and relevance of an organization, group or individual to the proposed project. Some of the stakeholders including Mtwara-Mikindani Municipal Council, Shangani Ward and Shangai-West Mtaa offices, Government Chemist Laboratory Authority (GCLA), Occupational Safety and Health Authority (OSHA), Fire Department and local community have been pre-determined based on the nature and location of the project, while others and potential affected groups in the vicinity of the proposed project site and area of influence were identified during the field visit. List of stakeholders identified is found in chapter 5.

Involvement of stakeholders

The study team, in collaboration with the OUT officials visited the proposed area for the proposed project and later on visited neighbouring community. Physical observations and stakeholders' interviews were conducted in order to collect baseline data and issues of concerns. The ESIA study applied different participatory methods to involve all the relevant stakeholders. Public meeting dominated at local level i.e. *Mtaa*, one-to-one interviews with individuals based upon a list of general

topics or questions and partly based on an open discussion, were conducted. Focused group discussions were also used to gather stakeholder's views and concerns.

In establishing the views of the public concerning the proposed project, the consultants provided introduction letter addressed to each stakeholder, briefing the project, need for ESIA and asking the stakeholder to freely raise their concerns to the Consultant. During the public meetings the consultants introduced the project and elaborated to the stakeholders the project objectives and purpose and envisaged project activities so as to give a good understanding for stakeholders to be able to air their views.

Identification of stakeholders' concerns

The stakeholders pointed out a number of issues and concerns. An issue raised by one individual or a group of people was cross-checked by discussing it over with other groups (triangulation). Key issues raised by each stakeholder group were summarized and further analysed. Details of stakeholders consulted, names and signatures of people consulted and record of main issues raised are integrated in Chapter 5 and Appendix 3 and 4 of this report accordingly.

1.6.3 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.

Noise and Vibration

Spot measurements were done on site to determine the current noise levels and vibration at the project site. Sound level meter device was used to record noise at the four corners of the project site (north, south, east and west) as prescribed in ISO 19961:2003 and ISO 3095:2001. 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, which is designed to measure ground vibrations according to European standard EN 14253:2003. The meter has an accuracy of $\pm 5\%$, acceleration of 200 m/S^2 , a wide frequency range of 10 Hz to 1 kHz for capturing almost all possible ground vibrations. 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. The same point used for noise measurements were also used for vibration.

Air quality

Spot measurements were done on site to determine the current ambient air quality in terms of particulate matter and pollutant gases at the project site. Particulate matters were measured at site in

terms of TSP, PM₁₀, PM_{2.5} by using Dust Monitor, that measures dust particles of different dimensions (microns of 10, 5.0, 2.5, <1.0, 0.3 and >10). The equipment complies with the EMC Directives.

Ambient pollutant gas concentrations (i.e. CO, NO_x, NO₂, SO₂, H₂S, and VOC) were measured using “Aeroqual series 500 monitor (S-500)” at four points. Different sensor heads were used depending on the type of gas that was measured at a particular time. The ambient gases were measured 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; once the device is switched ON, it performs an automatic calibration for three minutes by pumping in fresh air into the sensors so as set the toxic sensors to zero.

1.6.4 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.

1.6.5 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 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

1.6.6 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.

1.6.7 Policy, Legal and Institutional Arrangement

Policy, legal and institutional arrangement were compiled from review of documents: policies, legislation, guidelines and standards. Information and data on local by-laws, institutional structures and mandates/authority were obtained from Mtwara-Mikindani Municipal Council.

1.7 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. Assessment of Impacts and Identification of Alternatives
- 7. Environmental and Social Mitigation Measures
- 8. Environmental and Social Management Plan
- 9. Environmental and Social Monitoring Plan
- 10. Resource Evaluation / Cost Benefit Analysis
- 11. Decommissioning and Closure
- 12. Summary and Conclusions
- References
- Appendices

2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION AND ACCESSIBILITY

The proposed project site is specifically located at Plot Number 903 and 904, Shangani West *Mtaa*, Shangani Ward in Mtwara-Mikindani Municipality, Mtwara Region (Map of Figure 2.2 and Google Earth Map of Figure 2.1 below). The site is within Mtwara Central Business District (CBD) and it is adjacent to Kambarage Primary School and Med English Medium Primary school of Shangani West area. The specific coordinates of the site are 10° 16' 04" South and 40° 10' 04" East.

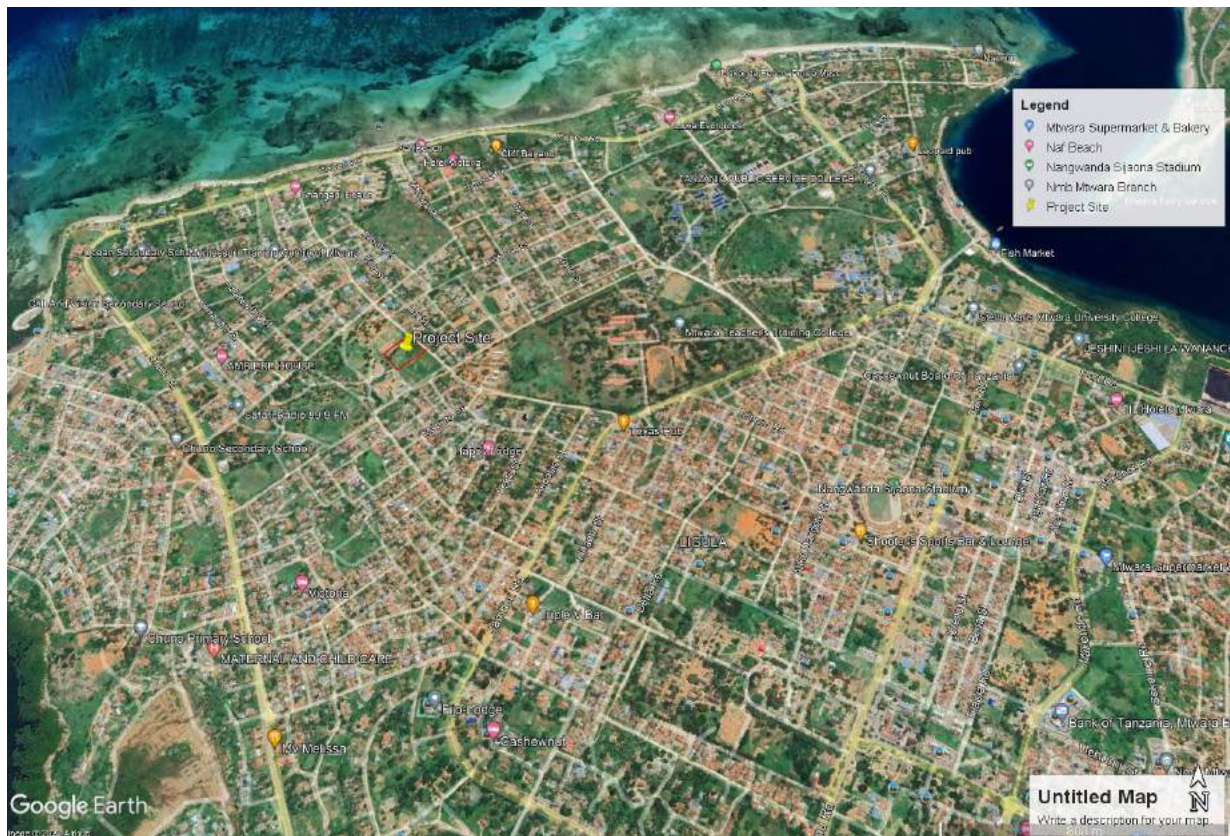


Figure 2.1: Google Earth Map showing the project site and its accessibility

The site is along the Maendeleo Road that joins with Jamhuri Road to the eastern side and Chuno road to the North western side, it is approximately 815 meters and 950 meters respectively. Chuno road is the most outer road to the west of Mtwara CBD area. The Jamhuri road joins with Port road to the North eastern side. The Mtwara port is about 2.17 kilometres to the proposed site via Jamhuri road.

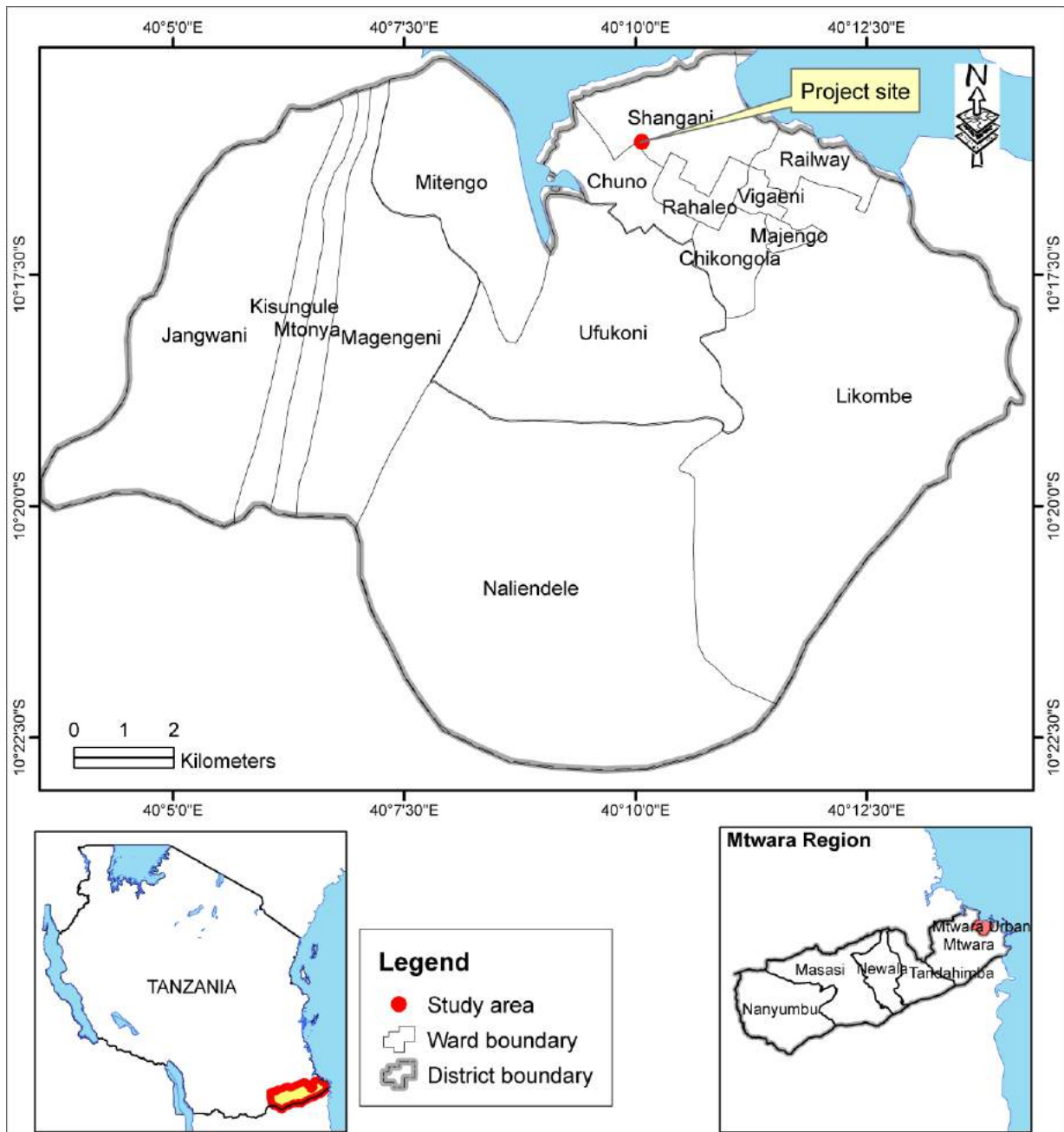


Figure 2.2: The Map of Mtwara Mikindani showing the location of the Project Site

Source: TRES Consult (T) Limited, 2023

2.2 LAND OWNERSHIP AND USE

The Open University of Tanzania is the registered owner of the two adjoining plots with No. 903 and 904 under Title Number 2524MTW, with a total area of 8285 square meters (Appendix 2). The plots use are designed for Public Building Purpose, Use Group G Use Class (h) as per Town and Country Planning (use Classes) Regulations, 1960 as amended in 1993. Hence the development in the area is compatible with the designed land use of the title. Likewise, the nearby areas are mainly covered by academic institutions.

2.3 SITE DESCRIPTION / FEATURES

The project site is about 16m above the mean sea level. Generally it is a coastal urban area and the sea is about 1.1 kilometres to the northern side where there is Mikindani bay. The site terrain is almost flat with little variation in altitude between points. Exception is observed to the east northern corner where it is relatively lower area that acts as depository area of surface run off from the nearby area. During the heavy rains the area holds water for few days. This is common phenomenon in Mtwara urban area where there are a number of water depository areas that floods during heavy rains, as there are few and minor natural drainage to drain the water from the area.

The project site is covered by grasses and few scattered trees species mainly of Neem (*Azadirachta indica*) some of which were sprouting and bushes. Near the eastern corner there is African Mahogany (*Azalia africana*) which is matured tree. The surrounding areas are characterized with exotic trees species mainly for ornamental and/or fruits. The common trees in the area are Madras thorn (*Pithecellobium dulce*), Ashoka (*Saraca asoca*) Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Coconut (*Cocos nucifera*) and other Palm family trees. Also there are some garden with planted seasonal crops such as Banana, Peas, and Pawpaw. The vegetation of the area gives the indication for habitat for fauna and based on the urban nature of the area there was no indication for large wild animal. The common urban birds are observed in the area while small reptiles, some amphibians, insects and other invertebrates are present in the undeveloped areas with some vegetation cover. According to IUCN *Azalia African* is regarded as vulnerable specie. No any other species with significance conservation status (i.e. threated or endangered as per IUCN guidelines/CITES List) was identified



Plate 2.1: Vegetation cover of the project site

Source: Field visit, September, 2023



Plate 2.2: African Mahogany (*Afzelia africana*) at the project site

Source: Field visit, September, 2023

The dominant soil in the area is sand underlying the coral limestone while brownish to blackish clay soils also feature in some areas and black alluvial soils are common in lower areas.

2.4 ADJACENT FEATURES/DEVELOPMENTS

The project site borders with Maendeleo road on North-eastern side and beyond is residential area. Along road reserve there are physical marks for utility network in the area to include natural gas pipeline (Plate 2.3). To the west/west north is Kambarage Primary school while to the east/east south and south western are undeveloped plots. Also it is diagonal with Medi English medium Pre & Primary school to the south. Further to the east are Shangani Secondary school, Mtwara Teachers Training college and Mtwara Technical Secondary school (see figure 2.3 below).



Plate 2.3: Noted infrastructures in the road reserve

Source: Field visit, September, 2023



Plate 2.4: North eastern side neighbourhoods

Source: Field visit, September, 2023



Figure 2.3: Google Map showing the project site and neighbouring features

2.5 PROJECT COMPONENTS AND DESCRIPTION

The proposed Laboratory building will be of two storeys consisting of four laboratories of Biology, Chemistry, Physics and ICT Multimedia (Figure 2.4 – 2.5 below). Also there will be Conference room, Library and Mtwara Regional Centre offices. The building will have pantry, sanitary areas and circular ramp for people with physical disabilities. Dedicated sanitary areas for people with disabilities will also be provided. The built up area will be 13% of the total area while the other area will be left for future development, lawn area and parking space (Site layout plan on figure 2.6).

The design of the building shall accommodate the infrastructures to enhance low energy use, rainwater harvesting, storm water management, adequate natural ventilation and lighting, and maintaining a significant green spaces, as part of adaptation to climatic change as covered in subsequent sections.



Figure 2.4: Front side view



Figure 2.5: Rear view



Figure 2.6A: Site Layout Plan



Figure 2.6B: 3D - Aerial view of the Site Layout Plan

2.6 THE PROJECT ACTIVITIES

2.6.1 Site Preparation and Mobilization

2.6.1.1 Site Preparation

The proponent and the contractor will ensure all necessary permits are in place to allow the work(s) to take place to include having construction permits from the planning authority i.e. Mtwara-Mikindani Municipal Council as part of compliance to the legal requirement. Necessary safety measures will be put in place to include securing the construction site by putting iron sheets around the site. Also the contractor will establish a small temporary site office for construction activities. The office will also include material store and pit latrines for both sex. At this stage the contractor will liaise with all Utility agencies/companies owning infrastructures within the road reserve of Maendeleo to identify their location to avoid impact to the infrastructures and interruption of services to the public served.

2.6.1.4 Mobilization for construction works

The mobilization phase will mainly involve deployment of required tools and machinery for the construction work and recruitment of the construction crew for the work. Also, the phase will involve deployment of construction material and their transportations from the point sources to site, however, most materials will be brought time to time as required. About 30 workers will be required for the construction project; however, they might be required at different stage of project development depending on their area of specialization and work. A Contractor will be responsible for this phase with supervision from the proponent project management team.

2.6.2 Project Construction

Some of the present vegetation at site will be cleared to pave a way for development of the proposed Laboratory building project. The first step, the contractor will involve site preparation/setting, excavating site to the required level. These will happen after clearance and accumulation of overburden materials and their eventual transportation to the disposal site. Under second phase, the works will involve the building erections/construction up to completion of the second storey.

Some of the overburdens/top-soils to be generated from excavations will be used for backfilling and resurfacing of the area. Once civil works is done mechanical and electrical works will finalise the buildings. Landscaping of the area and pavements lying will be among of the final activities of the construction phase.

The project will use local available building materials. The construction materials such as sand, stone, gravel and clay are expected to be obtained from authorized quarries in in Mtwara. However, concrete mix company will be contracted to supply concrete and thus other earth materials will be required in small quantities. Building materials such as cement, tiles, pavement, sanitary ware and steel mostly will be procured from various shops in Mtwara and if not available an option of sourcing from Dar es Salaam will be sought.

The contractor will be responsible for transportation of all construction materials and equipment from point source to the site mainly by using the Jamhuri and Chuno road then Maendeleo to the site. Most of the construction material such as cement, steel, wood, sand, stones and aggregates etc. will be brought from places whenever possible near the project site.

2.6.3 Operation of the Project

The building will be used mainly for academic purposes for teaching students through practical's in the noted laboratories. In this case chemicals will be used occasional especially in the chemistry laboratory, organic matter involving both flora and fauna will be used in the biological laboratories. Typical office works will be involved as there will be staff offices and conference rooms as well as library. The conference room will be used for meetings and seminars. Total number of estimated staffs after completion of the laboratory building is 20 maximum. As noted earlier the OUT offers training through online system and thus students will not be full time present at site. Only during practical and exams, the aspect of which will be once in a while. Likewise, the laboratory will be used as zonal centres and thus science students in the zone will be attending the practical and thus are not expected to be many (about 40 at full capacity). Other associated activities are related to utilities as covered below;-

2.6.3.1 Utilities

Water supply

Water will be required for laboratory works and general usage for cleaning and in sanitary areas. Normally laboratories are not intensive water users. Based on estimated number of staffs at site and occasional students visitation an estimation of water usage has been done. About 1.6 m³ of water will be required for staffs per day (80l/c/d). Students visitation is estimated at an average of 40 people at full building capacity that will be occasionally and will consume about 3.2 m³ per day. Thus, a total of 4.8m³ per day might be experienced during students visitation at full capacity. The area is served with the water supply system from Mtwara Urban Water Supply and Sanitation Authority (MTUWASA). The pipeline runs along the road of Maendeleo and thus the project will connect to the existing municipal water supply network. The MTUWASA Management confirmed to the consultant team that there is immediate plan to upgrade the water supply infrastructures of the area to ensure a steady supply of the service. The 4.8m³ per day can be supplied by the authority without a challenge. Further, the laboratory design includes a full set of facilities to harvest rain water, whereby pipes and a well-built storage tank of about 25m³ will be installed.

Electricity

The area is served with TANESCO Min - grid and the nearby powerline is about 400 meters from the site. The project will connect to the TANESCO Grid. The TANESCO Senior officer in Mtwara confirmed to the Consultant team that the Company will be able to service the building with its power need. Further, a full set of solar power system will be installed and that will control the use of excessive power from the national power grid.

2.6.3.2 Solid waste management

Construction related wastes will be generated to include debris/spoil materials, lumber, plastic remains, cans, tins, grass, and plastic packaging wastes like Cardboard boxes, wooden drums and empty cement bags. Also, domestic wastes will be generated due to presence of construction workers at site to include food remains, plastic bottles, paper and related wastes.

The contractor will designate an area for waste collection where wastes will be placed according to its nature. Further Municipal approved waste contractor will be engaged for waste removal.

During operation various kind of wastes will be generated mostly will be general wastes from offices, laboratory and pantry areas. These will include papers wastes, packaging materials, plastics, and

organic wastes (food wastes). Based on number of staffs to be fully station at site less than 5kg of wastes will be generated per day. The potential for hazardous waste generation exists from the laboratories the aspect of which is covered under subsequent sections.

The OUT will provide waste bins in strategic areas for collection of wastes at source and centralized waste collection point within the premises for collection by contracted agent. Collection point will be designed at one of the corners close to the gate for easy collection of the same without major nuisance during collection to other users of the area. A municipal approved contractor will be engaged for waste collection and disposal.

2.6.3.3 Liquid waste management

During construction, a pit latrine toilets will be established to serve construction crew. Supporting sanitary facilities will be provided to include water for required hygiene for users. Likewise, facilities will consider gender aspects i.e. both men and women toilets.

There is no centralised sewer system in Mtwara and thus the common practise is mainly septic tanks and soak away pit system. Thus, the project will explore the use of the same system in the area though the present challenge to the system is water table which is noted to be high (around 6 m below the surface) in the area. As per Water Supply Design Manual issued by the Ministry of Water - Guidelines from the Water Supply and Waste Water Disposal Design Manual, third Edition of March, 2009 eight percent (80%) of supply becomes waste water. Thus, with the demand of 1.6m³ per day will generate 1.28m³ per day during the usual days. During peak days when students will be at full capacity the demand will grow to 4.8m³ per day and the waste generated is calculated at 3.84m³ per day. This amount can be realistically managed properly with onsite system of septic tank and soak away pit proposed provided it is well designed and constructed.

During operation also there will be waste water from Laboratory operation. This will have separate management system from the sewage system. The OUT will design a waste water retention structures for the laboratory effluent. Two on series retention ponds will be designed for dilution of the effluent before final discharge to the open environment. The effluent on the retention ponds will be monitored to ensure it is safe for final disposal.

2.6.3.4 Hazardous materials/waste management

The main type of hazardous waste to be involved at site during construction include hydrocarbons such as used oil and diesel for running diesel powered machines at site. Also, there will be remaining paint containers. A proper temporary storage room will be constructed with bund wall to contain leakage or spillage in case of incident. After accumulation of large amount of used oil or at the end of construction during demobilization the oils and other type of hazardous wastes will be handled over to the authorised agent to handle such kind of wastes.

During operation there is potential for generation of hazardous wastes to include expired chemicals if due care is not taken. Chemicals in liquid or solid form might expire and require proper handling and disposal to avoid human health risks and environmental pollution. The OUT laboratory team will establish a system for management of chemicals to include ordering only the amount required for a short period of time to avoid accumulation and expiring. The system will also include First in First Out (FIFO) to ensure old chemicals is consumed first and hence to reduces chances for expire of chemical before usage. In case there will be expiring of chemicals, they will be stockpiled properly as per its nature and shall engage certified agent for disposal.

2.6.3.5 Security, health and safety

During construction, as noted earlier, the construction site will be secured by enclosure with single point of controlled entry and exit for public safety and security purpose. The site will have 24hours and 7 days security guards for safety and security purpose. All occupational health and safety issues as per requirement of the OHS Act, 2003 shall be adhered by the contractor. During operation a concrete fence will be constructed with a entry and exit gate and will be 24 hours 7 days guarded accordingly.

2.7 CAPITAL INVESTMENT

The project total investment costs is estimated at Tanzania Shillings One Billion Two Hundred Forty-Eight Million Seven Hundred Eighty-Five Thousand only (TZS. 1,248,785,000.00) which is equivalent to USD. 500,000.00.

