ARDHI UNIVERSITY

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED ESTABLISHMENT OF ARDHI UNIVERSITY-MWANZA CAMPUS ON PLOT NO. 01 &02, BLOCK "A", KARUMO VILLAGE, NYAMATONGO WARD, SENGEREMA DISTRICT, MWANZA REGION

January 2024

EXECUTIVE SUMMARY

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED ESTABLISHMENT OF ARDHI UNIVERSITY-MWANZA CAMPUS ON PLOT NO. 01 &02, BLOCK "A", KARUMO VILLAGE, NYAMATONGO WARD, SENGEREMA DISTRICT, MWANZA REGION

INTRODUCTION

Ardhi University (ARU) is a public academic institution established under the Ardhi University Charter, 2007. ARU has traversed through various transformations from Survey Training Centre (1956 – 1972), Ardhi Institute (1972-1996) to University College of Lands and Architectural Studies (UCLAS), a constituent college of the University of Dar es Salaam (1996 – 2006). ARU is a unique University being the only institution of its kind in Tanzania and in Africa offering integrated training and conducting research in land, the built environment and other environment related issues under the same roof.

Ardhi University (ARU) is one of the universities which has benefited from the Higher Education for Economic Transformation (HEET) project. HEET is a five-year project, which is financed by the World Bank through the Ministry of Education, Science and Technology (MoEST). 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 labor market relevance, by investing in requisite infrastructure for modern and effective teaching and research.

In that regard, Ardhi University (ARU) has set aside the fund for the new campus of 10,000 students and about 200 staffs to be established on plot no.1 & 2 block 'A', Sengerema District, Mwanza Region by 2024. This is in line with University Corporate Plan (CP) and the Medium Terms Rolling Strategic Plan (MTRSP) which highlight on the need for ARU to establish new campuses in up country regions as one of the strategies to expand its training and learning infrastructure and increase students' enrolment. The proposed new ARU Mwanza campus shall initially serve students for diploma level and eventually bachelor degrees. The proposed new campus shall be established in two phases. The first phase shall involve a construction of access road, offices, hostel, dispensary, studios ad class rooms, staff housing building. The second phase shall include the construction of directorate of students' services building, Offices, library, classrooms, workshop, student center, and villa for senior staff. The buildings shall cover 8.9% of the total project area (378 acres (1.53Km^2)). The proposed project will have an investment cost of TZS 15, 000, 000,000 (15billions, USD 6 million).

As a prerequisite to the construction of new buildings, the project will involve various site excavation activities including the demolition of the buildings currently on site. Building construction and associated activities will inevitably 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 requires project developers to carry out an Environmental Impact assessment (EIA) prior to project implementation.

In fulfilment of the above, ARU 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 project was registered and allotted Project Reference No. EC/EIA/2022/9073 as well as an approval of Terms of Reference (ToR) for undertaking ESIA study was made. The approval was communicated through a letter of 28/10/2022 with Reference Number HE.145/88/81/01 (Appendix 1). These 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 World Bank Environment and Social Framework (ESF) as well as the project's Environmental and Social Management Framework (ESMF) were observed in the study.
Ardhi University commissioned a team of Environmental and Social Experts to conduct Environmental and Social Impact Assessment for the proposed Project. The core ESIA study team is composed of the following experts: Environmental Expert, Environmental Engineer, botanist, Air quality and GIS experts; and Sociologists and Urban Planners.

PROJECT DESCRIPTION

The ARU-Mwanza Campus site covers 378 acres (1.53Km^2) of land which is equivalent to 12.1% of the total Karumo village land. The area for the proposed project is human modified with scattered bushes. It has been used as agricultural field and grazing land, as well as sand mining area. It has seven (7) residential houses scattered at the proposed site. The houses belong to villagers who have already been compensated. The buildings materials used include irons sheets, blocks and muds. The buildings shall be demolished to pave the way for construction of the proposed project. The topography of the site is characterized by an undulating plain sloping gently downward from South to North and then towards the Western side of the site. The project is transected by Karumo road which is passable throughout the year and the electrical transmission line. Furthermore, the proposed site has two graves and areas for spiritual rituals to be shifted to other places.