3 POLICY, LEGAL AND INSTITUTION FRAMEWORK

3.1 INTRODUCTION

In Tanzania there are several policies, legal and administrative structures that govern execution of environmental and social impact assessment (ESIAs). The administrative aspects require that all the new projects that are likely to affect the environment should have an environmental impact assessment done and submitted to the National Environment Management Council (NEMC). The objective being to evaluate the environmental and social impacts of the proposed development on the environment and to provide appropriate mitigation measures.

In developing the Laboratory Building project in the area, various environmental and social issues may arise at any phase of the project development i.e. from site selection, mobilization to decommissioning phases. These issues need to be addressed so that the envisaged operations do not impair the integrity of the environment and ensure that they are in line with policies and legal regime operating in Tanzania as well as world bank safeguards policies. This chapter lists down relevant policies and legislations pertaining to the planning and implementation of the proposed Laboratory Building project;-

3.2 RELEVANCE POLICIES

The following are relevant sectoral and cross-sectoral policies which provide directives on how the project should be operated in relation to concerned environmental and socio-economic settings. The OUT will need to observe these policies in the course of designing and implementing the proposed project activities.

3.2.1 The National Environmental Policy (URT, 2021)

This Policy serves as a national framework for planning and sustainable management of the environment in a coordinated, holistic and adaptive approach taking into consideration the prevailing and emerging environmental challenges and national and international development issues. The effective implementation of this policy requires mainstreaming environmental issues at all levels, strengthening institutional governance and public participation in the environmental management regime. The long-term vision of this policy is geared towards the realization of environmental integrity, assurance of food security, poverty alleviation and increased contribution of the environmental resources to the national economy. The key objectives of the policy are to:

- Enhance environmentally sound management of land resource for socio-economic development.
- Promote environmental management of water sources.
- Strengthen conservation of wildlife habitats and biodiversity.
- Enhance conservation of aquatic system for sustained ecological services and socioeconomic wellbeing.
- Enhance conservation of forest ecosystems for sustainable provision of environmental goods and services.
- Manage pollution for safe and a healthy environment.
- Strengthen the national capacity for addressing climate change impacts.
- Ensure safety at all levels of the application of modern biotechnology.
- Promote good governance in environmental management at all levels.
- Enhance predictable, accessible, adequate and sustainable financial resources for environmental management and promote gender consideration in environmental management.

The policy advocates using other relevant approaches in environmental management such as economic instruments, environmental standards, indicators and legislation. In carrying out this project, this study being among of the environmental management approaches the proponent is in line with the policy requirements and will observe the provisions of other approaches as noted above.

3.2.2 The Land Policy (URT, 1997)

The National Land Policy of 1995 (revised in 1997) emphasizes the importance of undertaking EIA for the management of land based development. Additionally, the policy advocates the protection of land resources from degradation for sustainable development. The policy addresses several environmental issues; of relevance to this project is land use planning. Land use planning takes into consideration the land capability, ensures proper management of coastal/urban/rural land resources, promote resource sharing and multiple land use techniques in area of conflicting land use, and lastly advocates the involvement of community in resource management, land use and conflict resolution.

The OUT legally owns the project land as per landownership documents of appendix 2. The title of plot no. 903/904 is designed for Public Building Purpose, Use Group G Use Class (h). Therefore relevant issues pertaining to land policy are observed and are hereby further complied with by undertaking this study.

3.2.3 The Water Policy (2002)

The National water policy is intended to protect the water quality and quantity. Relevant to this project is the section on avoiding polluting surface as well as ground water. The National water policy recognises the following:

- i. There is a growing scarcity, misuse and wastage of water resources in many places of Tanzania, which may become a serious threat to sustainable availability of the resource.
- ii. Existence of uncontrolled abstraction of water resources from different water basins.
- iii. The state of the quality of water resources is not comprehensively known and no regular monitoring is done due to inadequacy of resources and institutional capacity.
- iv. Inadequate linkage between water and land development thus resulting in pressures on water resources. With the on-going liberalisation there is need to have co-ordination mechanism to facilitate smooth the linkage. Water Rights shall not be tied to any land, and they shall not be transferable with land transfer.

The OUT by undertaking this study is in line with the policy requirements. Further the study shall observe other requirements of the policy *inter alia* proper water usage, proper waste water management from the project and advise on proper procedure to secure abstraction permit for a borehole.

3.2.4 The National Health Policy (URT, 2008)

One of 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 shall observe this policy during the project implementation.

3.2.5 The National Construction Policy (URT, 2003)

This policy promotes among other things, application of cost effective and innovative technologies and practices to support socio-economic development including utilities and ensure application of practices, technologies and products which are not harmful to both the environment and human health. This study is undertaken to ensure that the proponent uses technologies and products not harmful to both the environmental and human health by providing feasible alternatives and appropriate mitigation measures.

3.2.6 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 which deals with the tendencies of private sectors to employ expatriates even where there are equally competent nationals. The proponent and contractor shall promote this policy by employing many Tanzania of relevant qualifications with priority to the community around and special groups as stated by the policy especially during development phase.

3.2.7 The National Energy Policy (URT, 2015)

The policy outlines measures to adopt clean technology and minimize energy losses. The policy states that energy is a prerequisite for the proper function of nearly all sectors of the economy. It is an essential service whose availability and quality can determine the success or failure of development endeavours. The policy seeks to promote energy efficiency in all economic sectors. The OUT will promote the objectives of this policy from design perspective of the building to minimize energy uses. Further shall explore the use of clean energy during the project implementation.

3.2.8 The National Women and Gender Development Policy (2000)

This policy aims to improve opportunities for women and men to play their full roles in society, recognizing specific gender requirements. The policy aims to minimize shortcomings related to the limited participation of women in most economic development activities. It focuses on using available resources to increase incomes, eradicate poverty and improve living standards. The policy also recognizes and emphasises creating awareness of how environmental degradation increases poor women's burden. This project will respond to the policy by ensuring equal opportunities in employment during development and operation phases.

3.2.9 The National Policy on HIV/AIDS (2001)

The policy provides a framework for leadership and coordination of the National multi-sectoral response to the HIV/AIDS epidemic. One of the major objectives of the policy is to strengthen the role of all the sectors, public, private, NGOs, faith groups, CBOs and other specific groups to ensure that all stake holders are actively involved in HIV/AIDS work and to provide a framework for coordination and collaboration. 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 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 behaviour and attitudes of employees

and employers alike shall be part of HIV/AIDS intervention in the workplace. Establishment of the proposed project might result into social interactions among workforce and local community therefore the company will adhere to the policy.

3.2.10 The Tanzania Education and Training Policy, (2014)

This Education and Training Policy of 2014 is the outcome of the review and finally repeal of the Education and Training Policy (1995), Vocational Education and Training Policy of (1996), National Higher Education Policy (1999) and ICT Policy for Basic Education of (2007). This policy was prepared to provide education and training direction in the country, taking into account economic, social, scientific and technological changes and education and training challenges nationally, regionally and internationally to increase opportunities, efficiency and the quality of education and training in the country and attain the human resource standards of a medium-income economy country by 2025.

The proposed project is in line with the policy's objectives as it will provide competent human resources from the infrastructure and facilities for training the same for the country and the regional market.

3.3 LEGAL FRAMEWORK

In addition to the above policies, there are a number of legal and regulatory frameworks that the proposed project must comply with and which this study has taken into consideration. The Environmental Management Act (No. 20), 2004 is the principal legislation governing all environmental management issues in the country. Within each sector, there are sectoral legislations that deal with specific issues pertaining to the environment. Some of the relevant legislation and regulations that are relevant in the management of the environment include the following:-

3.3.1 The Environmental Management Act, Cap 191

The Environmental Management Act (2004) introduces a concept of right of Tanzanians to clean, safe and healthy environment and right of Tanzanians to access various segment of environment for recreational, educational, health, spiritual, cultural and economic purposes (Section 4 (1) and (2)). The Act imposes an obligation on developers to;-

- Comply with license conditions including the EIA certificate (S.201). The act requires the developer to conduct an EIA prior to the commencement of the project to determine whether the project may/or is likely to have, or will have a significant impact on the environment.
- As land user and occupier to protect, improve and nourish the land and using it in an environmentally sustainable manner, (S. 72)
- Abstain from discharging any hazardous substances, chemicals, oils or their mixture into waters or into any segment of the environment (S.110)
- Comply with environmental quality standards (S.141)
- Control, manage and dispose in a sound manner waste including litter, liquid, gaseous and hazardous wastes (Part IX).

By conducting this study, the proponent complies with the requirement of the Act and will further comply to various sections noted above through this report and eventual its implementation.

3.3.2 The Land Act, [Cap.113 R.E 2019]

The basic principles of the Land Act 1999 are adopted from Land Policy 1995. The Act contains provisions of critical environmental importance. One of important fundamental principles of the Land Act

is “to ensure that land is used productively and that any such use complies with the principles of sustainable development”. The project activities will be conducted in consent with this principle in order to preserve the environmental integrity of the area. Further, the Acts seek to control land use and clarify issues pertaining to ownership of land and land-based resources, transactions on land and land administration. Since the site is legally owned by the OUT the issue of land ownership conflicts do not arise, thus this is not discussed further. Further, on land use the proposed project site is designated for Public Building Purpose, Use Group G Use Class (h) hence compatible to the stated land use of the area.

3.3.3 The Water Resource Management Act, 2009 (Act No. 11/2009)

The Water Resource Management Act 2009 is a principal legislation dealing with the protection of water resources and control of water extraction for different uses. According to section 39 (1) of this act, owner or occupier of land on which any activity or process is or was performed or undertaken, or any other situation exists which causes has caused or is likely to cause pollution of a water source, shall take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. In general, the Water Resource Management Act provides the legal basis among others for:

- (i) Water resources management at National and Basin levels.
- (ii) The administration to legalize, grant, modify and diminish water rights to the use of water by those entrusted with responsibilities for water resources management.
- (iii) To protect water rights for all legitimate water users, hence monitoring the quality and quantity of water sources.
- (iv) Water use conflict management.
- (v) Water pollution control and other related issues like water supply and any related infrastructure construction

Under section 9 the Act requires any development in water shed or water resource area to carry out EIA study in accordance to EMA, 2004. The proponent by undertaking this study complies with the requirements of the Act and further will comply with other provisions of the Act.

3.3.4 The Occupational Health and Safety Act No. 5 of 2003

This Act makes provisions for the safety; health and welfare of persons at work places. Also provides for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work. It specifically requires the employer to ensure the safety of workers by providing safety gear at work place. This Act is relevant to the developer in view of the expected construction works with many associated risks. The proponent shall ensure the contractor for construction register the work place to Occupational Safety and Health Authority during construction phase and shall further consult the authority on occupational health and safety issues to ensure it is in line with the requirement of the Act.

3.3.5 The Contractors Registration Act No. 17 Of 2008

The 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 alteration works; ensure that all construction sites are hoarded; and labour laws, occupational health and safety regulations in the construction industry are adhered to. The Proponent shall comply to the Act by contracting the registered contractor for the project. Further the project shall

be registered with CRB. The proponent together with the contractor thereof shall also adhere to other relevant sections of the Act.

3.3.6 The Engineers Registration Act, 2007

This Act establishes an Engineering Registration Board (ERB) which regulates the conduct of engineers, to provide for their registration and for related matters. 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. Furthermore, the Act stipulates that no person shall employ or continue to employ its professional engineer any person who is not a registered engineer. The proponent and contractor shall therefore observe the provisions of the Act when executing its activities.

3.3.7 The Employment and Labour Relation Act No. 6 of 2004

Generally, the Act among other things intends to provide the legal framework for effective and fair employment relations and minimum standards regarding conditions of work. For example, it prohibits employment of children under 18 years of age; stipulated types of contracts that can be entered with employees; the maximum number of ordinary days or hours that an employee may be permitted or required to work; remuneration; leaves; unfair termination of employment; establishment of trade unions branches in workplaces; etc. The proponent shall observe these and other relevant provisions in this Act.

3.3.8 The Workmen's Compensation Act, Cap 263 of 2008

Generally the Act provides for the employment accident and occupational disease benefit. The employment injury schemes provide medical care and cash benefits to workers, who are injured on the job or develop occupational diseases. Eligibility is provided on a no-fault basis and may be coupled with restriction on workers legal right to sue for damages. In operating its activities, Proponent and the contractor shall observe the provisions of this Act.

3.3.9 The Local Government (Urban Authorities) Act, [Cap.288 R.E 2019]

This Act establishes urban authorities for the purposes of local government, to provide for the functions of those authorities and for other matters connected with or incidental to those authorities.

Section 55 of the Act enumerates basic functions of the urban authorities. The functions that are relevant to proposed project are:

- to provide for the prevention and abatement of public nuisances or of nuisances, which may be injurious to the public health or to the good order of the area of the authority;
- to regulate any trade or business, which may be noxious, injurious to the public health or a source of public danger, or which otherwise it is in the public interest expedient to regulate, and to provide for the issue of licenses or permits to facilitate the regulation of any such trade or business, and for the imposition of fees in respect of such licenses

Section 80 of the Act empowers the urban authorities to set by-laws. The proponent shall observe these and other relevant provisions in this Act.

3.3.10 The HIV and AIDS (Prevention and Control) Act of 2008

The HIV/AIDS Act (Act No. 28/08) calls for prevention, treatment, care, support and control of HIV and AIDS for promotion of public health in general. It also calls for appropriate treatment, care and support by using available resources to people living with or at risk of HIV and AIDS and to provide for related matters. Apparently, for the Project the risk of population living in or nearby project area contacting HIV/AIDS during construction and operation phases is high and thus, the Act provides legal guidance to the cause. Of particular importance to this project is found in part II, section 6 (1), titled Roles of Sectors, which states that: 'every ministry, department, agency, local government authority, parastatal organization, institution whether public or private, shall design and implement gender and disability responsive HIV & AIDS plans in its respective area, and such plans will be mainstreamed and implemented within the activities of such sector.' The OUT and contractor shall adhere to the requirements of the Act.

3.3.11 The Fire and Rescue Force Act No. 14 of 2007

This Act provides for the better organization, administration, discipline and operation of fire and rescue brigade services. Tanzania Fire and Rescue purpose is to enhance community safety, quality of life and confidence by minimizing the impact of hazards and emergency incidents on the people, environment and economy of Tanzania. The Force manages fire emergencies in Tanzania's major cities and towns and responds to rescues, hazardous materials incidents and possible terrorist activities across the country. The Force work with other government agencies to minimize the impact of bushfires, storms, floods, landslides, building collapses, motor vehicle accidents and other emergencies. It is the obligation of the project owner to register the project with fire and submit drawings for fire safety scrutiny and approval before starting construction. The project proponent shall comply with all provisions of the Act.

3.3.12 The Persons with Disability Act, 2010

The basic principles of this Act are to respect for human dignity, individual's freedom to make their own choices and independence of persons with disabilities, non-discrimination, full and effective participation and inclusion of persons with disabilities in all aspects of society, equality of opportunity, accessibility, equality between men and women with disabilities and recognition of their rights and needs, and provide a basic standard of living and social protection. Therefore, the proposed project will fulfil this legal requirement in all project phases, from design, construction and operation.

3.3.13 The Child Act of 2009

The legal framework for child labour in Tanzania is contained in the Law of the Child Act (Act No. 21, 2009). The Act sets the minimum age for admission of a child to employment at 14 (Sec. 77.2). It also contains a provision permitting light work for children who are at least 12, where light work is defined as work that is not likely to be harmful to the health or development of the child and does not affect the child's attendance at school or the capacity of the child to benefit from schoolwork (Sec.77.3). The Act prohibits the engagement of children and children below 18 in hazardous work, posing a danger to health, safety or morals and in "night work" taking place between 8 pm and 6 am (Sec. 82.2). The Law of the Child (Child Employment) Regulations (G.N. No. 196, 2012), which is used to implement the Law of the Child Act (Act No. 21, 2009), contains list of all hazardous activities in which a child shall not be allowed to work, even on a voluntary basis. Section 82 of the Act also protects children from sexual exploitation. A child shall be protected from sexual exploitation and use in prostitution, inducement or coercion to engage in sexual activity and exposure to obscene materials. This project will protect against child labour, especially during the construction period.

3.4 SUBSIDIARY LAWS UNDER THE EMA CAP 191

3.4.1 The Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018

These regulations have provided the list of projects which require an Environmental Impact Assessment study. Since such a project is likely to have some adverse environmental impacts. An in-depth study is required to determine the scale, extent, and significance of the impacts and identify appropriate mitigation measures. Furthermore, the regulation provides explicitly procedures and guidelines for carrying out the Environmental Impact Assessment in Tanzania. This report has been prepared in line with the procedure and requirement of these regulations.

3.4.2 The Environmental Management (Registration and Practice of Environment Experts) (Amendment) Regulations GN. NO. 500 of 2022.

Section 83 of the EMA (2004) stipulates that the Environmental Impact Assessment shall be conducted by experts or firms of experts whose names and qualifications are registered by NEMC. The NEMC maintain a registry of EA and EIA experts. These regulations also set the code of practice of the experts for which the Environmental Impact Assessment experts for this project subscribe. This EIA report has been prepared by the registered expert by NEMC.

3.4.3 The Environmental Management (Fee and charges) (Amendment) Regulations, 2021

These Regulations specify the amount of environmental fees for various operating projects and other fees for assessment. Of particular importance to this project is annual fees to enable the Council undertake monitoring and audits to ensure the environmental obligation stipulated in the EIA report is adhered to during all project phases. Thus the OUT shall adhere to these regulations by paying the required fees timely to the Council.

3.4.4 The Environmental Management (Air Quality Standards G. N. No. 237) Regulation, 2007

These regulations' objective is to set baseline parameters on-air and emissions based on many practical considerations and acceptable limits; enforce minimum air quality standards prescribed by the National Environmental Standards Committee. This is to help developers keep abreast with environmentally friendly technologies; and ensure the protection of human health and the environment from various sources. The Second Schedule of the Regulations specifies the highest permissible quantity for emissions and the acceptable test methods. Under Regulation 28, any holder of a permit, owner or occupier of premises is required that all incidences of inadvertent or accidental emissions or pollution in contravention of these standards shall report the incident within seven (7) days. The standards as laid down by these regulations shall be adhered to accordingly by the project as indicated in the monitoring plan of this report (chapter 9).

3.4.5 The Environmental Management (Water Quality Standards G. N. No. 238) Regulation, 2007

The Water Quality Standards Regulations' objective is to protect human health and conservation of the environment, enforce minimum water quality standards prescribed by the National Environmental Standards Committee. The committee would assist in determining water usage for purposes of establishing environmental quality standards and value for each usage, and ensure all discharges of pollutants take into account the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned. Thus the OUT shall adhere to these standards as stipulated in Chapters 8 and 9 of this report.

3.4.6 The Environmental Management (Soil Quality Standards) Regulation 2007

These Regulations specify the soil parameters to be adhered to by different operating industries/facilities as standards. The objective of the Soil Quality Standards Regulations is to protect human health and conserve the environment. The OUT shall adhere by monitoring the key parameters as detailed in chapter 9 of this report.

3.4.7 The Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations, 2015

The regulations are made from the Environmental Management Act Cap 191. The objective of the regulations is to maintenance of a healthy environment for all the people in Mainland Tanzania, the tranquility of their surrounding and their psychological wellbeing by regulating noise and vibration levels. It further prescribes the maximum permissible noise and vibration levels from a facility or activity to which a person may be exposed to. It also sets baseline parameters on noise and vibration permissible levels based on a number of practical considerations and acceptable limits. The OUT shall comply to the limits of this standard as noted under EMP of chapter 9 to this document.

3.4.8 The Environmental Management (Solid Waste Management) Regulations, 2009

The regulation state that every person living in Tanzania shall have a stake and a duty to safeguard the environment from the adverse effects of solid wastes and to inform the relevant authority on any activity and phenomenon resulting from solid waste that is likely to adversely affect the public health and environment. Further, the regulation requires the occupier of any premises to be obliged to use appropriate receptacles. Also, regulations require the occupier to comply with such days and approximate times for collection of waste specified by the local government authority having jurisdiction over the premises. Thus, the OUT shall comply with all these requirements during the implementation of the project in all phases.

3.5 WORLD BANK ENVIRONMENTAL AND SOCIAL FRAMEWORK

3.5.1 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; non-discrimination; social inclusion; public participation; and accountability—including expanded roles for grievance 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.

3.5.2 World Bank Environmental and Social Standards

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.

The standards are expected to: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement. The proposed project will apply the ESF. The proposed project will apply the ESF and Table 3.1 below describes the application of the ESSs to the project.

Table 3.1: Application of World Bank’s ESSs to the proposed project

ESSs	Yes/No	Application
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Yes	The site-specific environmental and social impacts will be managed through this report. The report has been prepared to recommend E&S measures to be incorporated into designs and implementation of the proposed project
ESS 2: Labor and Working Conditions	Yes	Workers will be contracted for the construction works and operation of the project. In order, to ensure fair treatment of workers, the project will ensure that terms and conditions of employment (hours, rest periods, annual leave, non-discrimination, equal opportunities and workers organizations) are aligned with the requirements of Tanzania law and ESS2. To protect workers appropriate Occupational Health and Safety (OHS) shall be applied to avoid the risk of ill health, accidents and injuries. The proponent will set labor management procedures with roles and responsibilities for monitoring primary suppliers. If child labor or forced labor cases are identified, the proponent will require the primary supplier to take appropriate steps to remedy them. Where remedy is not possible, the proponent will, within a reasonable period, shift the project’s primary suppliers to suppliers that can demonstrate that they are meeting the relevant requirements of this ESS
ESS 3: Resource Efficiency and Pollution Prevention and Management	Yes	The project activities will involve construction works which will generate dust, erosion, wastes (solid and liquid) that will be properly managed via ESMPs and EMP. More or less similar impacts are likely to be experienced during operation phases and will be managed by the same tools

		as well as operation and maintenance plans.
ESS 4: Community Health and Safety	Yes	<p>The project will not have substantial risk to community health and safety. Only localized negative impacts (like dust emissions noise pollution etc.) to sensitive receptors will need to be managed.</p> <p>Also, community safety especially is an issue of concern due to the influx of the project workers, and later on participants of the project, which might lead to GBV/SEA/SH, as well as transmission of HIV/AIDs and other communicable diseases. Guidance on HIV/AIDs, COVID-19, GBV/SEA/SH and HEET project GRM shall be followed.</p>
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	No	This ESS is not relevant to the proposed Two Storey Science Laboratory Building at Plot 903/904 in Mtwara-Mikindani Municipality.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	No	The project is not located inside or near protected areas and sensitive habitats. In case the project will purchase natural resources commodities such as timber, it will be important to establish the source area and to have a mechanism in place to ensure that the Primary Suppliers are not significantly impacting sensitive ecosystem or degrading natural habitats.
ESS 7: Indigenous People/ Sub-Saharan African Historically Underserved Traditional Local Communities	No	This standard is not considered relevant as the project will mainly be implemented in areas where communities that meet the requirements of ESS7 are generally not available in the area.
ESS 8: Cultural Heritage	No	This ESS is not relevant as the project area has already being developed.
ESS 9: Financial Intermediaries	No	This ESS is not relevant to the project.
ESS 10: Stakeholder Engagement and Information Disclosure	Yes	The proponent 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. As part of ESIA study stakeholders engagement has been done in line with the requirement of the ESS10.

3.5.3 World Bank Group ESHS 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. Specific guidelines which will be used is Environmental, Health, and Safety (EHS) Guidelines: Environmental Waste Management. As stipulated earlier the guidelines will be used together with the Environmental, Health, and Safety General Guidelines.

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 will 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 will be based on the professional opinion of qualified and experienced persons. This study will fully consider the WB guidelines to manage the project risks and impacts.

3.6 INSTITUTIONAL FRAMEWORK

3.6.1 Introduction

The Tanzania ESIA practice gives different functions and responsibilities to all parties involved in the ESIA process of any proposed development undertaking to which ESIA is obligatory. The EMA, Cap 191, gives NEMC a mandate to undertake enforcement, compliance, review and monitoring of EIAs and a role in facilitating public participation in environmental decision-making, generally supervising and coordinating all matters relating to the environment. The EMA empowers NEMC to determine whether a proposed project should be subjected to an ESIA, approve Consultants to undertake the ESIA study and invite public comments, and also grants NEMC the statutory authority to issue the certificates of approval via the Minister responsible for environment. NEMC is currently the designated authority to carry out the review of ESIA's, including site visits and handling Technical Advisory Committee (TAC) meeting, monitoring and auditing of environmental performance of the Project. Table 3.2 lists key institutions of potential relevance to the proposed Project.

Table 3.2: Key Institutions to the ESIA Process

Level	Institution	Role and Responsibility
National level	Vice President's Office (Division of Environment)	<ul style="list-style-type: none"> • Coordinate various environment management activities in Tanzania • Advise the Government on legislative and other measures for the management of the environment • Advise the Government on international environmental agreements • Monitor and assess activities, being carried out by relevant agencies in order to ensure that the environment is not degraded • Prepare and issue a report on the state of the environment in Tanzania; • Coordinate the implementation of the National Environmental Policy

Level	Institution	Role and Responsibility
	National Environment Management Council (NEMC)	<ul style="list-style-type: none"> • Carry on environmental audit and environmental monitoring • Carry out surveys which will assist in the proper management and conservation of the environment • Undertake and co-ordinate research, investigation and surveys in conservation and management • Review and recommend for approval of environment impact statements • Enforce and ensure compliance of the national environmental quality standards • Initiate and evolve procedures and safeguards for the prevention of accidents which may cause environmental degradation and evolve remedial measures where accidents occur; • Undertake in co-operation with relevant key stakeholder's environmental education and public awareness; • Render advice and technical support, where possible to different stakeholders
	Ministry of Lands, Housing and Human Settlements Development	<ul style="list-style-type: none"> • Land use planning • Issuing of Right of Occupancy • Valuation and compensation
	Ministry of Education Science and Technology	<ul style="list-style-type: none"> • Issuing policy guidance • Providing legal frameworks • Issuing licences, provisions of certificates of compliances • Enforcement of laws and regulations • Monitoring and reporting on compliance with the ESMF/ ESMP under the established National Project Coordination Unit (NPCU). • Ensure compliance with the various regulations, guidelines and procedures issued by the Minister responsible for the environment
	Occupational Safety and Health Authority (OSHA)	<ul style="list-style-type: none"> • Registration of the construction site, registration of workplace and inspection. • Issuance of OSHA Compliance certificate. • Inspection on OSH related aspects. • Enforcement of Occupational Health and Safety Act, 2003 (Act No. 5/2003).
Project Proponent	OUT	<ul style="list-style-type: none"> • Carrying out EIA study • Project implementation including mitigation measures • Carrying out regular environmental monitoring and internal auditing • Further details see section 3.6.2 below

Level	Institution	Role and Responsibility
Regional level	Mtwara Regional Secretariat Office	<ul style="list-style-type: none"> Oversee and advice on implementation of national policies at Regional level Oversee enforcement of laws & regulations Advice on implementation of development projects and activities at Regional level
Council level	Mtwara-Mikindani Municipality Executive Director Office	<ul style="list-style-type: none"> Chief Executive Officer for all development activities in the Municipality level Baseline data on social and economic conditions Extension services Plan and coordinate activities on community-based natural resource and environment management Enforcement of laws & regulations Coordinate environmental matters at the Municipal level Municipal Environmental Officer (MEMO) is responsible for project monitoring on environmental issues.
Ward Level (Shangani)	Ward Development Committees – (Ward Councillor, WEO, WDC)	<ul style="list-style-type: none"> Oversee general development plans for the Ward. Provide information on local situation and Extension services Technical support and advice Project Monitoring
Mtaa Leadership (Shangani West)	Mtaa Chairman / MEO, Environment Committee): and Other leaders	<ul style="list-style-type: none"> Information on local social, economic, environmental situation View on socio-economic and cultural value of the sites and plant operations. Rendering assistance and advice on the implementation of the project Project Monitoring (watchdog for the environment, ensure well-being of residents)
	Nearby community and Institutions	<ul style="list-style-type: none"> Information on local social, economic, environmental situation View on socio-economic and cultural value of the sites and on proposed expansion project operations.

3.6.2 Institutional Capacity for implementing Environmental and Social issues

The OUT responsibility is to ensure that the implementation process of the ESMP and Mitigation measures are line with the relevant national policies and legislations and World Bank Environmental and Social Standard 1. The OUT has the Project implementation Unit (PIU) with 18 people responsible for supervision and monitoring the implementation of the project construction activities. The management of all project activities during operation is under the PIU, in collaboration with other departments and units depending on the nature of the activity. In general, the PIU falls under the management of the OUT executing day-to-day activities in the project. The PIU is guided by management meetings that are chaired by the Vice Chancellor. The management meetings provide support, guidance and oversight of the progress of the PIU. Further, among the PIU staffs, 3 are working as EEnvironmental and Social Safeguard Specialists (i.e Gender specialist, Social Specialist and Environment Specialist) who will monitor the environmental and social activities of the project during all project phases. The Environment specialist holds a PHD in environment technology and management, Social specialist holds BA in Sociology and Gender specialist holds a PHD in Management Science and Engineering and is a focal gender person of the OUT. Further the OUT shall commissioning the consulting engineer to supervisor the contractor during construction among others

on Environmental and Social Issues. The roles and responsibility on environmental and social issues is covered on table 3.3 below:-

Table 3.3: Institutions responsibility at the project level

Institution	Roles and responsibility
World Bank	<ul style="list-style-type: none"> • Project financing • Ensures that the project is carried out to the highest environmental standards strictly in accordance with the ESMF and ESIA project report and the mitigation measures set out therein. • Also requires that environmental and social impacts are managed in accordance with the World Bank ESF and its ESS. • Provide second line of monitoring compliance and commitments made in the ESMPs through supervision.
PS-MoEST	<ul style="list-style-type: none"> • E&S monitoring and surveillance of all project components investments that will be undertaken by project. • The ministry will report results of this monitoring to the World Bank.
NPIU Environmental and Social Team	<ul style="list-style-type: none"> • Coordinate different activities to ensure that, the project meets the country legal and World Bank requirements with regard to Environment and Social Framework
Implementing institutions (OUT - PIU) Environmental and Social Team	<ul style="list-style-type: none"> • Maintaining the PIU chaired by the Deputy Vice Chancellor and assisted by qualified and experienced staffs in adequate numbers and under terms of reference as outlined in the Project Operational Manual (POM). • The PIU is vested with the responsibility of the day-to-day implementation of the project activities including financial management, procurement, environmental and social risk management, governance and anti-corruption, monitoring and evaluation, and reporting; • 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. • Support the procurement officer at OUT 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. • Coordinate preparation of ESIA and environmental and social management plans (ESMPs) done by consultant and site-specific ESMPs (SSEMP). • Ensure that contractors have an Environmental Health and Safety Officers (EHS), who are familiar with the compliance requirements, including WB EHS guidelines
Consultant (Environmental and Social Team)	<ul style="list-style-type: none"> • Work with the NPIU//UPIU to understand the requirements of the environmental and social assessment; • Conduct initial site visits with the UPIU to understand the sub-project setting and site-specific requirements; • Prepare the ESIA and ESMPs based on the procedures described in the ESMF including carrying out an alignment walk, alternatives analysis and baselines studies, identifying the E&S risks and impacts, developing mitigation measures and monitoring plans incorporating EHS requirements; • Cost all the mitigation and management measures proposed in the ESMPs and SSEMPs

Institution	Roles and responsibility
	<ul style="list-style-type: none"> • Propose a capacity building plan for the implementation of the sub-projects (where necessary) • Carry out public consultations; • Assist the UPIU in preparing documentation to obtain certification from NEMC for the ESIA's and ESMPs.
Contractors (Environmental and Social Team)	<ul style="list-style-type: none"> • Compliance with relevant environmental and social legislative requirements (project-specific, district- and national level), including allocating adequate budget for implementation of these requirements; • Work within the scope of contractual requirements and other tender conditions; • Prepare CESMPs based on the ESMP in the bidding documents and contracts; • Train workers about EHS (including relevant WBG EHS Guidelines) and the site specific environmental and social measures to be followed; • The EHS officer of the contractor will participate in the joint site inspections with the UPIU and Environmental Supervision Engineer/consultant; • Immediate notification of the NPIU and supervision engineer of any significant social or environmental health and safety incident linked with the project, and indication about the measures taken or that are planned to be taken to address the incident as well as propose any measures to prevent its recurrence. • Carry out any corrective actions instructed by the Supervision Engineer/consultant; • In case of non-compliances/discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impact; • Propose and carry out corrective actions in order to minimize the environmental impacts; • Send weekly reports of non-compliance to the Supervision Engineer/consultant; • Send monthly progress reports to the Supervision Engineer/consultant

4 BASELINE DATA AND INFORMATION

4.1 INTRODUCTION

This chapter provides a description of relevant environmental, economic and social characteristics of the project core area (site specific), and areas in the immediate vicinity of the project which is Shangani West Area as well as broad description of the area of influence i.e. Shangani Ward, Mtwara-Mikindani Municipal for the proposed project. The Consultant relied on secondary data and information found in literature covering the project area and observation at the site. The level of details in the various sections depends on the interactions between the project activities and the particular environmental or socio-economic aspect.

4.2 PHYSICAL CHARACTERISTICS

4.2.1 Administration

In the implementation of project activities, the proponent will have to communicate and associate with various local government authorities from the Regional level to Municipal level, Ward and Mtaa level. Administratively the project is located at Plot No 903 and 904, Shangani West *Mtaa*, Shangani Ward in Mtwara-Mikindani Municipality, Mtwara Region, Tanzania. The Mtwara-Mikindani Municipal Council is divided into twenty (18) wards and 111 Sub-wards. The Municipality shares borders with Mtwara District and surrounded by Indian ocean to the eastern side. It lies between 10^o and 11^o South of equator and between longitudes 40^o and 41^o East of Greenwich. The Council occupies a total land area of 163 square kilometres, 39.3% being proer while urban 60.7 % is characterised with sub-urban (URT, 2018).

4.2.2 Climate

Generally, the climatic condition of the area is typical of the tropical coastal area of Tanzania, which is characterized by high temperatures, low wind speed, high humidity, and the absence of a cold season. The main rainy season lasts from March to May and the long dry and cooler season from June through to October. There is a short rainy season in October to December followed by a short drier hot spell in January/February.

Rainfall

The Mtwara-Mikindani Municipal area has bi-season climate, a hot humid rainy Season from November to May when the dominant winds are from the North – East and a Cooler less humid dry Season from June to October when winds are from the South-East. The average range annual rainfall precipitation is about 800mm to 1000mm.

Temperature

The highest monthly mean air temperature is 27.7^oC in December and the lowest is 24.5^oC in July. Relative humidity varies from 87% in March to 79% October.

Wind

The wind in the area is dominated by two main phenomenons. The Northern Monsoon governs the period between November and March with winds from Northern direction. The Southern Monsoon occurs between May and October. The average maximum wind speed is 13 knots. Wind from Northern can increase up to 46 knots. The most frequent wind direction in years is S, the average wind speed in

years is 2.6m/s, and the maximum wind speed is 27.8m/s. (Source: Tanzania Meteorological Agency, 2021).

4.2.3 Topography, Soils and Geology

Generally, the elevation of Mtwara-Mikindani area is low ranging from the Sea level up to 50 metres. The topography is slightly undulating. The Council consists of one geological zone of a coastal Sedimentary zone extending up to the boundary of the Council. Along the coast, there is marine formation accompanied with patches of lime stone. The soils in the coastal Sedimentary zone are well drained sandy soils of low fertility and low moisture holding capacity. They are produced from sandstones. Some areas give rise to marine heavy clay soils. Further, coastal limestone produces red, well drained and heavy textured soils. The specific project site features sandy loam soils while on the lower power is alluvial soils.

4.2.4 Hydrology

The Mtwara Mikindani Municipality is mainly draining towards the nearby sea through seasonal stream and valleys. Also there are number of depository areas which seasonally contain some water and sometimes overflows towards valleys and seasonal streams to the Ocean. Some have become permanent ponds. The literature shows that the water table is quite high around the area with 12 meters below the ground, which could be the case at the project area. The general hydrological basin covering the project area is Ruvuma and southern Coast basin.

4.2.5 Air Quality

A spot baseline air quality survey was conducted to ascertain the concentration of respirable particulates and pollutant gases in the project area prior to the construction and operation of the proposed project. The dust levels in terms of particulate matter (TSP, PM₁₀ and PM_{2.5}) were measured on site and pollutant gases concentration were also measured. Generally the project area is not degraded in terms of air quality condition as all measured parameters were within the allowable limits of the local and international standard limits.

4.2.6 Noise and Vibration

The noise and vibration levels at the project site were also measured to establish the baseline condition before commencement of construction activities. Based on site assessment there is no continuous noise emission in the vicinity of the project site. The only source of noise is due to movement of vehicles and motorcycles along the Maendeleo road occurring intermittently during the movement of the same. The average noise level was noted to be within the limits of the international standard and 50% were within the local standard limits. All measured vibration data were within the human detectable limit, TBS limit and WHO guidelines.

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. As seen in Table 4.4 above, the highest ground vibration of 0.008 mm/s was recorded at station 3 as mm/s PPV. 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.

4.3 BIOLOGICAL CHARACTERISTICS

The Mtwara Mikindani Council is divided into two different vegetation types. The coastal area covered by mangrove trees and the rest particularly in the villages are predominantly grassland or bush grass land. The dominant species being *Maclura African*, *Dichrostachys cinerea*, *Combretum spp.*, *Acacia spp.*, *Cassia sp.*, *Markhamia lutea* with shrubs of *Comiphora Africana* and *Albizia vescholor* and exotic species of *Anacardium occidentale*. The general project area has largely been influenced by human developmental activities and thus there are no expected pristine forest covers. Most areas are covered by secondary growth or planted exotic trees and/or crops. Coconut trees are common in the area with few cashew nut trees also. The notable species at project site include Neem (*Azadirachta indica*) and African Mahogany (*Azalia africana*). The latter being categorised as vulnerable as per IUCN guidelines.

The nature of the area and the general surrounding does not indicate the presence of huge wild animals. Furthermore, based on the described vegetation of the area which also gives the indication of the habitats of fauna, there are neither huge wild animals no animal species of ecological significance (rare or endangered species) that would require special attention in the area. However, common small animals are expected in the area. These could include avifauna, reptiles, earth invertebrates and inserts.

4.4 SOCIO-ECONOMIC SETTING

4.4.1 Demographic Profile

In the 2022 Census, Mtwara Region was found to have a population of 1,634,947 with average annual Intercensal Population Growth Rate of 2.5. Based on the population census reports of 2022 Mtwara-Mikindani Municipality had a total population of 146,772, (69,841 being male and 76,931 Female) with Average Household Size of 3.3.

4.4.2 Land use

The Open University of Tanzania is the legal owner of the piece of land i.e. Plot No. 903 and 904 designated for Public Building located at Shangani West. The Land in urban centres is administered under the land Act of 1999. Most of the land is surveyed and people/institutions provided with title deeds. However, as in most cases of land owned by the Government, village lands are un-surveyed. Exception is being experience now in the area around the Mtwara town where most of the land pieces are being surveyed. This has been practised due to the increase rate of investment from early 2010 as a result of oil and gas operations.

4.4.3 Economic activities

The people of Mtwara-Mikindani depend on various activities for their survival. Agricultural products produced are such as cassava, Sorghum, maize, millet and legumes. About 33% of the total populations are engaged in agriculture and other related activities. Other activities include fishing, petty trade, small and medium enterprises; (small scale industries.) small scale animals keeping such as cows, goats, hens, and so on. Very small population are employed in industrial sector. This is because the industrial sector in this Council is very young. It is believed that the discovery of oil and gas will change the life standard of the people of Mtwara, particularly Mtwara-Mikindani.

Agriculture

The Council has a total area of 8,254 hectares of arable land favourable for agriculture which is equal to 51.6% of the whole area of council. Among the 8,254 hectares only 6,192 hectares (75%) is used for agriculture. Normally agricultural activities are practiced at subsistence (hand to mouth) level. There are no enough surpluses from those activities. Food crops grown include cassava, maize, sorghum, millets, paddy and legume, whereas cash crops grown include cashew, groundnut, simsim and coconut. The sector is characterized by inadequate extension workers; and low extension services and the use of rudimentary technologies, small area under irrigation and no agriculture input fund.

Livestock

The Municipal Councils have 296 livestock's keepers who practice zero grazing. The livestock include cattle, goat, pigs, sheep, rabbit, indigenous chicken, improved chicken for both broilers and layers, ducks, pigeon, as well as dog and cat. The table 4.6 below shows the population of the livestock by year 2018.

The sector is affected by various issues that are: livestock keepers are not visited regularly, increase morbidity rate in livestock, lack of enough livestock infrastructure (abattoir, slaughter slab, holding ground, lairage), lack of working gears, low milk productivity, shortage of livestock feeds, inadequate milk processing technology center and free range animal grazing system.

Fishing

The Municipal Council has coastal strip of 25 Kilometers, The average annual fish production 385 metric tons, Fish is recorded at Shangani, low production is attributed by inadequate and insufficient years and vessels. These are total of 600 fishers and 350 vessels mostly bearing dug out canoes which carry 1-2 fishers, There are 200 basket traps, 10 Ring nets, 400 gillnets, 5 long lines, 150 hand lines, 50 shank nets. The main draw back in this sector is lack of capital for fishers for purchasing fishing gears. (URT, 2018).

Industry, Trade and Commerce

The Mtwara Mikindani Municipal Council do not have Medium or large scale industries instead have small scale industries. There are 16 small scale industries engaged in different activities namely: block making, milling machines, clean water production, salt extraction, and cashew nut processing. (URT, 2018). There are initiatives to facilitate entrepreneurs in SMEs and small scale industries. Facilitation is done through consultation and provision of loans to the businesses. It is normally done in collaboration between the Municipal Council and other players like Small Scale Industry Development Organisation (SIDO), Commercial Banks, other financial institutions and other sector experts outside the Municipal Council.

Majority of the commercial enterprises are located at BIMA area, Maduka makubwa, Bus stand and Mtwara Market area. Also there are trading activities in various streets. The decision of the Government to make various reforms so as to simplify the process of starting the business by the entrepreneurs has brought many positive changes. Many people have managed to start their business and developing them successfully.

4.4.4 Social Services Infrastructure

Education and training

The Council has 32 primary Schools with 16923 pupils of whom 8555 are boys and 8368 girls. There are 266 classrooms, 50 teacher's houses, and 459 primary School teachers. Through Primary Education Development Programme (PEDP) the Council in collaboration with the community and other development partners has constructed a number of classrooms for the past five years. Increased numbers of classrooms result into an increase in enrolment of standard one pupil in primary schools.

The Council has 21 Secondary Schools whereby 13 of them are owned by government and 8 are privately owned.. Among 13 secondary schools ten of them offer chances to local standard seven leavers who pass STD.VII examinations in the catchment area and only two of them involve student from other part of a country. On high learning institutions the Municipality Council have Universities and Colleges to mention few The Open University of Tanzania (OUT), SAUTI, Teacher college, Tanzania public Service College and others.

Health

Mtwara referral hospital is in Mtwara-Mikindani municipality where by various services are provided, but there are other health institutions which are run by the community, council and other stakeholders. Generally there is well distribution of health services within the municipality. Most of the people are living within five kilometers to reach the health centre. But this health services are faced with a number of challenges which includes;- lack of expert doctors, shortage of ambulances, the high need of referral hospital, shortage of medicines and other medical equipments, Deterioration of some of the buildings and shortage of staff houses.

Roads

In this area there are urban roads. Most of the houses within the municipality are not well accessed by good road. This situation needs to be rectified so as to improve the road systems within the municipality. Most of the roads need water drainage system so as to preserve these roads especially during the rain seasons. Also there is a need for street lights so as to improve the security of the users. The municipal council has a total of 299.67 kilometres of road categorized as urban roads.

Water supply

Mtwara Urban Water Supply Authority is the sole distributor of water in the municipality. Almost 83% of the population in this municipality gets water within the distance of 400 metres from their homes. The distribution of water in the municipality is of three kinds which are;- Domestic water collection points, Clean water distributed by pipes, and Boreholes and shallow holes. The challenges associated with this sector include;- The higher need of water compared with the actual amount of water available. It is estimated that the actual amount needed is 12,500 m³ per day while the production capacity is estimated at 8,500 m³ per day based on installed capacity however the actual supply is below the capacity. Thus, the shortage is more than 4,000 m³ per day. The data of 2018 shows that the population served is 54.8% of out of total demand while installed capacity can serve 70.8%. The key noted challenge include lack of water supply scheme to cover bigger area and poor condition of the existing water infrastructures.

Liquid Waste Management

The Mtwara-Mikindani Municipal Council do not have sewer system for collection of sewage. Thus septic tanks and soak away pit is common system in the area. Further, do not have waste stabilization ponds for management of sewage from the septic tanks instead disposal is done at designated area where the municipal have put sludge management area in Chiko Mtaa, Mtawanya ward. The area was well dug in rectangular form with enough surface area and lined to avoid percolation on the ground. Thus, sewage is emptied on the lined area to allow natural evaporation. Since it was developed it has not been full to dislodge.

Solid Waste Management

The Municipal solid wastes are generated from various sources. Much of the wastes are from living houses (households), lodging houses, hotels, bars, restaurants, institutions, large and small industries and some are from gardening areas. In average the Council generates an average of 117 tonnages per day. The wastes are collected from the source to the Sanitary Landfill located at Magamba area in Mtwawanya Ward. The Landfill was built by the World Bank under the project of TSCP and it was officially opened in February 2017. It is in good operational condition. The Municipal capacity of solid waste collection and transportation to the Landfill is 108 tonnage per day. Thus the 9 tons out of municipal capacity to haulage to the dumpsite remains in the waste collections points for the following day. The municipal also collaborates with CBOs which deals with the collection of waste in the community to the collection points which then are hauled by the Municipal trucks to the Landfill. (URT, 2018).

5 STAKEHOLDERS ANALYSIS

5.1 INTRODUCTION

The objective of stakeholder consultations for the proposed construction of two storey science laboratory building at Plot No. 903 and 904, Shangani West *Mtaa*, Shangani Ward in Mtwara was to identify and involve key stakeholders in the environmental assessment process. The integration of public participation/involvement of stakeholders in the environmental assessment process is essential in terms of its implication for sound decision making, the sustainability of development activities and form part of best practice. Accordingly, the Environmental Management Act cap 191 and Environmental Management (EIA and Audit) (Amendment) Regulations, 2018 both documents provided procedures for the involvement of stakeholders and the public in the environmental assessment process and review of proposed undertakings. The Stakeholders Engagement Plan (SEP) for the Higher Education for Economic Transformation (HEET) was developed early to define a program for stakeholder engagement, including public information disclosure and consultation, throughout the entire project cycle. The SEP outlines the ways in which project team will communicate with stakeholders and includes a mechanism by which people can raise concerns, provide feedback, or make complaints about HEET project and any activities related to the project. The SEP stressed that involvement of the local population is essential to the success of the project(s) in order to ensure smooth collaboration between project staff and local communities and to minimize and mitigate environmental and social risks related to the proposed project activities.

With respect to the proposed project at Shangani area, the process afforded opportunity to the stakeholders to express their views and concerns in order to be included in the environmental assessment. The Consultants informed the local people, leaders, and key stakeholders about the proposed project through consultative meetings, key informant interviews, email communication, public meetings and telephone calls. During the consultation process, the stakeholders were taken through the proposed project, including its objectives, implementation technologies, and possible impacts of the project's implementation. Stakeholders were then given an opportunity to ask relevant questions regarding the proposed project to enable the consultants to clarify any issues they may not have adequately understood. Further, opportunity to air their views and concerns was given.

During the engagement, the team had a chance to conduct Focused Group Discussion (FGD). The FGDs were mostly conducted at local level (closest to the project) to discuss various issues related to the project and potential positive and negative impacts. The FGDs were conducted separately considering gender, activities and project interests to allow free expression since some of the topics targeted a specific group because of socially constructed norms. FGD was led by a qualified sociology expert and particular questions concerning issues of employment opportunities, health and safety, GBV issues, risks, and advantages of the project were discussed.