The proposed projects shall be located on plot no.1 &2 block 'A", Karumo Village, Nyamatongo ward, Sengerema District, Mwanza Region, Tanzania. The site is bordered by Lake Victoria to the West, Nyamatongo Secondary school and Kamanga Village settlement to the East, Sengerema-Kamanga road to the South and Village land to the North. The ARU Mwanza campus is accessible by the main road from Mwanza town to Sengerema via Kamanga Ferry. The campus is also accessible via Kamanga-Karumo Road, which passes through the site to Karumo village. The road is unpaved and lacks traffic separation for motorized and non-motorized traffic.

POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Tanzania is committed to attaining sustainable development goal. Some of the policies and legislation that have a close bearing to this project are listed hereunder:

i. Environmental Management Act No. 20 of (2004)
ii. The Water Supply and Sanitation Act No. 12 of 2009
iii. Land Act no 4 (1999), CAP 113 R.E. 2019
iv. The Urban Planning Act (2007)
v. Occupation Health Safety (2003)
vi. Employment and Labour Relations Act No. 6 of 2004
vii. Engineers Registration Act and its Amendments 1997 and 2007
viii. The Contractors Registration Act (1997)
ix. The Architects and Quantity Surveyors Act (1997)
x. The HIV and AIDS (Prevention and Control) Act of 2008
xi. The Local Government Laws (Miscellaneous Amendments) Act (1999)
xii. The Tanzania 2025 Development Vision
xiii. Environmental Impact Assessment and Auditing (amendment) Regulations (2018)

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

- World Bank's new Environmental and Social Framework (ESF);
- The World Bank Environmental and Social Safeguarding Policy for Investment;
- WB relevant Environmental and Social Standards. HEET will apply 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; and
- ESS10 - Stakeholder Engagement and Information Disclosure.

BASELINE CONDITIONS

The proposed site has Electrical, water supply and telecommunication system. Most of the animals discovered at the site are domestic animals from nearby community or surrounding residential areas. Vegetation types of the project site are composed of 21 species with high diversity plant species of different life forms including climbers, herb, grass, shrubs and trees. The area is dominated by trees species which account for 43% of the vegetation types found in the proposed construction area, followed by shrubs (29%), herbs (14), grass (10%) and climber which accounts for 5%. Though the results showed that the area has two types of grasses but their coverage in terms of land space is larger compared to other species. The grasses are scattered throughout the proposed construction areas while trees are concentrated in the areas where estate and warehouse, and multipurpose hall are proposed to be constructed. Most of the species identified are native (76%) the rest are exotic species (24%) while no endemic and near endemic species were identified at the site. In the proposed sites, no species were recognized to be identified in the IUCN Red list as endangered (0%), vulnerable (0%) and near threatened (0%) species, the rest are of

least concern (33%), or lack data (5%) and non-evaluated (62%) species. No specie has been identified to be included under CITES list. The total population for the Nyamatongo ward is 25,510 people.The main social economic activities are small agricultural activities, livestock keeping, fishing and retail shop business.The village has important social economic services like water, electricity, worshiping centres, dispensary and police post. However, The expect increase in the number of people that are expected to be more 10,000 will increase pressure on the available social services and change the lives of the people of Karumo and the surrounding communities.

STAKEHOLDER CONSULTATIONS AND PUBLIC INVOLVEMENT

The main stakeholders include:

i. Mwanza Regional Secretariat;
ii. Ministry of Education Science and Technology (MoEST);
iii. Tanzania National Electric Supply company (TANESCO);
iv. Sengerema Water Supply Authority (SEUWASA);
v. Sengerema District Council (SDC);
vi. Tanzania Commission for Universities (TCU);
vii. Occupation and Safety Authority (OSHA)-Mwanza Office;
viii. Fire and Rescue Army;
ix. Tanzania Rural and Urban Roads Agency (TARURA);
x. Tanzania Telecommunication Company Limited (TTCL); Tanzanian Lake Victoria Basin Water Board (LVBWB);
xi. Local communities of Karumo and Kamanga villages;
xii. Ardhi University Students including vulnerable students and those with disabilities; Ardhi University Students Organisation (ARUSO);
xiii. Academic and Administrative staffs through their respective organisations (ARISA and THTU respectively);
xiv. Local government authorities of Nyamatongo ward, Karumo and Kamanga villages

Major issues raised are:

i. The proposed college will generate knowledge, which would enhance sustainable utilisation of natural resources. Therefore, the proponent should ensure protection of all water supply systems around the project site.
ii. Waste Management problems.