5.2 GOAL OF THE CONSULTATION PROCESS

The overall goal of the consultation process is to disseminate project information and to incorporate the views in the design of the mitigation measures and environmental management plan. It is done to ensure the quality, comprehensiveness, and effectiveness of the impact assessment to ensure that various groups' views are adequately considered in the decision-making process to avoid conflict at a later stage. Consultation with the stakeholders was aimed at positively conveying information about the proposed project development, clearing up misunderstandings, allowing a better understanding of relevant issues. Also, how they will be dealt with, and identifying and dealing with controversial areas to clarify matters and make adjustments accordingly while the project is still in its design stage. Stakeholders and public involvement were therefore aimed at assisting the Consultant in:

- i) Improving project design and, thereby, minimize conflicts and delays in implementation;
- ii) Determining the scope of the environmental assessment.
- iii) Deriving specialist knowledge about the site.
- iv) Clarifying any misconceptions, misunderstandings, myths and the like, that may have arisen from misinformation about the project or local species beliefs
- v) Increasing long term project sustainability and ownership;
- vi) Reducing problems of institutional coordination; and
- vii) Gathering the information needed to complete the assessment

5.3 THE STAKEHOLDERS IDENTIFIED

The ESIA study benefited from extensive stakeholder consultations with a broad cross-section of the community. A stakeholder analysis was used to identify stakeholders that should be involved in the environmental assessment process. Their relevance informed the basis of inclusion of these in terms of their activities within the area and whether they are residents of the area. The Stakeholders were categorized into two groups for this study. The first group consisted of institutional stakeholders and the second consisted of community stakeholders. The institutional stakeholders were drawn from government ministries and departments and various agencies with roles within the project area. On the other hand, community stakeholders were community representatives drawn from various community governance structures within the project area. Details about the stakeholders consulted are presented below and appendix 3:

- Central Government: Ministries, Departments and Agency. These include Division Vice President's Office (NEMC, Division of Environment); - these are statutory body with regard to EIA approval process and thus will be automatically involved.
- Occupational Health and Safety Authority (OSHA) under the Ministry of Labour and Employment - who are responsible with health and safety aspects of the workers at work place.
- Government Chemistry Laboratory Authority (GCLA) – who are responsible for registration of laboratories, control and management of industrial chemicals in the country.
- Fire Department – responsible for fire and rescue services in Tanzania and in particular has a role to approve structure drawings on fire safety before construction.
- Tanzania Rural and Urban Road Agency (TARURA) – responsible for rural and urban roads maintenance and development.
- MTUWASA – responsible for water supply and sanitation services in the Municipality
- Local Government Authorities, who are daily responsible for overseeing social economic activities and developmental activities are undertaken in harmony with the community, environment and the legal aspects of the area within their area of jurisdiction. Authorities include Mtwara-Mikindani Municipal Council and key personnel include the Municipal Environmental Management Officer; Municipal Social Welfare Officer, Shangani ward and key staff include Ward Executive Officer and Shangani West Mtaa and key staff include Mtaa Executive Officer and Mtaa chairman.
- Project Proponent – OUT as client and the Contractor for the project - are responsible for provision of all necessary information for environmental assessment as well as implementation of measures stipulated in the project brief report.
- Local Community – Local communities that surround the project area that might be impacted by the Project, either positively or negatively, including the neighbours and members of the Shangani west *Mtaa*.
- Other stakeholders might be identified in the course of involvement if will be seen to be important for the project

5.4 STAKEHOLDERS' VIEWS AND CONCERNS

The study has identified main concerns and issues raised by the different stakeholders. Generally stakeholders view the proposed laboratory building as positive development for provision of better educational services for students of the area. Further, some stakeholders were worried of some issues/impacts associated with the project during construction and operation activities and specific identified issues are summarised hereunder while the detailed stakeholders concerns are presented as appendix 3 of this report.

5.4.1 Employment opportunity

The stakeholders noted that, priority should be given to locals for the emerging project employment opportunities especially the manual works that do not require skilled laborer's. On the same tune members noted have technicians in the area who could be considered during construction of the project while other insisted for consideration of vulnerable groups such as women.

5.4.2 Public safety and security

Public safety from construction activities was noted during the stakeholders engagement. Schools nearby the project site was given as a note to contractor to be engaged to manage excessive noise and dust emission and thus to avoid nuisance and health impacts to the pupils and students of the area. It was also advised for the site perimeter to be fenced with exit and entry points to address public safety especially pupils of the nearby school against construction related hazards. Also the security fence was insisted during construction for security purpose.

5.4.3 Storm water management

Storm water management was highlighted by a number of stakeholders from the experience of part of the site which is lower than the rest areas hence retains water during the rainy periods. Stakeholders were worried if this would be filled up storm water might flood to other nearby areas of the community and hence bringing nuisance. Thus, stakeholders advised for proper designs of the storm water channels towards appropriate areas to avoid nuisance and flood hazards during the heavy rains. On the same tune other stakeholders noted that there is plan for construction of huge drainage channels to drain storm water from Mtwara CBD area under World Bank TACTIC Project and one of the channels is about 400 meters on the south western side of the site.

5.4.4 Public infrastructures

There are few public infrastructures notably water and Gas pipes along the Road reserve of Maendeleo road which neighbors the project site. Thus it was advised for the proponent/contractor to take due care to avoid damage and resultant interruption of service to the public. To manage the same it was advised before construction the contractor/proponent to liaise with the concerned party i.e. TARURA and MTUWASA to provide guidance on site to safeguards these utility infrastructures.

5.4.5 Liquid Waste management

It was leant during stakeholders engagement that there is no public sewer system in Mtwara Mikindani Municipal council and thus the common sewage management is septic tanks and soak away pit system. Further, it was leant that the water table is high in the area. Thus, the design for onsite sewage management should consider the water table condition of the area.

The resultant wastes from laboratory which have chemical nature should be well managed to avoid pollution of the surrounding environment as well as surface and subsurface water from chemical pollution.

5.4.6 Solid waste management

Stakeholders noted that the waste emanating from project activities should be well managed in the area. Among of the waste noted by stakeholders include chemical wastes as a results of expiry of chemicals. On the same tune stakeholders plea for measures to avoid accumulation of stocks to extend of expiring and hence to avoid expensive disposal mechanism of the expired chemicals. Noted measures include ordering what is consumed over short period of time and instituting FIFO system i.e. First In First Out.

5.4.7 Awareness to GBV and STDs

Non-government organization (NGO) and others noted prevalence of GBV issues in the municipality and also in construction sector. Thus, recommended for awareness to the construction crew during construction period as one of the measure to address the same and HIV/AIDs and STDs issues. On this stakeholders recommended to make use the local NGOs in using part of Corporate Social Responsibility (CSR) budget of the organization to address the issues.

5.4.8 Legal and procedural aspects

There are a number of legal and procedural aspects that have been realized in the course of stakeholders engagement and in particular with government agencies/authorities. Before starting construction the project proponent/contractor will require to liaise with the Municipal council to secure building permit, Fire and rescue department for approval of project drawings for fire safety aspects, Occupational health and safety Authority for approval of the drawings on OHS aspects, registration of work permit and adherence of OHS aspects in the course of project implementation. Also Government chemistry laboratory Authority for registration of the laboratory and for management of chemicals under the authority mandate and Ruvuma River and southern Coast Basin if the project will need to have borehole for its permit and water use thereafter.

5.5 ADDRESSING THE STAKEHOLDERS' CONCERNS

The study has provided a variety of views and opinions on what are considered to be the main concerns and issues of different stakeholders. Based on the raised issues/concerns, an analysis was carried out and recommendations were given for those issues that required attention in the study. The recommendations are covered in the mitigation chapter of this document as indicated in chapter 7. Other chapters also provide some good clarifications on the issues raised. Table 5.2 shows the response table with specific sections where the issue is addressed.

Table 5.2: ESIA recommendations for issues raised by stakeholders

Issues	ESIA Recommendation(s)
Public safety and security	6.3.10, 7.2.10,

Storm water management	6.3.4, 7.3.4,
Public infrastructures	2.6.3.5, 6.3.9, 7.2.9,
Liquid waste management	6.3.2, 6.2.8, 7.2.7, 7.3.2,
Solid waste management	6.2.7, 6.3.1, 7.3.1,
GBV issues	6.3.16, 6.4.11, 7.2.16, 7.3.9,
Employment opportunities	6.4.1, 7.2.18, 7.2.19, 7.3.7, 7.3.8,
Legal and procedural aspects	Chapter 3, 3.3.4, 3.3.11,

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF ALTERNATIVES

6.1 INTRODUCTION

In previous chapters descriptions of both the project and the environment where the project will have footprint have been covered. Based on the project activities and areas covered the impacts of the project on the environment and social components as well as on human health are identified. Thus, this chapter presents the identification of potential impacts and their analysis to determine significance level. Treatment of the impacts is covered in the subsequent chapters of the report.

6.2 ASSESSMENT METHODOLOGY

The team members conducted literature reviews of available information related to the site conditions and with respect to similar laboratory building project operations prior to visiting the site. Most of the members of the team visited the project site in September/October 2023 for the study accordingly. The team spent the time on site gathering information through field studies. The combined site visit by all specialists assisted in integration of ideas and findings between the specialists.

The role of each specialist was to collect sufficient data to assess the environmental impacts. In order to achieve this, the ESIA team assessed the environment as it existed at project area and secondary data from published and unpublished sources.

6.2.1 Environmental impact rating scale

To ensure a direct comparison between various ESIA team studies, a standard assessment methodology was used to assess the significance (the importance of the impact in the overall context of the affected system) of the identified impacts. The criteria that were considered in the determination of the impact significance are:

- **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 be felt;
- **Degree of certainty:** the degree of confidence in the prediction of the impact;
- **Likelihood:** an indication of the risk or chance of an impact taking place;

To ensure integration of social and ecological impacts, to facilitate specialist assessment of impact significance, and to reduce reliance on value judgments, the severity of the impact within the scientific field in which it takes place (e.g. vegetation, fauna) is assessed first. Thereafter, each impact is assessed within the context of time and space, and the degree of certainty in the prediction is indicated.

The impact is then assessed in the context of the whole environment to establish the “significance” of the impact. This assessment incorporates all social, cultural, historical, economic, and ecological aspects of the impact. Thus, the severity or benefit of an impact within a specialist discipline is first assessed before the significance of the impact is evaluated in a broader context. Consequently, two rating scales are required, one to determine the severity or benefit, and one to determine environmental significance.

6.2.2 Severity / benefit

Severity is based on the professional judgement of the various specialists to evaluate the extent to which negative impacts would change current conditions, or how beneficial positive impacts would be

on a particular affected system (for ecological impacts) or a particular affected party (for social impacts). The severity of impacts can be evaluated with and without mitigation order to demonstrate how serious the impact is when nothing is done about it. The word mitigation means also ideas of containment and remedy. For beneficial impacts, optimisation means anything that can enhance the benefits. Mitigation or optimisation must be practical, technically feasible and economically viable.

6.2.3 Spatial scale

The spatial scale defines the extent or area over which the impact will take place.

Table 6.1: Spatial scale

Localised	A few hectares in extent. The specific area to which this scale refers is defined for the impact to which it refers.
Study Area	Includes the entire Shangani area.
District	Includes area within Mtwara-Mikindani Municipal Council
Regional	The impacts will be of such a nature that it may affect the Mtwara Region and nearby Regions.
National	The impacts will be of such a nature that it may affect the entire Tanzania.
International	The impact would affect resources and processes up to outside the border of Tanzania

6.2.4 Temporal scale

The temporal scale defines the times over which the impacts would continue to occur.

Table 6.2: Temporal scale

Temporal scale	Explanation
Short term	Less than a year.
Medium term	Between 1 and 5 years
Long term	Between 5 and 15 years, and from a human perspective essentially permanent
Permanent	More than 15 years, and resulting in a permanent and lasting change.

6.2.5 Significance ratings

Significance ratings based on synthesis of the above criteria above (only for negative impacts) are:

- Not significant/Negligible: Impact not of significance hence no mitigation action, should not influence the decision to approve the proposed development.
- Low: No mitigation action required. Impact should not influence the authorisation decision. However, monitoring of such impacts may be necessary to make sure they remain low over the lifetime of the project.
- Moderate: Mitigation action is required. Impact should influence the decision to authorise the development.
- High: Mitigation action is required. Impact should influence the decision for authorisation. Authorisation granted only when effectively mitigated.

6.3 MOBILIZATION / CONSTRUCTION PHASE

A. Environmental Impacts

6.3.1 Loss of vegetation

Vegetation has a great effect on the general and localized environment and normally can modify micro-climate. Usually, the flora creates a good environment for habitats and thus the two may go together more often than not. Site preparation to give a way for construction works to commence is usually associated with removal of existing vegetation covers and topsoil. In consequence, de-vegetation may result to negative effects on the flora and fauna. The site earmarked for development of the proposed building is within the area designated for Public Building use and nearby developments are academic institutions. The original natural vegetation and features on site and its vicinity has long been cleared. The current vegetation cover on site is dominated by short grasses and scattered neem trees species and one near the center mature remnant tree of *Azalia africana* species. The structure footprint will not cover the entire plot and thus part of plot will not be disturbed including the location of the mature tree. Therefore, the development of the proposed laboratory building will not displace any natural feature of significant ecological value. *The impact is considered negative, long-term and of low significance.*

6.3.2 Accelerated soil erosion

As noted earlier the site will be cleared for the project development and thus without due care agents of erosion might act it and cause soil erosion. Accelerated soil erosion might also occur due to earth work to be involved at the site(s) such as excavation of the area. Leaving these excavated or nude areas nude might cause soil erosion if rain and moving water act on these areas. This might become quite significant during rainy season. Soil erosion might propagate beyond the source point to affect other nearby areas. However, the site earmarked for the project is almost flat which is unlikely to cause significant erosion. *The impact is negative, short term and of low significance.*

6.3.3 Air Pollution due to dust emission

As noted in previous section the construction will further involve earth work at site. These activities inevitable will cause generation of dust into atmosphere. Likewise, dust will emanate from moving vehicles with construction materials such as sands and gravel for construction works, and especially when the moving vehicles with materials are not covered. Dust generated will impair local atmospheric condition. The impact receptors are likely to include site workers and nearby community as well as people/community centres along the route. Bearing that the scale of construction will be small, the material to be brought at site will also be in small quantity, and the involved civil work will be minimal and localised. *The impact is considered negative, cumulative, short term and of moderate significance.*

6.3.4 Air pollution due exhaust emissions

As a rule of thumb whatever uses fossil fuel generates exhaust emission into the atmosphere and thus contributing to the local air pollution as well as to the global air pollution. Thus, the trucks and earth moving equipment to be used will emit exhaust fumes which are unwanted atmospheric pollutants. Atmospheric pollutants from engines of vehicles/machinery include SO₂, NO_x, CO₂ and particulate matters. Main impact is impairment of local air quality, the extent of which will depend on quantities emitted, duration and prevailing atmospheric conditions. However, scale of the contribution of pollutants due to construction activities to be involved will be still on lower scale from the usage of fuel-based

vehicles and machines at site. *The impact of air pollution due to exhaust emission is considered negative, cumulative, short term and of low significance.*

6.3.5 Noise pollution and vibration

The amount of disturbance/annoyance felt by people from the noise created is mainly subjective and related to a wide range of human behavioral and social factors. The context in which the noise is heard is also important, as this can affect its relative acceptability. Noise at a particular level is generally more disturbing at night, when people are trying to sleep, than during the daytime. New noise sources introduced to quiet areas are also likely to be more disturbing to people than the same level of noise introduced into a noisy area. Noise is also more disturbing when people are engaged in complex tasks that require concentration like education.

Noise is measured in decibels and is considered to be a nuisance when the combined expected maximum noise level exceeds 70dB (A); the relevant noise is at least 1.0dB above the prevailing noise level and the contribution to the increased noise level of the new or altered development is at least 1.0dB (A). The Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations (2015) stipulates maximum permissible day time noise levels of 70 dBA for industrial area and 60dBA for residential and industry/small scale production and commerce. Likewise, the stipulated WHO/IFC guidelines require noise emission levels in the working areas should be less than 70dBA.

During the mobilization stage of the project, noise and vibration associated with equipment working on site will be generated, which will affect the nearby receptors and also the working personnel. Noise and vibration generation will essentially result from the operation of the plant and equipment involved on the construction site, namely excavators, concrete mixers and lorries. Vibration might become significant when huge compactors are used on site. Vibration related impacts could be development of cracks on walls and buildings neighbouring the site. Based on the site condition the public receptors are not quite close to experience excessive noise from normal construction activities of lower scale. Noise might become an issue to the site workers, the aspect of which is fully covered under the occupational health and safety hazards section *The impact is considered negative, cumulative, short term and low significance.*

6.3.6 Land degradation at source of construction materials

Conventional constructions materials such as aggregates and sand will be obtained from existing borrow pits within Mtwara Region. Most borrow pits in the country shows signs of rampant and haphazard exploitation methods and depletion with no plans for restoration of any of these sites. Other areas had to be closed down due to rampant and haphazard exploitation methods that posed pollution risks to the environment. In some instances, sand are extracted from riverbeds. Most of these areas are declared by the government as a danger zones and exploitation is prohibited.

Pollution risks include sediment overload to water bodies during rain season and contamination by oils from trucks, excavators and loaders while also the activity exacerbate degradation. The project proponent shall not encourage suppliers of these materials to use closed down burrow pit or sand extracted from river bed. Hence, environmental impacts associated with extraction of materials for construction works is a matter of indirect and cumulative effect because it will be contributing to a problem that has other root causes. *The Impact is considered Secondary or indirect, negative impacts, cumulative, long-term and of moderate significance.*

6.3.7 Land and water pollution from construction wastes

Main sources of construction waste will be from site preparation, earth moving works, and domestic waste from construction crew. Also large amounts of solid waste will be generated during construction of the project. These will include metal cuttings, rejected materials, excavated materials, used paper bags, empty cartons, empty paint and solvent containers, broken glass among others. Solid wastes if not well managed and disposed off at unapproved site would negatively impact the site and surrounding environment. In addition, have a potential of causing disease outbreaks due to their presence providing suitable breeding conditions for vectors of certain diseases such as cholera and typhoid. Unmanaged construction wastes might also end up in channels and block the normal flow of storm water and hence causing flooding during wet season. Outbreak of diseases such as Malaria could also be exacerbated by the presence of water pool caused by blockage of normal flow of water for breeding of anopheles mosquitoes. *The impact is considered negative, short term and of moderate significance.*

6.3.8 Public Health Hazards due to Liquid Wastes

Workers working on site during development phase definitely will generate some wastes in solid and liquid form including human wastes. Unmanaged site wastes might end up to the nearby water bodies and thus polluting the water that is flowing downstream. This might result into sanitary related diseases such as cholera, dysentery and alike. Depending on the number of construction workers and the season when work will be done the impact might become significance. *The impact is considered negative, short term and of moderate significance.*

6.3.9 Disruption of public utilities along the road reserve

Along the Maendeleo road reserve there are public utilities which include underground main water pipe(s) and natural gas pipeline. At certain point a proper connection of the main road and site will need to be made for access. If enough care is not taken civil work might result into damage/disruption of these utilities especially to those which are underground and thus affecting both the public that depends on these utilities as well as the utility companies/institutions owning these infrastructures. *The impact is considered negative, short term and of moderate significance.*

6.3.10 Occupational Health and Safety Hazards

When human and machinery are involved at work always there are potential occupational health and safety hazards. Some of the hazards are obvious which require some management; issues like exposure to excessive noise levels from the machinery, excessive dust emission from earth works. Injuries to construction workers may result from moving equipment. According to the National OHS Act of 2003 causes of accidents in construction sites includes but not limited to poor site layout; poor erection and improper use of scaffolds; falling objects from high level such as poles; improper method of lifting; sharp edges; improper use of Personal Protective Equipment (PPE); inadequate provisions of PPE; falling through uncovered openings especially at upper floor levels and carelessness of workers. *The impact is considered negative, short term and of high significance.*

6.3.11 Contamination of land and water from accidental spills and leakages of hydrocarbon

The machines on site during construction may contain moving parts, which may require continuous oiling to minimize the usual corrosion or wear and tear. Likewise, moving vehicles on construction sites may require oil and other lubricants change. Possibilities of such oils spilling and contaminating the soil

and water within the construction sites are possible. However, no maintenance will be carried out at the project site, all contractor vehicles will be serviced at the proper designated garages designed for this purpose which can substantially contain these dangers. *The impact is predicted to be negative, short-term duration and of low significance.*

B. Social impacts

6.3.12 Traffic accidents along the main and access roads

The construction activities as indicated in previous sections will involve transportation of construction materials to the site. Accidents involving both the construction workers and the general public can be expected to occur during the mobilisation/construction stage if precautions are not taken. Drivers might cause accident to children in the nearby schools and residential areas. Based on small scale of construction few vehicles (about 3 to 4) and low frequency will be involved at site. *Thus, the impact is considered negative, short term and of moderate significance.*

6.3.13 Increased incidence of diseases transmission including HIV/AIDs and STDs

During construction about 30 workers will be involved at site. Some workers will come from other places apart from Shangani. This might result into social interactions and intermingling. In this case social interactions cannot be avoided which can result into spread of HIV/AIDs and other STDs. As noted in the background GBV there are early pregnancies cases, child neglect cases without appropriate measures there is likelihood for HIV/AIDs and STDs spread. *The impact is considered negative, short term and of moderate significance.*

6.3.14 Potential risk and hazards associated with labour

The project will require construction workers during construction phase. Presence of the construction crews could potentially create a source of social challenges as a result of interaction of local people with project workers. The influx of people may result into social conflict between foreign workers and locals; use of alcohol and substance abuse among workers leading to anti-social behavior; pressure on existing infrastructure; and feel of unrest for local women as a result of workers moving to the area. Due to the scale and nature of the project, it is not expected that there will be large workforce required for the project. Estimated that 30 people will be required during the construction phase. Also, the presence of construction workforce will be temporary and therefore the demographic effects are not expected to cause significant long-term impacts. Once construction is completed, many foreign workers and contractors will leave the project area. *The impact is predicted to be negative, short term but of low significance.*

6.3.15 Potential risks and hazards associated with child labour

Due to high prevalence of child labour and forced labour in Tanzania there could potentially be impacts associated with lack of work contracts, long hours with no pay and children working at supplier's sites. Given the relatively small scale of the project with small number of expected work force there will be less risk associated with child labour and forced labour within supply chain. *The impact is predicted to be negative, long term but of moderate significance.*

6.3.16 Potential GBV/SEA/SH related incidences

The GBV/SEA/SH are acknowledged as a social issue in Mtwara-Mikidani Municipality. The GBV committee has been formed and meets regularly to solve the emerging GBV cases. The proposed

project is expected to employ about 30 construction workers at one time from local communities and outside the community. There will be no campsite and this will lead the workers to be hosted in the nearby facilities. The presence of workers increases the risk of SEA/SH (GBV) towards members of the community in particular female students who may be present near the project site. Such risks are known to occur on construction projects.

Some potential GBV/SEAH related incidences during construction phase include: denial of resources, opportunities or services; physical assault; requests for sexual favors; psychological and physical abuse; exploitation of vulnerable position, differential power or trust for sexual purposes; actual or threatened physical intrusion; unwanted sexual advances; and sexual physical contact. Gender discrimination may limit women's access to resources, opportunities, and public services necessary to improve the standard of living for themselves and their families. As a result, the livelihoods of women affected by the project may be disproportionately impacted if not managed appropriately. *The impact is predicted to be negative, short term but of moderate significance.*

6.3.17 Gender inequity in employment

There is a potential risk that gender inequality might be perpetuated during project construction through unequal distribution of work, discrimination against women, and unequal pay for women, among others. Women are likely to be least favoured in the employment opportunities in the project area. This is because the nature of jobs available during construction is perceived to be done mainly by men. *The impact is predicted to be negative, long term but of moderate significance.*

6.3.18 Employment opportunities

During mobilization and construction of the proposed project, there will be employment opportunities for both professionals and unskilled workers. Several workers including casual labourers, masons, carpenters, joiners, plumbers, electricians and engineers are expected to work on the project from the start of the project to the end. Semi-skilled, unskilled labourers and formal employees are expected to obtain gainful employment during the period of construction. With labour intensive construction technologies, the project will provide employment for youths and provide support to the Government of Tanzania initiatives on creation of jobs though on short term. The creation of employment opportunities is beneficial both from the economic and social point of view. *The impact is considered positive, short term and of moderate significance.*

6.3.19 Benefit to local producers and suppliers of goods and services

The development of the project at various phases will require supplier and produces of the services and products. Some of services include design of the building and provision of associated drawings, consultancy services like this study have started to be realised even before construction starts. Supply of materials for construction from local sources is also a positive aspect of the project, as it will reduce the cost of the project from procuring far from the site while benefitting local producer and suppliers. The materials include gravel, sands, cement, colour paints, nails, iron sheet and alike. *This impact is considered positive, cumulative short term and of moderately significance.*

6.4 OPERATION PHASE

A. *Environmental Impacts*

6.4.1 Public health hazards from general solid wastes

The operations of the multipurpose laboratory building with offices have potential of generating solid wastes though in small amount and mainly laboratory related wastes and domestic type of solid wastes. Waste might emanates from the office use and presence of people for prolonged hours at the area to include paper wastes, organic wastes from remains of food, packaging wastes, and plastic bottles. Laboratory wastes might include organic waste in terms of plant parts, dead small animals like insects, rats for experimental purpose. If these are not handled and disposed properly may bring eyesore and attract vermin and vectors that causes disease. These wastes when left or dumped in drainage may block the normal water flow and thus creating conducive environment for disease causing organisms such as mosquito while also might accelerate floods during rainy season. However, the amount of generated waste will be small due to small envisaged number of workers to be full time station at site. Likewise the nature of operation of OUT do not involve full time students rather once in a while visitation for practical and examinations. *The impact is predicted negative, long term and of low significance.*

6.4.2 Public health hazards from liquid wastes

During operation phase of the proposed Multipurpose laboratory Building there are many factors for consideration related with management of liquid waste which if not well considered could lead to detrimental effects particularly to public health and pollution of water. Design for associated infrastructures such as sewage system and removal of waste are important for the planned building so as to maintain the sanitation, hygiene and aesthetics. If not properly disposed of, waste may provide sites for reproduction of vermin and becomes a focal point for the spreading of diseases. This is not only in the close vicinity of the building area but also at considerable distances since bacterial, viral and parasitically may migrate to far areas. Inadequacy in the design and management of waste will result into health hazards to public and workers, reduce aesthetic of the area and can severely degrade ground and reduce the land/property value. *Due to few number of workers to be involved the impact is predicted to be negative, long term and of low significance.*

6.4.3 Public health hazards from hazardous wastes

During operation of the laboratories there will be waste generated which can not be mixed with normal wastes especially those of chemical nature both in liquid and solid form. Improper management of the waste might pose risks to the public that could be exposed to the chemicals. Likewise, untreated chemical waste might pollute the surface and subsurface water. Solid waste in form of expired chemicals cannot be guaranteed hence its management need to be considered accordingly without which might pose public health risks. *The impact is predicted to be negative, long term and of moderate significance.*

6.4.4 Floods hazards

As noted in earlier chapter part of the site which is lower than the rest areas hence retains water during the rainy periods. With constructed laboratory building storm water will increase in the area in terms of volume and rate of flow. Without proper consideration this might exacerbate the situation at site and to the nearby residents. However, the earmarked area is small and located outside the building footprint area. *The impact is predicted to be negative, long term and of moderate significance.*

6.4.5 Fire Hazards

In absolute terms, the possibility of fire outburst at any place or part of the building always exists. Such an occurrence will then inevitably have an environmental bearing on the atmosphere. A fire is a combustion which develops in a totally uncontrolled manner with respect to time and space. It produces tremendous quantities of heat, smoke and polluting and even toxic gases. And the energy generated further favours the spreading of the fire. The impacts on humans are smoke and gases, such as CO₂, CO, H₂S. These smoke and gases may present the following hazards: temperature (internal burns by inhalation of hot gases), Opacity (which obstructs the view of evacuation), asphyxiation through lack of oxygen (the oxygen concentrate in ambient air is 21% during a fire this concentration is drastically reduced) and toxicity of the combustion products. The flames reach temperatures of 600°C to 1200°C and burns immediately result from any human contact with them. The impacts on buildings are the destruction of the buildings and their contents, and costs associated with the damages caused. While in absolute terms, a fire hazard always exists in everyday life, yet measures need to be taken at the design and operational phases of the project to minimize this risk, and concurrently to provide security to the project and its users. *Therefore the impact is considered negative, long term and of moderate significance.*

6.4.6 Occupational health and safety hazards

The laboratory activities might be involved with complex chemical reactions that might generate fumes in the atmosphere. Some of the fumes might be unfriendly to the human health especially to the personnel's involved with the chemicals. These fumes requires management at source to avoid the impact of air pollution and its resultant effects. Without proper management the fumes might cause serious effect even fatal to the workers and personnel involved depending on the nature of the fumes. Other occupational health and safety issues include the ergonomic hazards which need to be considered for the workers. *The impact is considered negative, long term and of high significance.*

B. Social impacts

6.4.7 Employment opportunities

During operation of the proposed project, there will be employment opportunities for both professionals and unskilled workers though not in large number. Currently, the OUT Mtwara centre does not have science laboratory building and thus the coming of the laboratory will require more staffs to operate it. This implies new staffs to be employed. This is positive impact in line with the Government of Tanzania initiatives on creation of jobs. The creation of employment opportunities is beneficial both from the economic and social point of view. *The impact is considered positive, long term and of moderate significance.*

6.4.8 Benefit to local producers and suppliers of goods and services

The operation of the laboratory will require various goods and services to include consumables used in the laboratories. Supply of goods and services from local sources is also a positive aspect of the project, as it will reduce the cost of the project from procuring far from the project area while benefitting local producer and suppliers. *This impact is considered positive, cumulative long term and of moderately significance.*

6.4.9 Improved service delivery by the Open University of Tanzania at the area

The construction of multipurpose laboratory building will enhance the service delivery to the science students than before without inhouse laboratories. Further, physical presence of The Open University of Tanzania building in Mtwara will attract more students to join with the University and especially science students. *This impact is considered positive, long term and of high significance.*

6.4.10 Visual impact/ increased aesthetic value of the project area

The construction of the modern laboratory building and their associated facilities at the area though is not natural feature will bring about positive visual impact in the area. Thus, its presence will cause visual difference with the current development. Thus, the surrounding area has already been modified to suit to human ecology thus development of this structure in the existing human environment will bring more appealing features and thus enhance the visual features of the area. *The impact is considered positive, long term and of high significance.*

6.4.11 Risk of SEA/SH issues

Students in particular female students are at risk of SEA/SH while using the proposed Zonal laboratory at OUT Mtwara Regional Centre. This can include expectations of sexual favours in return for grades, sexual assault, verbal sexual harassment amongst others. SEA/SH may affect students and teachers and perpetrators can also include faculty staff, other students and none faculty staff. The identification of SEA/SH risks during operation will be considered further as part of the GBV Action Plan. *This impact is predicted to be negative, cumulative, long-term, and of high significance.*

6.4.12 Health Hazards due to social interaction among workers and users

With the anticipated increase in number of visitors and employees in project area, the social interaction among them may not be avoided. Some of interactions may be of intimate nature resulting in contracting of sexually transmitted diseases such as HIV/AIDS. Considering the nature with which HIV/AIDS is contracted and spread, this makes it a significant contribution to the pandemic. The youth especially girls are the most vulnerable group to that social interaction due to the nature of their work and their social economic background. *The impact is predicted to be negative, of long-term duration and moderate significance.*

6.4.13 Non-user-friendly buildings for Persons with Disabilities (PWDs)

The Persons with Disabilities Act, No. 9 of 2010 defines a person with disability as any person with physical, intellectual, sensory, or mental impairment and whose functional capacity is limited by encountering attitudinal, environmental and institutional barriers. The Act was enacted to provide for the protection of persons with disabilities. It included provisions for access to health care, social support, accessibility, rehabilitation, education and vocational training, communication, employment, and non-discrimination. Most public buildings and facilities in Tanzania are not accessible to people with disabilities despite that the Government has laws and policies in place that strictly instruct how these buildings and facilities should be (Kavishe, F. and Isibika, S., 2018). Despite the effort of the Act which requires all public institutions to create convenient access to persons with disability, many public institutions, including universities, are yet to comply. Despite the presence of people with disabilities in higher learning institutions, facilities provided for both accommodation and classrooms prove to be ineffective in fulfilling their expectations (Mbiru, M.B., 2022).

This necessitates more considerations of the inclusion of expectations of PWDs in the design of the proposed laboratory building to avoid the elimination of all forms of discrimination and social exclusion. Additionally, physical barriers may restrict people with disabilities movement in building and hinder their

performance. Consideration to PWD has been given a high priority during designing whereby ramps and toilets have been designed to cater for PWD. *Based on this consideration the impacts is considered to be negative, long-term, and of moderate significance.*

Table 6.3: Summary of Potential Impacts

Potential Impacts	Significance value
Mobilization/Construction phase	
<i>Environmental Impacts</i>	
Loss of vegetation	<i>The impact is considered negative, long-term and of low significance.</i>
Accelerated soil erosion	<i>The impact is negative, short term and of low significance.</i>
Air pollution due to dust emission	<i>The impact is considered negative, cumulative, short term and of moderate significance</i>
Air pollution due to exhaust emission	<i>The impact of air pollution due to exhaust emission is considered negative, cumulative, short term and of low significance.</i>
Noise pollution and vibration	<i>The impact is considered negative, cumulative, short term and low significance.</i>
Land degradation at the sources of construction materials	<i>The Impact is considered Secondary or indirect, negative impacts, cumulative, long-term and of moderate significance.</i>
Land and water pollution from construction wastes	<i>The impact is considered negative, short term and of moderate significance.</i>
Public health hazards due to liquid waste	<i>The impact is considered negative, short term and of moderate significance.</i>
Disruption of public utilities along the road reserve	<i>The impact is considered negative, short term and of moderate significance.</i>
Occupational health and safety hazards	<i>The impact is considered negative, short term and of high significance.</i>
Contamination of land and water from accidental spills and leakages of hydrocarbon	<i>The impact is predicted to be negative, short-term duration and of low significance.</i>
<i>Social impacts</i>	
Traffic accidents along the main and access roads	<i>The impact is considered negative, short term and of moderate significance.</i>
Increased incidence of diseases transmission including HIV/AIDs and STDs	<i>The impact is considered negative, short term and of moderate significance.</i>
Potential risk and hazards associated with labour	<i>The impact is predicted to be negative, short term but of low significance.</i>
Potential risks and hazards associated with child labour	<i>The impact is predicted to be negative, long term but of moderate significance.</i>
Potential GBV/SEA/SH related incidences	<i>The impact is predicted to be negative, short term but of moderate significance.</i>
Gender inequity in employment	<i>The impact is predicted to be negative, long term but of moderate significance.</i>
Employment opportunities	<i>This impact is considered positive, cumulative short term and of moderately significance.</i>
Benefit to local producers and suppliers of goods and services	<i>This impact is considered positive, cumulative short term and of moderately significance.</i>

Operation phase	
<i>Environmental impacts</i>	
Public health hazards from general solid wastes	<i>The impact is predicted negative, long term and of low significance.</i>
Public health hazards from liquid wastes	<i>The impact is predicted to be negative, long term and of low significance.</i>
Public health hazards from hazardous wastes	<i>The impact is predicted to be negative, long term and of moderate significance.</i>
Floods hazards	<i>The impact is predicted to be negative, long term and of moderate significance.</i>
Fire hazards	<i>Therefore the impact is considered negative, long term and of moderate significance.</i>
Occupational health and safety hazards	<i>The impact is considered negative, long term and of high significance.</i>
<i>Social impacts</i>	
Employment opportunities	<i>This impact is considered positive, cumulative long term and of moderately significance.</i>
Benefit to local producers and suppliers of goods and services	<i>This impact is considered positive, cumulative long term and of moderately significance.</i>
Improved service delivery by the Open University of Tanzania at the area	<i>This impact is considered positive, long term and of high significance.</i>
Visual impact/ increased aesthetic value of the project area	<i>The impact is considered positive, long term and of high significance.</i>
Risk of SEA/SH issues	<i>The impact is predicted to be negative, cumulative, long-term, and of high significance.</i>
Health Hazards due to social interaction among workers and users	<i>The impact is predicted to be negative, of long-term duration and moderate significance.</i>
Non-user-friendly buildings for Persons with Disabilities (PWDs)	<i>The impacts is considered to be negative, long-term, and of moderate significance.</i>

6.5 CONSIDERATION OF ALTERNATIVES

6.5.1 Introduction

The discussion and analysis of alternatives in Environmental and Social Impact Assessments considers other practicable strategies that will promote the elimination of negative environmental impacts identified. This section is critical in consideration of the ideal development with minimal environmental disturbance.

In analysing the environmental impacts, there are usually two or more development alternatives to consider for each issue. The alternatives may encompass a wide range of consideration and can represent a choice between the construction and operation of a development and the non-development option. With this in mind, the general principle involved in identifying the option(s) of the proposed project in the area was to ensure that the option chosen would result in optimal social, economic and environmental returns. In effect the option chosen should corroborate well not only for the proponent, but also for the environment and stakeholders in the area. The option with the highest cost benefit factor, the most technically feasible and with least residual impact is identified as the preferred option. The following alternatives have been identified and have been discussed with project proponent as means of reducing environmental effects. They are discussed in further detail below:

6.5.2 Alternative Site

The ADB EIA Guidelines, Annex 2 (1992) states that “*project options should be provided within the constraints of the aim and broad economic, technical and environmental factors*”. In the context when a site for construction of Two Storey Science Laboratory Building was chosen a number of factors were considered and these include:-

- i. **Availability of Land** – The OUT has rented regional center office in Mtwara . It had plans to construct its own building for regional office and thus acquired a piece of land in 1992 in an area designated for academic institutions. The coming of this project found an already in place plots fully owned by the Institution. The plots were examined to see if would be appropriate to accommodate the Science Laboratory Building and the findings were positive as the site is located in appropriate land use, the site was free from cumbersome i.e. resettlement or land conflicts. Further, the site was more conducive due to the other factors noted subsequent bullets.
- ii. **Availability of basic public infrastructures**;- existing of public basic infrastructures in the project area to include water supply, electrical supply and road to easily reach the site were considered for the project. The Science Laboratory building requires these services just like any other public building. The owned plot located in an area where there are existing networks of utilities. The area without these would mean to get it far from the project site, the aspect of which would mean more environmental and social costs as well as more financial costs.

Since the owned piece of land by the OUT qualified the requirement of the Science Laboratory Building project and poses no major environmental and social impacts and risks the site was considered for the project. The plot land use is compatible with the proposed development and it is away from sensitive environmental areas. Thus, the chosen site recognizes the viability and need for the proposed development and is designed to address environmental and social issues and concerns.

6.5.3 No development Alternative

In the assessment, zero option is considered separately to demonstrate the condition without changes on site and with changes on site as far as environmental, social and economic aspects are concerned. Leaving an area in its existing state will mean all foreseen potential negative impacts will not happen in the area, likewise all potential project positive impacts will not be realized. Considering the area is within urban planned area (Mtwara-Mikindani Municipal Council), developed and modified area it is obvious even without this proposed project in long run the area will continue to change due to urban development based on the plan. Thus ignoring the project will not have significant environmental benefits. However, turning this part of land into OUT Science Laboratory Building in an area with existing academic institutions/activities with positive impacts far beyond the core area is something cannot be easily ignored. Considering the nature and level of significance of the potential negative impacts (i.e most of which are usual impacts to most development and are graded moderate to low significance) and the potential means to offset the impacts (which do exist), the project cannot be foregone in the area.

Based on the above the alternative is for project other than zero option. The project will improve education service delivery to students of the OUT for socio-economic development of the country.

6.5.4 Liquid Waste Management Alternatives

The study has considered only three liquid waste management alternatives for the sewage from the proposed project building usage as other alternatives are not applicable in the area. The three alternatives include Waste Stabilization Ponds, Septic Tanks and Soak away Pits and Constructed wetland.

Waste stabilization ponds (WSP);- This is the use of a series of ponds (primary, secondary/facultative and tertiary/maturation ponds), which allow biological processes to treat the wastewater to meet the discharge limits of effluent quality standards. However, this treatment is suitable to serve large number of people while the building will serve few number of people on daily basis. The OUT regional centre office has less than 10 people and even after construction permanent staff will be less than 20 people while the OUT students will be visiting once in a while during practical sessions. Thus the amount of waste to be generated will be small in amount to require WSP. Despite, small amount of sewage to be generated the WSP also requires larger area that is not available in the area. Also, the ponds generate foul smell which is not conducive condition for the area.

Constructed wetland: This is the removal of pollutants in wastewater through the combination of physical, biological and chemical processes. It is engineered system designed and constructed to mimic natural processes taking place in the natural wetlands. There are two types of the constructed wetland i.e. surface or sub-surface constructed flow. The land required for subsurface flow is 5m² per person (Paul G. Smith et al, 2005). Thus the required space is less compared to WSP system. The system does not require operation costs once constructed as long as there is space for the construction. The resultant effluent can be directed to the natural stream or to the constructed soak away pit.

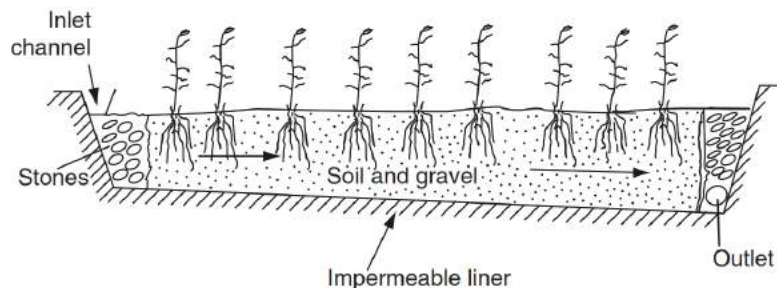


Figure 6.1: Illustration of sub-surface flow constructed wetland

Source: Paul G. Smith et al, 2005.

Septic tank and soak pit systems: - This involves the construction of underground tanks for treatment of sludge and is connected to soak away pits for disposal of resultant effluent. It is less expensive to construct and requires relatively small space than the rest. It is suitable for houses or buildings with few people. However, it requires emptying of the sludge once septic tank is full.

Conclusion: Based on analysis of the three alternatives the most preferred is the septic tank and soak away pit due to low number of people to be involved at site with resultant small amount of generated waste water. Further, this is less expensive to construct than the rest and requires small space than the rest.

7 MITIGATION MEASURES

7.1 INTRODUCTION

The impacts which are most likely to affect the environment and human health in the execution of the proposed project have been identified and analyzed in Chapter 6. Based on the analysis and hence classification of the most significant environmental and social impacts, this chapter proposes the mitigation measures for the negative impacts and enhancement measures of those positive ones. The mitigation measures aim at offsetting the impacts or reducing the severity of the impacts to a minimal level that becomes also insignificant. The standards upon which the mitigation measures are targeted, the responsible entity and the associated mitigation costs are presented as part of the Environmental and Social Management Plan in Chapter 8. Below are the mitigation and enhancement measures:-

7.2 MOBILIZATION PHASE/ CONSTRUCTION PHASE

A. Environmental Impacts

7.2.1 Loss of vegetation

The following shall be done;-

- Clearance will be restricted to areas with physical structures and supporting facilities only.
- The trees around the project footprint will be maintained accordingly including the mature remnant tree of *Azalia africana* species.
- After construction the OUT shall plant ornamental trees and other vegetation as part of beautification of the area.

7.2.2 Accelerated soil erosion

To mitigate the impact, the following shall be done; -

- Major civil and/or earth work shall be done during dry season when there is no run off to act on the nude site. This will also simplify the machinery work other than working in wet environment with machines. Should there be a need to conduct civil works between March and May during construction phase, the contractor's employed shall take appropriate mitigation measures to prevent accelerated soil erosion.
- The contractor shall ensure that backfilling is done adequately, compacted, and the site restored. The backfilling operation will be performed in such a manner so as to prevent washing away of soil.

7.2.3 Air Pollution due to Dust Emission

The following measures shall be applied; -

- All trucks carrying the fine earth materials will be enclosed during transportation to the construction site to prevent dust generation along the route. Trucks used for that purpose will be fitted with tailgates that close properly and with tarpaulins to cover the materials.
- Measures to suppress dust shall be applied to include watering the area vulnerable for dust including routes/earth roads (3 times a day)
- Washing of Trucks each morning to remove mud on mudguard and tires to reduce dust on routes
- Watering on dry excavated areas to reduce fugitive dust
- Speed limits will be instituted to drivers and especially in routes passing in community centers areas.
- Covering stockpile that have potential to generate fugitive dust at site

7.2.4 Air pollution due to exhaust emission

The following measures shall be applied; -

- Equipment maintenance to be undertaken in accordance with manufacturer's instructions and at the specified maintenance interval to reduce exhaust emission;
- Equipment operators will be trained in and will follow equipment operational procedure.
- Load limit shall be specified to type of vehicle to avoiding overloading that causes excessive exhaust emission.
- Timely maintenance of the trucks through regular inspection on the need for maintenance.

7.2.5 Noise pollution and vibration

The following shall be done;-

- Construction activities will be restricted to daytime hours only.
- Vehicles and machines will be maintained and serviced as required to ensure they do not generate excessive noise. Among others shall have properly functioning exhaust mufflers.
- Installation of portable barriers to shield compressors and other small stationary equipment shall be done
- Enforced vehicle load restrictions to avoid excess noise emissions from engine overloading shall be done.
- Speed limits will be instituted to drivers and especially in routes passing in community areas.
- No huge compactors that generate excessive vibration shall be used at site.
- Training to drivers on safe driving habits that also control noise levels shall be done

7.2.6 Land degradation at source of construction materials

The contractor will source construction materials such as sand, ballast and hard core from authorized quarry and sand mining firms/sites, whose projects have undergone satisfactory environmental assessment and received appropriate approval. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are considerably well mitigated. If there are no registered quarry site the materials shall be sourced from the area designated by local authority for sourcing such materials. The contractor will be encouraged to make use of premix concrete suppliers for those major construction works requiring concrete.

7.2.7 Land and water pollution from construction wastes

To mitigate the impacts of wastes an efficient collection and disposal system based on the principles of reduction, re-use and recycling of materials, shall be instituted at the project site. A site waste management plan shall be prepared by the contractor that will be followed. This will include designation of appropriate waste storage areas, collection and removal schedule, and a system for supervision and monitoring. Introduction of waste disposal bins, warning notices, "DOs & DoNTs" etc posted at strategic points of the project site will be done. No, on site burial or open burning of solid waste shall be permitted at the project site. The contractor will make use of the existing solid waste disposal and collection system of the Municipal Council i.e. collected by Municipal truck or by municipal authorised Agent. Further, the construction site will be fenced and all wastes will be handled within the fenced area before collection.

7.2.8 Public Health Hazards due to Liquid Wastes

To manage sewage at construction site temporary pit latrines will be established for the workers to include for both male and female latrines.

7.2.9 Disruption of public utilities along the road reserve

OUT and the Contractor shall liaise with TARURA and infrastructures owners (i.e. TPDC, MTUWASA etc.) within the road reserve before starting any excavation works in the road reserve area close to the site. This will provide proper guidance on excavation works to safeguards public infrastructures.

7.2.10 Occupational health and safety hazards

To mitigate this impact, OUT and contractor shall comply with relevant Tanzania (OHS Act, 2003) on health and safety requirements including the provision of Personal Protective Equipment's (PPE), reasonable working hours and good working conditions and facilities. Specifically; -

- Accidents will be minimized through proper maintenance of the machines, protecting or guarding the cutting edges, and awareness of the people including workers on the dangers and make them understand how to protect themselves and others.
- The supervisors shall ensure that safety procedure and measures are in place and are enforced (implemented) including appropriate safety gears (PPEs) e.g. eye glasses and dust masks will be ensured in order to reduce risks associated with dust.
- The contractor shall provide adequate training to workers on the OHS of the construction works
- Approved working hours shall be observed in order to avoid careless mishandling due to fatigue.
- Medical checks pre & post-employment as well as mandatory once a year checks shall be done
- Undertake site specific risk assessment and developing mechanism to avoid or reduce the risks. This shall be done per each new work to be undertaken and a safety procedure shall be developed and implemented by dedicated project HSE officer.
- The site shall have enclosure with entry and exit point for safety and security purpose against the public.
- The contractor shall prepare Health and Safety Management Plan for implementation of OHS issues at site.