ASSESSMENT OF IMPACTS

(a) Environmental risks and impacts assessment done included: (i) those defined by the WB Environmental Health and Safety Guidelines (EHSGs); (ii) those related to community safety; (iii) those related to climate change (iv) any material threat to the protection, conservation, maintenance and restoration of natural habitats and biodiversity; and (v) those related to ecosystem services and the use of living natural resources; and (vi) those related to the design of the physical facilities.
(b) The Social risks and impacts assessment done included: (i) threats to human security through crime or violence; (ii) risks that project impacts fall

disproportionately on individuals and groups who, because of their particular circumstances, may be disadvantaged or vulnerable; and (iii) negative economic and social impacts relating to the involuntary taking of land or restrictions on land use.

Impacts associated with the project

A: Impacts on the physical Environment

Positive environmental impacts

i. Improved amenities/ landscaping
ii. Increase waste management facility in the area
iii. Improved health, safety and security in the area
iv. Improved aesthetic value, and
v. Improve easy flow of natural air

Negative environmental impacts

vi. Loss of arable land
vii. Loss of biodiversity
viii. Change of habitat
ix. Loss of ecosystems services
x. Acceleration of soil erosion
xi. Generation of liquid waste
xii. Generation of solid waste
xiii. Generation of Hazardous waste
xiv. Increased runoff/storm water
xv. Land pollution
xvi. Surface and ground Water Pollution
xvii. Air pollution
xviii. Contribution to Climate change
xix. Noise pollution
xx. Generation of vibrations
xxi. Visual impact
xxii. Increase pressure on natural resources

B. Impacts on Social Environment

Positive social impacts

i. Loss of arable land for cultivation
ii. Employment opportunities
iii. Increase in income generation opportunities
iv. Changes in lifestyle and quality of life
v. Increased skills and impart knowledge to local communities
vi. Increase of academic facilities in Mwanza

Negative social impacts

vii. Loss of cultural assets and displacement ritual sites
viii. Change of habitant
ix. Population increase
x. Increased pressure on social services
xi. Increased traffic flow

xii. Increased risks of road/ ferry accidents
xiii. Increase in level of crimes
xiv. Increased risks of communicable diseases
xv. Change in social values and ethics
xvi. Increase in conflicts
xvii. Food insecurity
xviii. Price inflation of goods and services
xix. Occupation health, safety and security risks
xx. Community health and safety risks
xxi. Child labour
xxii. Increased incidence of GBV/SEA/SH
xxiii. Increased transmission of STDs, COVID etc
xxiv. Loss of livelihood
xxv. Restrictions on use of access road to Karumo village
xxvi. Loss of employment

C. Economic Impacts

Positive impacts

i. Increased Revenues to local authorities
ii. Increased commercial and social activities around project locations
iii. Increased Income to local suppliers and service providers
iv. Increased land values

MITIGATION MEASURES

The design of the mitigation measures for the identified Environmental and Social impacts applied the mitigation hierarchy suggested in the ESF (i.e. ESS1) which are:

a) Anticipate and avoid risks and impacts;
b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
c) Once risks and impacts have been minimized or reduced, mitigate; and
d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.

Many of the mitigation measures put forward are essentially good engineering practice that shall be adhered to during all the project phases.

Potential mitigation measures during construction phase

Negative Social Impacts

i. Institute good site practices including prevent public access to the construction site by securing equipment and demarcate excavate, using warning signs with appropriate text (local language) and graphic displays;
ii. Institute traffic management and safety programme including, training and testing of heavy vehicles operators and drivers, enforcement of speed limits, maximum

loading restrictions and compliance with all Tanzania transportation law and standards;

iii. Provide more avenues for service providers e.g. cafeteria and restaurants
iv. Constructions of police stations at Ardhi University and the surrounding communities
v. Awareness campaigns /Education on HIV, COVID-19 and STDs shall be provided to workers;
vi. The project will prepare a GBV Action Plan that ensures project awareness raising strategy (for workers and community members), a list of GBV service Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.
vii. ARU will conduct regular monitoring of project workers in relation to health, working conditions, hours of work, minimum age, and the other requirement of national law.