7.2.11 Contamination of land and water from accidental spills and leakages of hydrocarbon

It shall be ensured that re-fueling and services for vehicles will be done off site. Spill control measures such as storage and handling of hydrocarbons such as oil shall be done to include storage on impervious areas (such as concrete surfaces with bund wall). Heavy equipment will be checked for lubricant leaks before starting the work, and workers will be trained on proper storage of hydrocarbons. Emergency response measures shall be put on site in case of accidental oil spill that will include having absorbent materials, sand kits at site, and alike.

B. Social Impacts

7.2.12 Traffic accidents along the main and access roads

The following shall be done; -

- Only qualified drivers with appropriate driving license shall be engage.
- Induction course shall be done to all drivers prior starting driving

- Drivers shall be sensitized on maintaining speed limits for main roads and on access roads.
- Promoting safe drive with specified hours for long drive to avoid fatigue
- Provision of road and safety signs at site or access roads shall be done.

7.2.13 Public Health Hazards (HIV/AIDs and STDs spread)

The OUT and Contactor will devote time in raising awareness of the dangers of the HIV/AIDS within the project premises. Although basic knowledge of HIV/AIDS is high among Tanzanians, knowledge of self-protection measures and behaviour change will be provided and a preference will be given to those who are vulnerable and to empower women for they compose one of the most vulnerable groups. When the need arises OUT and Contractor will seek for professional assistance from local organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace. The contractor shall also prepare HIV/AIDS Management Plan for implementation of OHS issues at site.

7.2.14 Increased local population due to labour influx

To avoid increasing influx of people, semi-skilled and unskilled labour required by the project will be sourced locally to provide communities with employment and the opportunity to earn an income during the construction phase. Local communities will be given prior information through local government offices on available employment opportunities and required qualifications. A special clause that requires local peoples to be employed as labourers during construction will be included in the contract. This will minimise the influx of people within the project area.

7.2.15 Potential risks and hazards associated with child labour

To prevent the exploitation of the child labour, the OUT and Contractor will comply with the provisions in the Employment and Labour Relation Act,2004 and the ILO Convention No. 182. OUT will develop transparent human resources policies and Labour Management Procedures for recruitment process, working conditions, terms of employment wages, worker-employer relations, non-discrimination issues, monitoring, roles and responsibilities. The OUT expects its contractors to adhere to the principles set forth in the Contract which will cover inter alia, standards related to Labour and prohibition of Child Labour. Employment of child labour (children below the age of 18), pregnant women and elder citizens in hard labour and dangerous activities will be prohibited.

7.2.16 GBV/SEA/SH related incidences

The OUT will emphases to all contractor to provide equal employment opportunities between men and women depending on required qualifications at all level. During construction local employment shall be optimized by allocating jobs fairly (consider gender, marginalized groups), involve community leaders/committees to identify suitable/able people for the jobs, review to avoid bias or favouritism observing national/and international labour standards. The OUT and Contractor will conduct mandatory and periodic training for workers on required lawful conduct in host community and legal consequences for failure to comply with laws on gender-based violence (GBV). The OUT will roll out its grievance redress mechanism (GRM) of the proposed project for communities living in the project's area and areas of Influence and collecting information about GBV and associated social ills on a monthly basis with a view to resolving it with the project contractor. The OUT will identify and create a partnership with a local NGO to report workers' misconduct and complaints/reports on GBV or harassment through the GRM. Further, awareness on GBV issues to the workforce shall be provided in collaboration with the Local NGOs and/or GBV committees in the area.

7.2.17 Gender inequity in employment

The OUT will ensure that women and men are given equal employment opportunities during recruitment and job postings. Regular sensitization and awareness campaigns to the workers will be done to promote gender equity in employment during the construction works and during operation. Gender disaggregated data, separate bathing, changing room, sanitation facilities for men and women will be provided. Zero tolerance on sexual harassment, all forms of gender-based violence and discrimination at all phases of the project will be imposed.

7.2.18 Employment

It is expected that during construction phase of the project, a good number of people will be employed. Offering local people, the opportunity for employment during the construction or of providing services such as supplying construction materials etc, will provide an additional income-generating opportunity to locals of the area. Where skilled labour is concerned, this will almost certainly be the case when there will be limited or no local skilled labour. This minor impact could be turned into a positive impact if the contractor constructing the building is both encouraged to and committed to hiring local labour, particularly when only semi-skilled or unskilled labour is required. This could be made clear during the tendering process for construction of the building. One way of promoting this would be for the Contractor to train local people to acquire the skills needed by these contractors to carry out the work.

7.2.19 Benefit to local producers and suppliers of goods and services

The project will procure most construction materials from local sources. The use of locally available materials and labour for the proposed development will contribute towards growth of the economy by contributing to the income and hence poverty reduction as well as contributing to gross domestic product. The consumption of these materials, fuel oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue. Some of the project services have been already contracted to Tanzanian suppliers and contractors.

7.3 OPERATION PHASE

A. Environmental Impacts

7.3.1 Public health hazards from solid wastes

As noted in section 2.8.3.2, the OUT will establish a system for waste management. The system will include having disposal bin located in strategic areas of the site for collection at source. Further, centralized waste collection point will be established to handle increased quantity of waste and for collection. It will be designed at one of the corners close to the gate for easy collection of the same without major nuisance during collection. Only authorised waste collection agency by the Municipality will be allowed for collection of the waste. The Municipal authorised agents are responsible for collection and disposal to the authorised disposal site.

7.3.2 Public health hazards from liquid wastes

As noted in section 2.6.3.3, there is no centralised sewer system in Mtwara and the expected amount of effluent from sanitary areas ranges from 1.28 m³ to 3.84m³. Thus, the OUT will design a septic tank and soak away pit system for sewage management on site. The design will also take into account the water table of the area. Further, proper construction as per design shall be done.

7.3.3 Public health hazards from hazardous wastes

The OUT will design a waste water retention structures for the laboratory effluent. Two on series retention ponds will be designed for dilution of the effluent before final discharge to the open environment. The effluent on the retention ponds will be monitored to ensure it is safe for final disposal.

7.3.4 Floods hazards

The Laboratory building footprint as well as its activities thereof will not affect the lower part of the plot which act as depository for the rain water. However, the OUT in course of project implementation will collaborate with TARURA and Mtwara-Mikindani Municipal Council for construction of the storm water drainage along the road for conveyance of the storm water to the natural or man made drainage channels.

7.3.5 Fire Hazards

The architecture of the proposed Building shall ensure the building has easy mechanism of evacuation in the eventuality of a fire and other emergencies. The design of the building will provide ample space for exiting the building and the corridors will be of sufficient widths and dimensions to enable easy and speedy evacuation. Provision will be made under the plumbing installation, for fire-fighting system. Further, the following shall be done; -

- The OUT shall install firefighting system to include fire detectors, portable fire extinguishers for emergency, fire hydrant and water reserve tank that can also be used in case of fire.
- Staffs will be trained on how to operate the firefighting equipment.
- Drawings shall be submitted to fire department for scrutiny and guidance on fire safety designs and shall adhere to the requirement(s).

7.3.6 Occupational health and safety hazards

The final designs of the science laboratory building shall adhere to the required standards taking into account the nature of operations. Some of the key aspects to be considered include the ventilation of the chemistry laboratory, location of the gas to be involved in the process, storage room of chemicals requirements. Further, in order to mitigate the potential impacts due to laboratory fumes from complex chemical reactions the chemistry laboratory shall be equipped with fume hood built-in with scrubber which is acid and organic resistant to withstand the acid and organic fumes from the chemistry laboratory operations. Also, before operations of the laboratory building baseline risk assessment should be done in line with OHS Act of 2003 to identify OHS risks and hazards and thereafter to formulate the mitigation measures to be implemented during the operation.

B. Social Impacts

7.3.7 Employment

It is expected that during operation phase of the project, relatively few number of people will be engaged compared to construction phase. However, construction phase will more of temporary engagement contrary to operation that will be permanent though few people will be involved. Offering local people, the opportunity for employment will provide a steady income for their families and hence partly addressing unemployment and poverty issues of the country. This minor impact could be turned into a positive impact if the proponent is both encouraged to and committed to hiring local labour. This

could be made clear during the employment process to involve local community through local government offices for information sharing.

7.3.8 Benefit to local producers and suppliers of goods and services

During operation various goods and services will be required for laboratory and related activities at site. The use of locally available suppliers will contribute towards growth of the economy by contributing to the income and hence poverty reduction as well as contributing to gross domestic product. The consumption of goods and services will attract taxes including VAT which will be payable to the government hence increasing government revenue. This could also be advertised through local offices for information sharing for service providers within the local area.

7.3.9 Risk of SEA/SH

The OUT will draft, approved and implemented a GBV Action Plan and will assess the SEA/SH risks associated with the project based on existing data and input from key stakeholders. This will include identification of risks to workers and communities as well as risks to students within operating institutions. The GBV requirements and expectations will be defined in the bid documents including codes of conducts (to be signed by workers), training, awareness raising for workers and the community, GBV responsive GRMs and approach to GBV case management. Also, GBV measures needed to protect students at the national level and the institutional level including the need for institutions to develop GBV policies to address SEA/SH, training and awareness raising, GBV responsive GRMs, educator/ staff codes of conduct (to be signed), student agreements, referral pathways etc., will be defined. The OUT will identify and create a partnership with a local organisation to report workers' misconduct and complaints/reports on GBV or harassment through the GRM.

7.3.10 Health Hazards due to social interaction among workers and users

The project proponent will support already existing and new initiatives to sensitize/educate the people around the project on the HIV/AIDS pandemic. Also, the proponent will provide HIV/AIDS training/awareness campaign programmes to its employees and will encourage workers who know they are infected and receive care to break through the denial about HIV by talking with their fellow workers, friends and neighbours and reducing the discomfort associated with the subject. When the need arises, the OUT will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace.

7.3.11 Non-user-friendly buildings for Persons with Disabilities (PWDs)

As noted earlier the building will be designed and built with ramps and other special facilities such as toilets to facilitate access and use by PWDs. Detailed consultation with the PWDs community will be undertaken during the design process to ensure key access and user-friendly facilities are designed and constructed.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 INTRODUCTION

The Environmental and Social Management Plan (ESMP) is presented in table 8.1 below. This ESMP for the proposed science laboratory building project is based on the assessment undertaken as part of the ESIA. A number of mitigation measures have been identified which aim to reduce and / or eliminate the predicted impacts of the project. These mitigation measures will be appropriately applied to the project mobilization/construction, operation and decommission phases. This management plan provides a strategic framework for mitigation implementation. The Contractor shall implement components relevant to mobilization of materials and machines and actual construction. The ESMP include an estimate of the costs of the measures so that the project proponent can budget the necessary funds. Appropriate bills of quantities shall clearly give the actual figures. In any case the consultant used informed judgment to come up with these estimated figures.

8.1.1 Purpose of the ESMP

The purpose of the ESMP is to describe the measures that should be implemented by the contractors and project proponent during the implementation of the proposed project to eliminate or reduce to acceptable levels of the key potential environmental and social 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. Where impacts cannot be avoided, they must be mitigated against using appropriate measures. The ESMP has been developed: -

- i) To bring the project to comply with Government of Tanzania applicable national environmental and social legal requirements social policies and procedures;
- ii) To provide guidance on EHS issues as required by the IFC and World Bank Environmental and Social Framework (ESF)
- iii) 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.
- iv) To provide an operational reference and tool for environmental management during project construction and operation activities.

All contractual and legal obligations relating to the ESMP apply to the main Contractors and any Sub-Contractors appointed by them. It is the responsibility of the Construction Contractors to provide adequate resources to ensure effective implementation and control of the ESMP. The Sub-Contractor is responsible to its respective Contractor for compliance with the measures presented in the ESMP. It is also the responsibility of the Construction Contractor and their Sub-Contractors to ensure that all project staff are trained and procedures are understood and followed. Further reasonability of each part is given under section 3.5.2. The summary of the key issues of the proposed project and their management are shown in Table 8.1 below.

Table 8.1: Environmental and Social Management Plan

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/ Standard	Responsibility	Estimated Costs [Tsh]
Mobilization/Construction Phase		<i>Environmental Impacts</i>			
	Loss of vegetation	<ul style="list-style-type: none"> ▪ Clearance will be restricted to areas with physical structures and supporting facilities only. ▪ The trees around the project footprint will be maintained accordingly including the mature remnant tree of <i>Azelia africana</i> species. ▪ After construction the OUT shall plant ornamental trees and other vegetation as part of beautification of the area. 	Planted trees around the building, retained mature tree	Proponent	500,000
	Accelerated soil erosion	<ul style="list-style-type: none"> ▪ Major civil and/or earth work shall be done during dry season. Should there be a need to conduct civil works during wet season, the contractor shall take appropriate mitigation measures to prevent accelerated soil erosion. ▪ The contractor shall ensure that backfilling is done adequately, compacted, and the site restored. The backfilling operation will be performed in such a manner so as to prevent washing away of soil. 	No eroded area / the disturbed areas reinstated	Proponent, Contractor	
	Air pollution due to dust emission	<ul style="list-style-type: none"> ▪ All trucks carrying the fine earth materials will be enclosed during transportation to the construction site to prevent dust generation along the route. Trucks used for that purpose will be fitted with tailgates that close properly and with tarpaulins to cover the materials. ▪ Measures to suppress dust shall be applied to include watering the area vulnerable for dust including routes/earth roads (3 times a day) ▪ Washing of Trucks each morning to remove mud on mudguard and tires to reduce dust on routes ▪ Watering on dry excavated areas to reduce fugitive dust ▪ Speed limits will be instituted to drivers and especially in routes passing in community centers areas. ▪ Covering stockpile that have potential to generate fugitive dust at site 	<u>Units- mg/m³</u> TSP < 0.23, PM ₁₀ < 0.05 & PM _{2.5} < 0.025	Proponent, Contractor	15,000,000
	Air pollution due to exhaust emission	<ul style="list-style-type: none"> ▪ Equipment maintenance to be undertaken in accordance with manufacturer's instructions and at the specified maintenance interval to 	<u>Units- mg/m³</u> SO ₂ <0.5,	Proponent, Contractor	

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
		<p>reduce exhaust emission;</p> <ul style="list-style-type: none"> ▪ Equipment operators will be trained in and will follow equipment operational procedure. ▪ Load limit shall be specified to type of vehicle to avoiding overloading that causes excessive exhaust emission. ▪ Timely maintenance of the trucks through regular inspection on the need for maintenance. 	NOx < 0.2, CO ₂ < 500, CO <30,		
	Noise pollution and Vibration	<ul style="list-style-type: none"> ▪ Construction activities will be restricted to daytime hours only. ▪ Vehicles and machines will be maintained and serviced as required to ensure they do not generate excessive noise. Among others shall have properly functioning exhaust mufflers. ▪ Installation of portable barriers to shield compressors and other small stationary equipment shall be done ▪ Enforced vehicle load restrictions to avoid excess noise emissions from engine overloading shall be done. ▪ Speed limits will be instituted to drivers and especially in routes passing in community areas. ▪ No huge compactors that generate excessive vibration shall be used at site. ▪ Training to drivers on safe driving habits that also control noise levels shall be done 	From 7am to 7pm ≤ 55 dBA	Proponent, Contractor	2,000,000
	Land degradation at source of construction materials	<ul style="list-style-type: none"> • Earth nature construction materials will be obtained from authorized/permitted sources • The contractor will be encouraged to make use of premix concrete suppliers for those major construction works requiring concrete. 	No degradation	Proponent, Contractor	500,000
	Land and water pollution from construction wastes	<ul style="list-style-type: none"> ▪ A site waste management plan shall be prepared and followed. This will include designation of appropriate waste storage areas, collection and removal schedule, and a system for supervision and monitoring. ▪ The contractor shall provide different waste bins for segregation on site and to discourage uncontrolled waste disposal. 	Zero littering	Proponent, Contractor	500,000

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
		<ul style="list-style-type: none"> ▪ No, on site burial or open burning of solid waste shall be permitted at the project site. ▪ The contractor will make use of the existing solid waste disposal and collection system by approved contractors by the Municipality. ▪ All the waste will be managed within the fenced area before collection 			
	Public Health Hazards due to Liquid Wastes	<ul style="list-style-type: none"> ▪ A temporary pit latrines will be established for the construction workers at the site to include for both male and female. 	Pit latrine in place, no hazards due to wastes	Proponent, Contractor	1,500,000
	Disruption of public utilities along the road reserve	TARURA and infrastructures owners (i.e. TPDC, MTUWASA etc.) within the road reserve will be contacted before starting any excavation works in the road reserve area close to the site.	No damage to public infrastructures	Proponent, Contractor	
	Occupational health and safety hazards	<p>Relevant health and safety requirements (OHS Act, 2003) including the provision of Personal Protective Equipment's (PPE), reasonable working hours and good working conditions and facilities shall be complied. Specifically; -</p> <ul style="list-style-type: none"> ▪ Accidents will be minimized through proper maintenance of the machines, protecting or guarding the cutting edges, and awareness of the people including workers on the dangers and make them understand how to protect themselves and others. ▪ The supervisors shall ensure that safety procedure and measures are in place and are enforced (implemented) including appropriate safety gears (PPEs) e.g. eye glasses and dust masks will be ensured in order to reduce risks associated with dust. ▪ The contractor shall provide adequate training to workers on the OHS of the construction works ▪ Approved working hours shall be observed in order to avoid careless mishandling due to fatigue. ▪ Medical checks pre & post-employment as well as mandatory once a year checks shall be done ▪ Undertake site specific risk assessment and developing mechanism to avoid or reduce the risks. This shall be done per each new work to be undertaken and a safety procedure shall be developed and implemented 	Low risk to workers/ Zero exposure	Proponent, contractor	2,500,000

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
		<p>by dedicated project HSE officer.</p> <ul style="list-style-type: none"> The contractor shall also prepare Health and Safety Management Plan for implementation of OHS issues at site. 			
	Contamination of land and water from accidental spills and leakages of hydrocarbon	<ul style="list-style-type: none"> Re-fueling and services for vehicles will be done off site. Spill control measures such as storage and handling of hydrocarbons such as oil shall be done to include storage on impervious areas (such as concrete surfaces with bund wall). Heavy equipment will be checked for lubricant leaks before starting the work, workers will be trained on proper storage of hydrocarbons. Emergency response measures will be put on site in case of accidental oil spill that will include having absorbent materials, sand kits at site, and alike. 	Zero spill	Proponent, Contractor	500,000
		Social impacts			
	Traffic accidents	<ul style="list-style-type: none"> Only qualified drivers with appropriate driving license shall be engage. Induction course shall be done to all drivers prior starting driving Drivers shall be sensitized on maintaining speed limits for main roads and on access roads. Promoting safe drive with specified hours for long drive to avoid fatigue Provision of road and safety signs at site or access roads shall be done. 	Zero accidents	Proponent, Contractor	500,000
	Public Health Hazards (HIV/AIDs and STDs spread)	Awareness raising on the dangers of the HIV/AIDs within the project premises especially to those who are vulnerable and to empower women for they compose one of the most vulnerable groups. When the need arises OUT and Contractor will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDs for instituting a health education and disease control programme at the workplace. The contractor shall also prepare HIV/AIDs Management Plan for implementation of HIV/AIDs issues at site.	No new HIV/AIDs incident	Proponent, Contractor	3,500,000
	Increased local population due to labour influx	Semi-skilled and unskilled labour required by the project will be sourced locally to provide communities with employment and the opportunity to earn an income during the construction phase. Local communities will be given prior	No labour influx	Proponent, Contractor	

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
		information through local government offices on available employment opportunities and required qualifications. A special clause that requires local peoples to be employed as labourers during construction will be included in the contract.			
	risks and hazards associated with child labour	The OUT and Contractor will comply with the provisions in the Employment and Labour Relation Act,2004 and the ILO Convention No. 182. OUT will develop transparent human resources policies and procedures for recruitment process, working conditions, terms of employment wages, worker-employer relations, non-discrimination policy, monitoring, roles and responsibilities. The OUT expects its contractors to adhere to the principles set forth in the Contract which will cover inter alia, standards related to Labour and prohibition of Child Labour.	No child labour incident	Proponent, Contractor	
	GBV/SEA/SH related incidences	The OUT will draft, approved and implemented a GBV Action Plan and will assess the SEA/SH risks associated with the project based on existing data and input from key stakeholders. This will include identification of risks to workers and communities during construction as well as risks to students within operating institutions. The GBV requirements and expectations will be defined in the bid documents including codes of conducts (to be signed by workers), training, awareness raising for workers and the community, GBV responsive GRMs and approach to GBV case management.	No GBV incident	Proponent, Contractor	
	Gender inequity in employment	Women and men will be given equal employment opportunities during recruitment and job postings. Regular sensitization and awareness campaigns to the workers will be done to promote gender equity in employment during the construction works and during operation. Gender disaggregated data, separate bathing, changing room, sanitation facilities for men and women will be provided.	Equal opportunity	Proponent, Contractor	
	Employment	The employment impact could be turned into a positive impact if the contractor constructing the building is both encouraged to and committed to hiring local labour, particularly when only semi-skilled or unskilled labour is required. This could be made clear during the tendering process for construction of the building. One way of promoting this would be for the Contractor to train local people to acquire the skills needed by these contractors to carry out the work.	As many as possible	Proponent, contractor	N/A

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
	Benefit to local producers and suppliers of goods and services	The proponent/contractor shall strive to procure the required service and products from local supplied and producers.	As much as possible	Proponent, contractor	N/A
Operation Phase		Environmental Impacts			
	Public health hazards from solid wastes.	<ul style="list-style-type: none"> ▪ Designated area for wastes collection shall be established. ▪ Provision of wastes receptacles and labeling of these receptacles according to the type of wastes will be done. ▪ Only authorised waste collection agency by the Municipality will be engaged for collection of the waste. 	Zero littering/	Proponent	1,200,000
	Public health hazards from liquid wastes.	<ul style="list-style-type: none"> ▪ The OUT will design a septic tank and soak away pit system for sewage management on site. The design will also take into account the water table of the area. Further, proper construction as per design shall be done. 	No waste water leaks	Proponent	
	Public health hazards from hazardous wastes	The OUT will design a waste water retention structures for the laboratory effluent. Two on series retention ponds will be designed for dilution of the effluent before final discharge to the open environment. The effluent on the retention ponds will be monitored to ensure it is safe for final disposal.	Neutral water (pH 6 - 8)	Proponent	
	Floods hazards	The OUT in course of project implementation will collaborate with TARURA and Mtwara-Mikindani Municipal Council for construction of the storm water drainage along the road for conveyance of the storm water to the natural or man-made drainage channels.	Zero incident	Proponent	
	Fire Hazards	<p>There will be enough exit doors for evacuation in case of fire incidence. The corridors will be of sufficient widths and dimensions to enable easy and speedy evacuation. Provision will be made under the plumbing installation, for fire-fighting system. Further; -</p> <ul style="list-style-type: none"> ▪ The OUT shall install with firefighting system among others portable fire extinguishers for emergency especially in the office side. ▪ Staffs will be trained on how to operate the firefighting equipment. ▪ Drawings shall be submitted to fire department for scrutiny and guidance on fire safety designs and shall adhere to the requirement(s). 	Zero fire incident	Proponent	1,500,000

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
	Occupational health and safety hazards	The final designs of the science laboratory building shall adhere to the required standards taking into account the nature of operations. Some of the key aspects to be considered include the ventilation of the chemistry laboratory, location of the gas to be involved in the process, storage room of chemicals requirements. Further, in order to mitigate the potential impacts due to laboratory fumes from complex chemical reactions the chemistry laboratory shall be equipped with fume hood built-in with scrubber which is acid and organic resistant to withstand the acid and organic fumes from the chemistry laboratory operations. Also, before operations of the laboratory building baseline risk assessment should be done in line with OHS Act of 2003 to identify OHS risks and hazards and thereafter to formulate the mitigation measures to be implemented during the operation.	Zero incident	Proponent	Part of investment costs
		Social impacts			
	Employment	The employment impact could be turned into a positive impact if the proponent is both encouraged to and committed to hiring local labour. This could be made clear during the employment process to involve local community through local government offices for information sharing.	As many as possible	Proponent, contractor	N/A
	Benefit to local producers and suppliers of goods and services	The proponent shall strive to procure the required service and products from local supplied and producers. This could also be advertised through local offices for information sharing for service providers within the local area.	As much as possible	Proponent, contractor	N/A
	Risk of SEA/SH	The OUT will draft, approved and implemented a GBV Action Plan and will assess the SEA/SH risks associated with the project based on existing data and input from key stakeholders. This will include identification of risks to workers and communities as well as risks to students within operating institutions. The GBV requirements and expectations will be defined in the bid documents including codes of conducts (to be signed by workers), training, awareness raising for workers and the community, GBV responsive GRMs and approach to GBV case management. Also, GBV measures needed to protect students at the national level and the institutional level including the need for institutions to develop GBV policies to address SEA/SH, training and awareness raising, GBV responsive GRMs, educator/ staff codes of conduct	No GBV/ SEA/SH victims/incident	Proponent	5,000,000

Phase	Potential Impacts	Management/Mitigation and Enhancement Measures	Target Level/Standard	Responsibility	Estimated Costs [Tsh]
		(to be signed), student agreements, referral pathways etc., will be defined. The OUT will identify and create a partnership with a local organisation to report workers' misconduct and complaints/reports on GBV or harassment through the GRM.			
	Health Hazards due to social interaction among workers and users	The project proponent will support already existing and new initiatives to sensitize/educate the people around the project on the HIV/AIDS pandemic. Also, the proponent will provide HIV/AIDS training/awareness campaign programmes to its employees and will encourage workers who know they are infected and receive care to break through the denial about HIV by talking with their fellow workers, friends and neighbours and reducing the discomfort associated with the subject. When the need arises, the OUT will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace.	Tanzania AIDS/ HIV Policy, No HIV/AIDS victims, No new cases.	Proponent	5,000,000
	Non-user-friendly building for Persons with Disabilities (PWDs)	The building will be designed and built with ramps and other special facilities such as toilets to facilitate access and use by PWDs. Detailed consultation with the PWDs community will be undertaken during the design process to ensure key access and user-friendly facilities are designed and constructed.	Easy access to all users	Proponent	4,000,000

9. ENVIRONMENTAL AND SOCIAL MONITORING PLAN

9.1 INTRODUCTION

The correct and successful implementation of impact mitigation measures in order to reduce adverse impacts on environmental and social conditions needs to be ensured by a proper monitoring programme. This chapter presents the Environmental and social monitoring plan (EMP) that will be carried out throughout the project implementation to mitigate the impacts and enhance the benefits of the project. The EMP outlines the specific actions that shall be undertaken to ensure that the project complies with all applicable laws and regulations related to environmental impacts and impact mitigation. The EMP deals with all mitigation required for the physical, biological and socio-economic impacts and focuses on the impacts as provided in table 8.1 above.

9.2 OBJECTIVES OF EMP

The EMP applies to, and will be implemented throughout, all phases of the project: mobilization/construction, operation, and decommissioning. The objective of the EMP is to set out clearly the key components of environmental and socio-economic management for the proposed project and thereby ensure that the following concepts are realized throughout the mobilization/construction, operation, and decommissioning.

- i) negative impacts on the physical, biological and socio-economic environments are mitigated;
- ii) benefits that will arise from the development of the proposed project are enhanced;
- iii) support smooth implementation of project with minimum losses to environmental and social infrastructure;
- iv) compliance and guided by National, International laws, standards and guidelines e.g., noise level standards, occupational and safety standards etc and best practice is achieved; and
- v) good will and good relations with communities, and governments at local and national levels are maintained.

9.3 MONITORING RESPONSIBILITY

Implementation of the EMP is the solely the responsibility of the project proponent. The proponent shall supervise and monitor components of the monitoring plan and keep record of monitoring outcome. The proponent has ability to provide the necessary supervisory oversight to ensure the mitigation measures are working and where they are not remedial measures are established. The proponent is committed to protect and enhance the environment.

Detailed parameters to be monitored have been considered along with responsible party(s). The proponent will endeavor to ensure that resources are available to implement the EMP throughout all phases of project development and decommissioning. The EMP will be subject to the principle of continuous improvement. The details of environmental and social issues/impacts, proposed parameter to be monitored and timing agencies responsible for execution of proposed actions during mobilisation/construction, operation and decommissioning stages are presented in tables 9.1 below. The EMP includes an estimate of the costs of the monitoring activities so that the project proponent can budget the necessary funds.

Table 9.1: Environmental and Social Monitoring Plan

Phase	Potential Direct Impacts	Parameter to be Monitored	Monitoring Frequency	Monitoring Area	Measurement Unit	Target Level /Standard	Responsibility	Estimated Costs [Tsh]
Mobilization / Construction Phase	Environmental Impacts							
	Loss of vegetation	Trees and other végétation	Twice a year & after construction	Project area	Visual	No disturbed vegetation out of project area	Proponent,, Contractor	200,000
	Accelerated soil erosion	Eroded area	Monthly	Project area	m ²	No eroded area	Proponent, Contractor	500,000
	Air pollution due to dust emission	Particulate matter (TSP, PM ₁₀ , PM _{2.5})	Monthly	Project area,	Mg/m ³	TSP < 0.23, PM ₁₀ < 0.05 & PM _{2.5} < 0.025	Proponent,, Contractor	300,000
	Air pollution due to exhaust emission	Noxious gas	Once per Month	Project area,	Mg/m ³	SO ₂ <0.5, NO _x < 0.2, CO ₂ < 500, CO <30,)	Proponent,, Contractor	300,000
	Noise pollution and Vibration	Noise level	Once per Month	Project area	dB	Day < 55, Night < 45	Proponent,, Contractor	200,000
	Land degradation at source of construction materials	Records	Quarterly	project site	-	No degradation	Proponent,, Contractor	300,000
	Land and water pollution from construction wastes	haphazard disposal of waste / wastes bins	Once per month	Project surrounding area	Visual,	No haphazard disposal of solid waste	Proponent,, Contractor	200,000
	Public Health Hazards due to Liquid Wastes	Pit latrine/ leak	Monthly	Project site,	visual	Pit latrine in place, no leak	Proponent, Contractor	200,000
	Disruption of public utilities along the road reserve	Incident of damage of Public infrastructures	Monthly	Project site,	visual	No incident	Proponent, Contractor	200,000
	Occupational health and safety hazards	Availability of PPE, Measures to reduce risk/risk	Once per month	Construction site	NA	Low risk to workers/ Zero exposure	Proponent,, Contractor	400,000

Phase	Potential Direct Impacts	Parameter to be Monitored	Monitoring Frequency	Monitoring Area	Measurement Unit	Target Level /Standard	Responsibility	Estimated Costs [Tsh]
		exposure						
	Contamination of land and water from accidental spills and leakages of hydrocarbon	Hydrocarbons	Once per Month	Project area	Visual	No spill incident	Proponent, Contractors	200,000
	Social Impacts							
	Traffic accidents	Accident records, Safety/warning signs on roads/awareness training to drivers	Once per Month	Project area, access route	Number of accidents, visual, training records	Zero accidents	Proponent,, Contractor	200,000
	Public Health Hazards (HIV/AIDs and STDs spread)	HIV/AIDs Incident	Once per Month	Project area	Records	No new HIV/AIDs incident	Proponent, Contractors	200,000
	Increased local population due to labour influx	Influx of workers	Once per Month	Project area	Local leaders	No labour influx	Proponent, Contractors	200,000
	Risks and hazards associated with child labour	Child labour incident	Once per Month	Project area	Local leaders	No child labour incident	Proponent, Contractors	200,000
	GBV/SEA/SH related incidences	GBV Incident	Once per Month	Project area	Records, local leaders	No GBV incident	Proponent, Contractors	200,000
	Gender inequity in employment		Once per Month	Project area	Local leaders	Equal opportunity	Proponent, Contractors	200,000
	Employment	local employees	Every 6months	Project area	Number of local employees	As many as possible	Proponent	200,000

Phase	Potential Direct Impacts	Parameter to be Monitored	Monitoring Frequency	Monitoring Area	Measurement Unit	Target Level /Standard	Responsibility	Estimated Costs [Tsh]
	Benefit to local producers and suppliers of goods and services	Local contracts for supply of goods and services	Every 6months	Project area	Number of Local contracts	As many as possible	Proponent	200,000
Operation Phase	Environmental impacts							
	Public health hazards from solid wastes	Solid wastes	Once every six month	Project vicinity/channels & drainage	Visual	Zero littering	Proponent,	200,000
	Public health hazards from liquid wastes	leak	Once every six month	Project site,	visual	no leak	Proponent	200,000
	Public health hazards from hazardous wastes	pH level	Once every six month	Project site,	Records	6.0 – 8.0	Proponent	200,000
	Flood hazards	Number of incidence	Once every six month	Project area	Number of Incidence	Zero incidence	Proponent	200,000
	Fire hazards	Number of accidents	Once every six month	Project area	Number of Incidence	Zero incidence	Proponent	200,000
	Social impacts							
	Occupational health and safety hazards	Number of incidents	Once every six month	Project area	Number of Incidence	Zero incident	Proponent	200,000
	Employment	local employees	Every 6months	Project area	Number of local employees	As many as possible	Proponent	200,000
	Benefit to local producers and suppliers of goods and services	Local contracts for supply of goods and services	Every 6months	Project area	Number of Local contracts	As many as possible	Proponent	200,000
	Risk of SEA/SH	Incidents	Every 6months	Project area	Number of incidents	No incidents	Proponent	200,000

Phase	Potential Direct Impacts	Parameter to be Monitored	Monitoring Frequency	Monitoring Area	Measurement Unit	Target Level /Standard	Responsibility	Estimated Costs [Tsh]
	Health Hazards due to social interaction among workers and users	Incidents	Every 6months	Project area	Number of incidents	No new HIV/AIDS victims	Proponent	200,000
	Non-user-friendly building for Persons with Disabilities (PWDs)	Ramps and other special facilities such as toilets	One During Design & commissioning state	Project area	Facilities & type	Easy access to all users	Proponent	200,000

10 COST BENEFIT ANALYSIS

10.1 INTRODUCTION

The cost-benefit analysis of this project focuses on economic costs and benefits and social benefits other than income and externality which are not included as part of the calculation. The Higher Education for Economic Transformation (HEET) Project is geared towards meeting the following strategic objectives (i) to increase enrolment in priority disciplines, (ii) to improve the relevance and quality of programs at universities to meet the conditions and standards of the current and future labour market, (iii) to strengthen system-level coordination, management, and regulations to ensure quantity, quality and relevance of higher education in Tanzania, and (iv) to increase the rate and extent of graduate employability through improving the relevance of curricula and create new and demand driven programs.

These results suggest that the project is expected to yield significant economic returns and thus is a very sound investment. These are conservative estimates of the project benefits, given that they do not account for other potential benefits, including the social benefits of education and training. The proposed project will increase access and improve the quality of technical programs at OUT. The benefits are expected to emerge from realising economies of scale in training design and delivery in Tanzania.

The main costs associated with the Two Storey Science Laboratory Building at Shangani area include direct project costs, education and training costs for individuals and foregone income (indirect cost) for individuals during training. The additional maintenance cost for construction and additional academic and administration staff are anticipated. Moreover, because HEET supports OUT in staff development, salary increase due to additional qualification/training experience for some staff could be expected.

10.2 COST STRUCTURE

The proposed building will provide adequate space and equipped facilities for the labs that will be used as zonal science laboratories for science students in the project's priority areas. The tangible and intangible annual benefits of the project would include the following: monies gained from students paying fees; potential to increase employment locally; potential to increase local economy by injecting funds into the surrounding community and the ability to contribute over the long term to a better internal economy in Tanzania. The tangible and intangible costs of project include:

- the cost of general operations, namely paying employees, food, and maintenance. All running costs
- the initial startup cost of establishing a process area and the operational costs associated with running it
- the environmental costs would include a definite loss of vegetation as establishment of proposed project would entail the clearance of onsite vegetation to allow project activities to take place effectively
- the destruction of the natural landscape which cannot be completely restored to its original pristine shape once altered
- the potential cost to surrounding communities in terms of heightened noise levels during construction, increased contamination of both surrounding air and water, and increased dust as a result of the project activities.

Before the project is approved by the Government of Tanzania and the World Bank it has to pass the net present value test. The costs and benefits were used to calculate the net present value of the project. According to the Ministry of Education, Science and Technology, the net present value of this project is positive with a promising payback period. The conclusion indicates that the project is economically viable from economic perspectives.

10.3 FINANCIAL EVALUATION

The World Bank Appraisal Document for HEET project reveals that the project is technically, socially and economically feasible, viable and is desirable for country's economy. The construction of laboratory, teaching and research facilities will include Physics Lab, Chemistry Lab, Botany and Zoology Lab, Food Science Lab, Tourism and hospitality Lab, ICT multimedia state of the art Lab, Multipurpose modern Conference facilities as well as offices. It will result into many social benefits like employment generation, inflow of technology, strengthening of education base within the country, inflow of technical and managerial expertise, creation of many other ancillary businesses etc. In light of anticipated financial, social and development benefits the project qualifies for positive recommendation for immediate implementation. Since the World Bank has confidently arranged the required funds and of establishing the project within the committed time frame the conclusion is to recommend to all concerned authorities to accord utmost support to this project so as to enable the country to realize the benefits as perceived in this report.

10.4 SOCIAL BENEFITS

Labs provide students with various opportunities to learn and experiment, which plays a crucial role in the ongoing intellectual development of students at any academic level. Science labs give students the time, space, and resources to explore and experiment. The benefits from the proposed Two Storey Science Laboratory Building project at Shangani area will be beyond the direct benefit of an individual's increase of wage, employability, and productivity. The strategic intervention of government in the priority economic sector with potential growth opportunities will lead to national development. Therefore, it is essential that policies and institutional mechanisms are set to remedy externalities. The proposed project under HEET will support the OUT and support building capacity at the national level.

10.5 COMMUNITIES BENEFITS

The benefit to the communities may be looked into in different perspectives. The successful construction Two Storey Science Laboratory Building with a wide range of different users will make money for local contractors and services provider who will be involved in the project e.g., Construction companies, Architectures, Soil surveyors, ESIA Consultants, etc. who in turn will pay taxes which the Government will use to provide social services to the community. The project activities will also generate employment during the construction and operation of the projects and facilities. As indicated in chapter 2, the activities that the project accommodates, will provide direct employment to Tanzanians from all businesses and services. In addition to the Science Laboratory operational expenditure on local goods and services, including staff wages, food and beverages, concession fees, utilities and maintenance, the project demonstrates the indirect contributions through discretionary spending outside the centre and induced spending by staff and students. It also suggests demonstration effects around training, standards, and stimulation of private sector development and recognizes the additional benefits generated during construction. Generally, since the project has a positive net present value, it will contribute to Tanzania's economic growth and development.

10.6 POSSIBLE COSTS TO GOVERNMENT

As already mentioned, the Government will directly and indirectly benefit from taxes generated during the Science Laboratory construction and operations. Apart from tax generation, the project will also enhance the economic growth and education sector development spurred by the operations and activities associated with the project. The government's image in the promotion of the education sector will also be enhanced nationally and internationally, which will increase attractions from other local and foreign funders and ensure continued market growth.

10.7 ENVIRONMENTAL AND SOCIAL COST-BENEFIT ANALYSIS

Environmental and social cost-benefit analysis is assessed in the negative versus positive analysis. Furthermore, the analysis considers whether the impacts are mitigatable and the costs of mitigating the impacts are reasonable. As mentioned in Chapters 6 and 7, the benefits of the project, in terms of financial and social benefit, are substantial, the environmental and social impacts are mitigatable and the financial resources needed to mitigate the impacts are relatively small compared with the actual capital investment. This project shall have a significant impact on the economy of Tanzania.

11 DECOMMISSIONING PLAN

11.1 INTRODUCTION

This is a preliminary decommissioning plan. This plan establishes feasible decommissioning schemes that can be accomplished without undue risk to the health and safety of the public and decommissioning personnel, without adverse effects on the environment, and within established guides and limits of the appropriate regulatory agencies. This preliminary plan will serve to ensure that the decommissioning and ultimate dispositions of the Laboratory Building are considered during the initial design and construction of the building. The preliminary plan will remain a "living document," and revisions will be made throughout the operating life of the building. It must be reviewed periodically and revised to reflect any changes in the Laboratory Building construction or operation that might affect decommissioning. Prior to the initiation of actual decommissioning activities for the Lab Building, a detailed final disposition plan will be prepared.

The final plan should be based on the preliminary plan and revisions, and will define specific work activities including safety evaluations of planned decommissioning methods, new technology, and the Laboratory Building status that will result from the decommissioning program. In addition, this plan must contain sufficient information to obtain any approvals needed from the appropriate regulatory agencies to proceed with decommissioning activities.

11.2 AIM OF THE PRELIMINARY PLAN

The preliminary plan serves to establish decommissioning as an important consideration from the inception of the project, during design and throughout the operation of the Lab building project. The plan has the following purposes:

- a) The primary purpose of the preliminary plan is to ensure that the Laboratory building project designers are cognizant of decommissioning during the initial design of the project. Thus, where design choices that would enhance decommissioning are available for types of materials and system components, and location of components, these choices shall be made.
- b) Another purpose of the preliminary plan is to identify the ultimate decommissioning options and final project status. These options would be evaluated and narrowed to the decommissioning method of choice as the end of Laboratory building project life is approached.
- c) The final purpose of the preliminary plan is to demonstrate to regulatory agencies that important aspects of decommissioning are considered as early as possible during the initial design of the project. The plan serves as the starting point to demonstrate that areas such as decommissioning methods, costs, schedules, and operating impact on decommissioning will be reviewed and refined throughout the operating life of the Laboratory building project.

11.3 CONTENT OF THE PRELIMINARY

The preliminary plan provides a general description of decommissioning methods considered feasible for the Lab building project. The description is intended to demonstrate that the methods considered are practical and that they protect the health and safety of the public and decommissioning personnel. Design personnel should study the proposed decommissioning methods and take steps to ensure that the design incorporates features that will facilitate decommissioning. Considerations include:

- a) An estimate of manpower, materials, and costs anticipated to support decommissioning.

- b) A description of the anticipated final disposition and status of the Laboratory building equipment and site.
- c) A discussion demonstrating that adequate financing will be programmed for decommissioning.
- d) Identification of records that should be maintained during construction and operation which might facilitate decommissioning, including a set of “as built” drawings.

11.4 PROJECT DECOMMISSIONING METHODOLOGY AND SCHEDULE

The OUT shall fund and implement all aspects of Project decommissioning, including but not limited to, all engineering, environmental assessment, permitting, construction, and mitigation activities associated with the removal of the structures, in accordance with this plan and mitigation of Project removal impacts on site. The project proponent shall monitor environmental impacts during and after project removal to respond to defined events during the monitoring phase.

1. Decommissioning will involve, but not limited to the specified list, because some issues or problems may surface during subsequent monitoring and audits:
 - a) The buildings will continuously be rehabilitated and renovated. While doing that there will be solid wastes which will be disposed of according to the ESMP.
 - b) Moreover, during decommissioning the buildings will be demolished accordingly to suit the new activity while doing that the rubble will be disposed off according to the directions of the Mtwara-Mikindani Municipal Council’s directives.
2. Since the lab building activity is an ongoing concern the Employees will not be terminated from their employments rather will be relocated to the other area of works.
3. On decommissioning the proponent will search for experts’ opinions in order to convert the entire area into another or other uses. Could be expanding the laboratory building to serve more students than the current design capacity of the project, or could be used for other communal use.
4. The restoration or convention plan for the entire premises will be made by proponent (with expertise from environmentalists and economists) and then forwarded to NEMC for approval.
5. Also, proponent Management shall obtain all permits required to undertake decommissioning of the Project. This basically will include Pension Fund, Municipal Council etc.

Should there be no feasible option for conversion to other use of the building then the project structures will be required to be totally removed. Project removal will begin six months after closure and continue for twelve months. Within the six months from closure, proponent will carry inventory for all components that need to be removed and / or disposed of. This inventory will include building structures, equipment etc. to be demolished/dismantled. Also, mode of disposal will have to be finalized. This information will assist in the preparation of the final decommissioning plan, for approval by NEMC. After the approval of the decommissioning plan the metal parts will be removed first within the first three months (this is important to ensure that they are not vandalized). The second three months of the decommissioning will be used to remove concrete structures and foundations. Debris will be used as road fills for rural roads. All disturbed areas will be landscaped and re-vegetated using indigenous trees.

Project decommissioning has five phases: (1) pre-removal monitoring; (2) permitting; (3) interim protective measures; (4) Project removal and associated protective actions; and (5) post-removal activities, including monitoring of environment and socio-economic activities.

The first three phases will occur prior to removal of the Project (i.e., within the first three months). The fourth phase — project removal and associated protective actions — will take place six months after closing business. The fifth phase will begin after total removal and due to nature of the project (medium scale, with relatively moderate impacts) removal and continue for at least three months.

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

(1) Pre-removal monitoring: Pre-removal monitoring includes environmental and socio-economic status of the project site and the surrounding. This monitoring is essential to identify if there is any environmental or social liability which need to be settled before the permit for closure is given. This period will also be used to inventories all assets and facilities that need to be disposed of and to prepare a final decommissioning plan for approval by NEMC.

(2) Permitting: Proponent shall obtain all permits required to undertake removal of the Project. This basically will include NEMC, Mtwara-Mikindani Municipal Council etc.

(3) Interim Protective Actions: This will take care of any interim protective measure that needs to be implemented to protect human health and environment, if any.

(4) Project Removal: As noted above, the removal of the project will be completed within three months.

(5) Post-Removal Activities: Post-Project removal monitoring will continue for three months

The Proponent shall remove the Laboratory equipment, rubbles from demolition and ancillary structures safely and in a manner that minimizes environmental impacts e.g., dust pollution, disposal of any hazardous material, providing protective gear to decommissioning personnel etc; satisfies its obligations under the EMA Cap 191; restores the site to a condition suitable for other use; and pays all dues (government, suppliers etc.).

12 SUMMARY AND CONCLUSION

The study was performed to fulfil the requirement of the Environment Impact Assessment and Audit Regulations, G.N. No.349/2005 as amended in 2018 as well as World Bank Environment and Social Framework (ESF) and the project's Environmental and Social Management Framework (ESMF). The proposed project was subjected to this study to ascertain its compliance with the set legal, legislative and regulatory frameworks and assessment of its probable impact on the social, economic and biophysical environment. The environmental assessment establishes the baseline condition of the site and assesses the impact of the proposed project on area resources. The likely positive and negative impacts of the proposed project are identified and quantified to the extent possible. The issues/ impacts have been assessed and described in some detail to gain an adequate understanding of possible environmental and social effects of the proposed project – from mobilization to decommissioning to formulate mitigation measures in response to negative aspects that have emerged.

A number of mitigation measures are recommended against the identified adverse activities/impacts during the project's entire lifespan. The proposed mitigation measures are included in an environmental and social management plan (ESMP). The ESMP consists of mitigation and institutional measures to be taken during all phases of the planned Laboratory building to eliminate, offset, or reduce adverse environmental and social impacts. The plan also includes the actions needed to implement these measures. Moreover, the ESIA outlines specific environmental management and monitoring plans and identifies any necessary reporting requirements and schedules.

The Environmental Monitoring Plan provides parameters to be implemented and responsibility. The ESMP provides the way forward to implement the identified mitigation measures. The ESMP shall be implemented as a prerequisite for a positive Record of Decision (RoD) by the appropriate authorities. The estimated costs for implementing the mitigation measures are just indicative. Appropriate bills of quantities shall be gives the actual figures. In any case, the consultant used informed judgment to develop these figures.

This report concludes that the proposed project is in appropriate location as far as land use and interactions with human social and economic setting is concerned. Most of the environmental and social impacts have been identified and assessed and none of these are considered to be that severe after mitigation to prevent the further planning, design, and development of the proposed construction of the Science Laboratory Building at Plot No 903/904 at Shangani area in Mtwara-Mikindani Municipality. Thus, the project in the area can be considered suitable subject to implementing the mitigation measures as indicated in the Environmental and Social Management Plan. Further, to further sustainability of the project in the area, it is recommended that the proposed Monitoring Plan should be implemented accordingly for consistent efficacy of mitigation measures or timely corrective measures before significant impacts to the environment and social components.

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APPENDICES

APPENDIX 1: BASELINE DATA ON AIR QUALITY, NOISE AND VIBRATIONS

Appendix 4.1: Average ambient particulate matter in mg/m³

Station	Location	Coordinates	TSP	PM ₁₀	PM _{2.5}
1	Northern Border	10°15'59.78"S 40°10'4.16"E	0.025	0.012	0.007
2	Western Border	10°16'1.49"S 40°10'3.63"E	0.015	0.008	0.005
3	Eastern Border	10°16'0.55"S 40°10'2.21"E	0.022	0.010	0.006
4	Southern Border	10°16'2.43"S 40°10'2.12"E	0.012	0.006	0.003
Local Standard – TBS, 2019, Air Quality Specification			0.5	0.15	0.075
WHO/IFC (2007) and WB AQG 2006			0.23	0.05	0.025

Sampling date: October, 2023

Source: Field measurements

Appendix 4.2: Average ambient pollutant gases

Station	Location and coordinates	CO	NO ₂	NO _x	SO ₂	VOC	H ₂ S
		mg/m ³	mg/m ³	mg/m ³	mg/m ³	mg/m ³	mg/m ³
1	Northern Border 10°15'59.78"S, 40°10'4.16"E	0.05	0.002	0.003	0.01	5.2	0.002
2	Western Border 10°16'1.49"S, 40°10'3.63"E	0.62	0.016	0.025	0.07	5.1	0.009
3	Eastern Border 10°16'0.55"S, 40°10'2.21"E	0.03	0.001	0.002	0.01	5.4	0.004
4	Southern Border 10°16'2.43"S, 40°10'2.12"E	0.74	0.018	0.027	0.08	5.2	0.010
Local Standard – TBS, 2019, Air Quality Specification		10	0.12	0.12	0.5	-	-
WHO/IFC (2007) and WB AQG 2006		30	0.2	0.2	0.5	-	0.1

Sampling date: October, 2023

Source: Field measurements

Appendix 4.3: Average noise levels

Station	Location	Coordinates	Daytime Noise in (dBA)
1	Northern Border	10°15'59.78"S, 40°10'4.16"E	64.73
2	Western Border	10°16'1.49"S, 40°10'3.63"E	50.90
3	Eastern Border	10°16'0.55"S, 40°10'2.21"E	63.27
4	Southern Border	10°16'2.43"S, 40°10'2.12"E	52.70
TBS-NES Limits			<60
WB/IFC Guideline			<70

Sampling date: October, 2023

Source: Field measurements


Appendix 4.4: Average vibration (in mm/s PPV)

Station	Location	Coordinates	(mm/s)
1	Northern Border	10°15'59.78"S, 40°10'4.16"E	0.007
2	Western Border	10°16'1.49"S, 40°10'3.63"E	0.003
3	Eastern Border	10°16'0.55"S, 40°10'2.21"E	0.008
4	Southern Border	10°16'2.43"S, 40°10'2.12"E	0.002
OSH (Working Env't) Regulations, 2016			5

Sampling date: October, 2023

Source: Field measurements

APPENDIX 2: CERTIFICATE OF OCCUPACY

TITLE No. <u>2524 MW</u> REGISTERED <u>21-10-2010</u> AT <u>9:00</u> AM <i>[Signature]</i> Senior Asst. Registrar of Titles		Stamp Duty Shs <u>100/-</u> Paid and Revenue Receipt No. <u>01972299</u> of <u>S-1-2004</u> Issued <i>[Signature]</i> Registrar of Titles Land Form No. 22
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THE UNITED REPUBLIC OF TANZANIA

THE LAND ACT, 1999
(NO. 4 OF 1999)

CERTIFICATE OF OCCUPANCY

(Under Section 29)

WANGANYIRA STAZIBV GUYU ABY Stamp Duty Shs <u>5400/-</u> Paid on original Receipt No. <u>01972299</u> of <u>S-1-2004</u> Issued <i>[Signature]</i> Stamp Duty Officer
--

Title No. 2524 MW
L.O. No. 299634
MT/181270.

The 1st day of October Two thousand and Ten.

THIS IS TO CERTIFY that OPEN UNIVERSITY OF TANZANIA is a body corporate established by Act No. 17 of 1992 of P.O. Box 23409, DAR ES SALAAM (hereinafter called "the Occupiers") are entitled to the Right of Occupancy (hereinafter called "the Right") in and over the land described in the Schedule hereto (hereinafter called "the Land") for a term of **Ninety nine** years from the first day of **January, Two thousand and four** according to the true intent and meaning of the Land Act and subject to the provisions thereof and to any regulations made thereunder and to any enactment in substitution therefore or amendment thereof and to the following special conditions:-

1. The Occupiers having paid rent up to the thirtieth day of June, 2004 shall thereafter pay rent of shillings **One hundred and eight thousand (Tshs.108,000/-)** only a year in advance on the first day of July in every year of the term without deduction PROVIDED that the rent may be revised by the Commissioner for Lands,
2. The Occupiers shall:-
 - (i) 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 responsible for Surveys and Mapping.

- (ii) Do everything necessary to preserve the environment and protect the soil and prevent soil erosion on the land and do all things which may be required by the authorities responsible for environment and to achieve such objective
 - (iii) Building to be in permanent materials.
 - (iv) Submit building plans to the **Mtwara - Mikindani Municipal Council** within six months from the date of the commencement of the Right.
 - (v) Building construction to begin within six months after approval of plans.
 - (vi) Building to be complete within thirty six (36) months from the date of the commencement of the Right
3. **USER:** The land shall be used for **Public Building** purposes only, Use Group 'G' Use Class (h) as defined in the Town and Country Planning (Use Classes) Regulations, 1960 as amended in 1993.
 4. The Occupiers 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 Commissioner.
 5. The Occupiers shall deliver to the Commissioner notification of disposition in prescribed form before or at the time the disposition is carried out together with all premia, taxes and dues prescribed in connection with the disposition.
 6. The President may revoke the right for good cause or in public interest.

MTWARA MUNICIPALITY



INSET SHOWING DETAILS OF PLOT

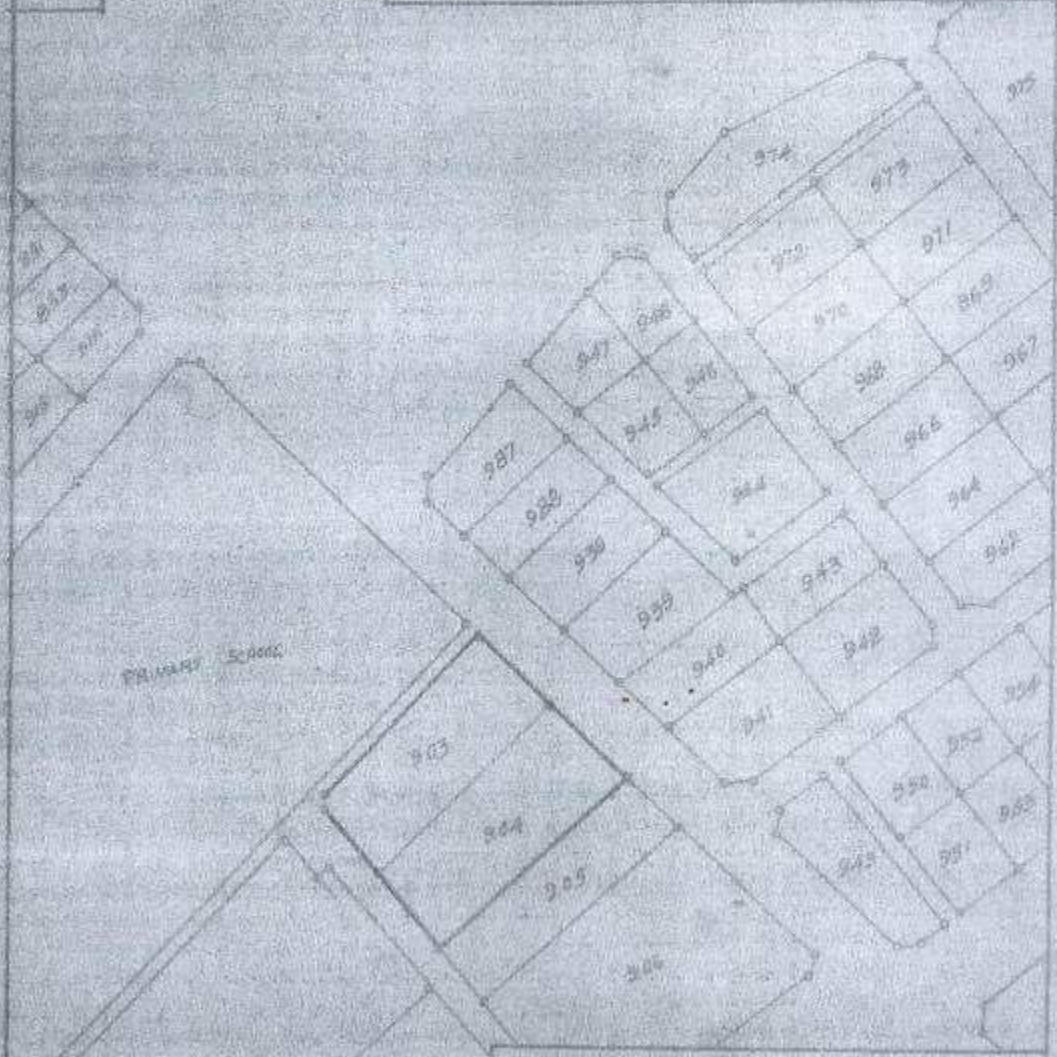
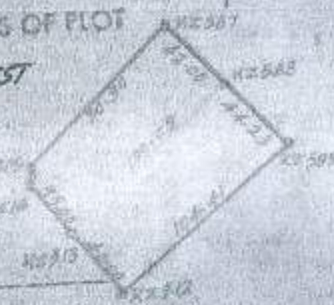
Locality SHANGANI WEST

Block —

Plot No. 903 & 904

L.O. No. 299634

Area 8285 M²



On terms of this plan (unless so otherwise provided) the admission of title by the Government.

This plan, prepared in accordance with Revenue Plan No. 25686 is approved by the Registrar of Deeds and Registration with the Director of Survey and Mapping. Date 2-7-2010 Survey and Mapping Officer, Ministry of Lands, Natural Resources and Forestry, Pretoria.

SCHEDULE



ALL that land known as Plot No. 903 and 904 situated at Shangani West in Mtwara Municipality containing Eight thousand two hundred eighty five (8285) square metres shown for identification only edged red on the plan attached to this Certificate and defined on the registered Surveys Plan Numbered 25686 deposited at the Office of the Director for Surveys and Mapping at Dar es Salaam.

Given under my hand and my official seal the day and year first above written



ASSISTANT COMMISSIONER FOR LANDS

The within named OPEN UNIVERSITY OF TANZANIA hereby accept the terms and conditions contained in the foregoing Certificate of Occupancy.

SEALED with the COMMON SEAL of the said)
OPEN UNIVERSITY OF TANZANIA and)
DELIVERED in the presence of us this... 20TH)
day of... AUGUST... 2010.)
PROF TOLLY SALVATOR AUGUSTIN) MBWETTE)
Signature: )
Postal Address: 23409)
DAR ES SALAAM)
Qualification: THE VICE CHANCELLOR)
DR. ELISEI BASIL TEMU)
Signature: )
Postal Address: 23409)
DAR ES SALAAM)
Qualification: DIRECTOR)
PLANNING AND DEVELOPMENT)

APPENDIX 3: DETAILED STAKEHOLDERS VIEWS AND CONCERS

The team of TRES consultants undertook stakeholder's consultation to ensure key project stakeholders are fully involved with the project. The TRES Team was accompanied by Open University senior officials namely Dr. Msafiri Njoroge (Director – Regional Center), Dr. Janeth Isanzu (HQ - GBV Coordinator), Ms. Ukundi Nkya (Project Accountant), Mr. Jackson Frumence Mtena (PRO-Mtwara) and Mr. Yusuph Nandonde (Communication officer). The stakeholders consulted include: - Mtwara-Mikindani Municipal Council- Director's office, Shangani Ward office, Shangani West Mtaa office and the local community of the project site. Other institutions include;- Occupation Safety and Health Authority (OSHA), Government Chemistry Laboratory Authority (GCLA), Fire Department, Tanzania Rural and Urban Road Agency (TARURA), Mtwara Urban Water Supply and Sanitation Authority (MTUWASA), Ruvuma and Southern Coast Water Board, TANESCO, FAWAPO Local NGO, Below are the views and concerns from the consulted stakeholders;

Mtwara-Mikindani Municipal Council Director's Office

The team of consultants visited the Mtwara-Mikindani Municipal Director's office and met with Act. MED. The acting Director welcomed the ESIA team for the study and also welcomed the project development in the area, noting that the project will improve the provision of educational services in the Mtwara. Further she noted that the project will beautify the area and will clear bushes of the site. The Director reminded for proponent to apply the building permit before starting construction at site.

The team also consulted the Environmental Department under the Municipality and had a discussion with the Municipal Environmental Management officers. The officer had the following views;-

- It is inevitable the project will clear some vegetation at site and to mitigate it is advised to plant trees around the site for beautification of the area. If there is no enough space trees can be planted in other areas such as nearby schools.
- Dust emission from construction activities should be managed to avoid nuisance and air pollution especially to pupils nearby the project site. Use of water bowsers should be applied to suppression dust.
- Likewise, noise pollution from construction activities should be minimized to avoid the impacts to the nearby pupils of the Primary Schools of Medi and Kambarage.
- Storm water channels should be well thought of to drain out storm water as part of the plots is lower and hence retains storm water after rains. The officer further noted that there is ongoing construction of storm water infrastructures to remove storm water within the Mtwara CBD under the TACTIC project and hence the proponent could construct the storm water toward huge channels under the project. The project is implemented by TARURA in collaboration with Municipal office.
- Since the project is surrounded by schools the construction site should be fenced to control access by the public for safety purpose.
- The project should consider locals in the employment opportunities
- STDs and HIV/AIDs should be addressed for construction workers to avoid social impacts during and after the project.
- Occupational health and safety issues should be taken on board during construction to include issues like having sanitary areas for the workers, drinking water.

TARURA

The team consulted TARURA Regional and District offices and had discussion with the two Engineers of the Authority. The following were response and views on the proposed project;-

- The officers acknowledged to have TACTIC project under the World Bank that among others aims at constructing drainage channels to drain out storm water in the lower areas of the Mtwara CBD. It was

noted that a contractor for designing of the infrastructures has been appointed. Further, the officer accompanied the consultant to the site to show the site earmarked for the construction of the channels.

- It was advised that before starting construction the contractor or OUT should liaise with TARURA to provide guidance on the safe use of the road at the site and safeguards the utility infrastructures along the road reserves. The noted infrastructures on the road reserve are water supply structures.

Occupation Safety And Health Authority (OSHA)

The team of consultants consulted Occupation Safety and Health Authority (OSHA) specifically on the Occupation Health and Safety aspects at the work place of which, the Authority is dealing with. At OSHA – Southern Zone office, the team met with one of the Doctors of the Authority. The Doctor had the following views on the development of proposed project; -

- OSHA have online system for registration of the project/workplace (i.e. WIMS – workplace information management system) on which the contractor or proponent is required to register the workplace online.
- The contractor is required to prepare OHS policy in both languages of Swahili and English and be displayed at workplace.
- The workplace needs to have appointed/designated a Safety representatives and First Aider among the workers and ensure they attend OHS training at OSHA.
- The contractor is also required to undertake risk assessment of the project activities and to prepare the report, this will identify the hazards at the workplace and measures to mitigate the same.
- A safety committee should be formed at workplace to be led by the SHE Representative that will discuss all safety issues and make follow up for implementation.
- There should be safety file for filling all safety minutes, letters and actions taken to mitigate the hazards/risks.
- The contractor/proponent should conduct mandatory medical examination for workers to include pre-employment, during employment period once per year and post-employment.
- Provision of full and appropriate PPEs to the workers at workplace should be done as per identified hazards based on baseline risk assessment.
- Provide First Aid Kit at workplace
- Provide clean and safe drinking water to staffs for free
- There should be changing rooms for the workers for both male and female workers
- Provide conducive sanitary facilities for workers

Inspectors shall visit for purpose of inspection of the workplace and further provide more guidance on compliance with OHS Act. 2003.

Shangani Ward

The team visited the Ward office of Shangani where the proposed project is located administratively and held a discussion with Ward Executive Officer. The officer had the following views;-

- The project site is relatively far from the residential areas and hence there is no major expected issue to face the residents.
- Part of the site is inundated during rain season and hence filling the area might cause inundation of other nearby areas that might cause nuisance and chaos from neighbors. This should be well attended.
- Shangani west area is a bit isolated and calm, with minimal movements of people the situation of which favors thief to steal. Thus it is advised for the construction site to be fenced and should be 24/7 guarded.

Fire Department

The team of consultants visited the Fire and Rescue Force Office in Mtwara region and held discussion with the A/INSP. The following were the views on the project;-

- i. The Proponent should submit project drawings to fire department to determine the fire protection layout of the proposed building.
- ii. The Proponent will be required to cover the cost of scrutinization of the drawings for the project as well as construction fee before starting construction.
- iii. Among of the aspects to be considered during the scrutiny of the drawings and inspection after construction include;-
 - provision of exit doors which should open outside to allow easy escape/rescue in case of emergency.
 - provision of fire extinguishers at appropriate locations for easy access,
 - provision of fire detection system (smoke detectors, control panel and alarm) and water reservoir tanks for water usage during fire emergency
- iv. The proponent should acquire fire safety certificate thereafter which annually renewed.
- v. The Inspector also noted that the public fire hydrant is far from the project area.

Government Chemist Laboratory Authority (GCLA)

The team of consultants visited the Government Chemist Laboratory Authority-Southern Zonal office in Mtwara and the discussion was held with the acting - Zonal Manager. The following were the views and concerns on the proposed project;-

- i. The acting manager noted that, the Chief Chemist is the registrar of all laboratories in the country, and thus the proponent should liaise with the office for registration of the laboratory.
- ii. The Authority is also responsible for registering, managing and controlling all industrial chemicals in the country and thus the information for chemicals involved with laboratory should be known by the Authority.
- iii. There sewage management system at site should be separated from the effluents emanating from chemical laboratory. The laboratory effluent should have its own management.
- iv. To avoid expiring of chemicals and hence hassle for disposal the manager noted that only chemicals required within defined reasonable time should be procured and its use should use FIFO system i.e. first in first out. It was insisted it is expensive to dispose expired chemicals and thus measures to avoid expiring of stocks should be emphasized.
- v. It was recommended that proper chemical disposal mechanism should be in place during project implementation;
- vi. The manager advised that policy on how to manage chemicals and chemical wastes should be prepared and executed;
- vii. It was noted that the general management practice of chemical wastes from operations of academic oratories is control of pH. Neutralization should be done to ensure resultant effluent is neutral then it can be allowed to flow towards open environment. There should be dedicated containment structures for neutralization before releasing to the open environment or to the common effluent system.
- viii. The manager also noted that Chemicals should be properly stored with adherence to the required standards and there should be proper record of chemicals stock.
- ix. There should be trained personnel to deal with chemicals,
- x. The chemical laboratories should have appropriate warning signs/symbols and labels.

Mtwara Urban Water Supply And Sanitation Authority Office

The team consulted the MTUWASA on the issues related to water supply and sanitation in the Municipality of which the Authority is dealing with. The meeting was held with the management of the MTUWASA led by the acting Managing Director. The following were views and response on raised issues regarding the proposed project area:-

- i. Mtwara do not have a sewage management system due to the nature of the terrain/landscape. Due to the nature of the terrain the system would require a lot of pumping that would be very costly to run the sewer system. Thus, the common practice is septic tank and soak away pit system. Once tanks full are emptied for disposal to designated area under the Municipal council.
- ii. It was noted that there is plan for construction of waste stabilization ponds for sludge management at Chiko area within the Municipality.
- iii. There is operational water supply network in the project area (Shangani west) and currently there is upgrading of the system that also involves construction of new infrastructures to increase reliability of supply and network coverage area.
- iv. It was advised for the proponent to liaise with MTUWASA before starting construction for the safety of water structures within the road reserve nearby the site.

Ruvuma River and Southern Coast Basin Water Board

The team of consultants visited Ruvuma River and Southern Coast Basin Water office which is mandated to manage, protect, develop and allocate water resources within the basin. The team held a meeting with Basin offices who provided the following views and concerns regarding the proposed project:-

- i. The officer recommended that there should be proper disposal of the chemicals wastes from laboratory activities. The Proponent should adhere to environmental regulations for the sake of water (surface and subsurface) protection.
- ii. Should the project have a borehole the proponent should secure borehole construction permit before drilling and thereafter water use permit for abstraction.
- iii. Storm water management should be well considered in the area.
- iv. Road reserves structures nearby the site to include water pipes should be considered to avoid damage and interruption of the service to the public.
- v. The project should consider locals to the emerging project opportunities such as employment.
- vi. The constructor and proponent should be cognizant to the high water table of the Shangani area which is as high as up to 6 meters.

FAWOPA-TANZANIA

The TRES team consulted Faidika Wote Pamoja (**FAWOPA**) which is a Non- Governmental Organization (NGO), FAWOPA that deals with Legal aid, human right, education, Women economic empowerment Health, Gender and Male involvement, Environmental, Vulnerable children and provision of legal services. The team had a briefing meeting with Executive Director. The Director expressed the following opinions and concerns on the proposed project's development:-

- i. As part of baseline information the Director noted a common GBV issues within the Municipality to include Early pregnancies, Children drop out of school and start working on the project construction sites as employees; Sexual abuse and exploitation; Child neglect.
- ii. The Director explained child labour could not be director involved with the contractor but through supply chain, for instance children might sell some foods or fruits at construction site, or suppliers of construction materials could be involving children. Thus he advised for contractor to have a policy or mechanism to address the issue of child labour to the entire supply chain.
- iii. The Proponent or/ and contractor is should provide awareness to its employees regarding GBV issues as well as HIV/AIDs and STDs and on this could engage local NGOs like FAWAPO to provide the

awareness. Also, as part of the CSR could support the NGOs to provide awareness to the surrounding community on the same issues of GBVs and STDs and HIV/AIDs. This will be part of achieving the national policies in fighting against the AIDS pandemic.

- iv. The local content should be well considered in these kind of the projects in which the contractors should not bring employees from far away while locally are available and able to do the same kind of job. Thus, the Director insisted to give priorities to locals for emerging project opportunities including women.
- v. The Director highlighted on common barriers led to the existence of Gender Based Violence (GBV) are;- Cultural believes, Norms and Custom value, Lack of awareness to some parents and Poverty.

Shangani West Mtaa

The team of TRES consultants had a meeting with the Shanagni west community in presence of the local leaders i.e. Mtaa Chairperson, MEO and Ward executive officer. The following are views and concerns on the aforementioned proposed project: -

- i. Members appreciated for the government's efforts to bring the project of OUT laboratory building to their area believing will benefit the residents and other people around Mtwara.
- ii. Members plea for the quality of the building should be as good as per other similar buildings to be developed in other regions.
- iii. It was highlighted that, the laboratory building should be compatible with the value of the money that will be used in the construction.
- iv. The teacher from Med primary school highlighted on the challenge of science students to study only theories due to absence of science laboratories and thus the project will help secondary students to gain an understanding of science subjects, also it will motivate students to study Science subjects;
- v. Members noted that noise from construction activities should be controlled to avoid impacts to the nuisance and disturbance to the public bearing the primary schools neighboring the project area.
- vi. Also it was noted that the project should consider to drain out the storm water from the area to the appropriate area.
- vii. It was noted that, priority should be given to locals for the emerging project employment opportunities especially the manual works that do not require skilled laborer's. Also it noted that there are technicians in the area who could be considered during construction of the project.

Finally, the members accepted the proposed project and promised the cooperation to all project implementation phase.