Negative Environmental Impacts

i. Equipment shall be maintained in good running condition and equipment, which generate excessive black smoke shall not be used;
ii. Enforce vehicle road restrictions to avoid excessive emissions from engine overloading, where practical switching off engines will be done when machines are not in use;
iii. Protect stockpiles of friable material subject to wind through wetting;
iv. Cover loads with friable material during transportation;
v. Green spaces shall be maximized in project areas
vi. Vehicles carrying construction materials shall be restricted to work during night time only;
vii. Impact pile driving shall be avoided where possible in vibration sensitive areas;
viii. Wastewater shall be properly treated using the system consists of the Septic –soak away system; UASB and wetland. Only effluents complying with Tanzania Standard will be discharged on receiving water body.
ix. The contractor shall have adequate facilities for handling the construction waste including the demolition waste from the 7 houses to be demolished;
x. Construction will be done as per engineering design and procedure of which a maximum requirement of compaction strength is achieved during the construction. That is maximum dry density (MDD) specified in the design manual by consultant;
xi. Locating parts of the development further away from the general public;
xii. Clearance of patches of native forest remaining in the neighbourhood of the proposed project shall be avoided;

Potential mitigation measures during the operation phase

Negative Social Impacts

i. A safety, health and environment induction course shall be conducted to all students and workers, putting more emphasis on HIV/AIDS, which has become a national disaster as well as other emerging pandemics such as COVID 19 and dengue fever;
ii. Use of water conservatively by instituting technologies (e.g. self-lock water taps) and awareness raising notices to users, etc.;
iii. The project will prepare a GBV Action Plan that ensures project awareness raising strategy (for workers and community members), a list of GBV service Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.
iv. ARU will conduct regular monitoring of project workers in relation to health, working conditions, hours of work, minimum age, and the other requirement of national law.
v. Provide more avenues for service providers e.g. cafeteria and restaurants
vi. Constructions of outpost police stations at Ardhi University-Mwanza Campus in order to strengthen security service;
vii. The cooperation of local people together will help to lessen criminal incidents and maintain security of people and their properties.

Impacts on physical environment

i. Septic –soak away system, UASB and wetland shall be designed in such a way waste treatment is achieved by 100% before disposal to the receiving water body;
ii. The design of storm water drainage will be given a high priority;
iii. Adequate number of portable fire extinguishers shall be placed at strategic locations;
iv. Good housekeeping shall be maintained at all the time;
v. The design of buildings shall strictly adhere to the Fire Safety Standards;
vi. To change the consumption behaviour in terms of energy and water

Mitigation Measures During Decommissioning Phase

Social impacts

- Seminars shall be conducted on alternative means of livelihood after termination of job

Environmental Impacts

i. The debris resulting from the demolition will either be transported by a licensed waste transporter for dumping at an approved site or used as base material for new construction work;

ii. All the necessary health and safety measures will be implemented including provision of personal protective equipment such as, safety harnesses, helmets, gloves, respirators, safety shoes, coveralls, goggles and ear protectors;

ENVIRONMENTAL AND SOCIAL IMPACT MANAGEMENT PLAN

The options to minimize or prevent the identified adverse social and environmental impacts as well as a monitoring plan have been suggested in this report and are contained in the ESMP. Many of them are based on good engineering and social practices. The ESMP defines roles and responsibility of different actors of the plan. However, the key actors during construction phase is contractor and Ardhi University while during the operation phase, Ardhi University will be the key actor in implementation of mitigation measures. The associated environmental costs amount to Tshs 572,000,000.

ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

There will be four types of monitoring activities; i) baseline monitoring, ii) impact monitoring, compliance monitoring, and mitigation monitoring. The monitoring of environmental and social parameters during the construction phase shall be carried out by the Contractor's safeguard team (i.e. Environmental, social and safety experts), under the supervision of the Consultant's safeguard team. The responsibility for mitigation and monitoring during the operation phase will lie with the ARU Estate Department. Depending on the implementation status and sensitivity of any emerging issues, OSHA and /or NEMC will perform annual EHS reviews in which environmental concerns raised will be reviewed alongside project implementation. The estimated annual costs for carrying out the proposed environmental motoring programme amounts to Tshs 22,000,000.

DECOMMISSIONING

As decommissioning will take place in the remote future, the specific conditions for mitigation are generally inherently uncertain. In view of this, specific mitigation measures pertaining to environmental impacts of decommissioning works cannot be proposed at the moment with a reasonable degree of certainty. A decommissioning plan that considers environmental issues shall be prepared by the developer prior to the decommissioning works. Should it be done, decommissioning may entail change of use (functional changes) or demolition triggered by change of land use.

PROJECT COST BENEFIT ANALYSIS

The implementation of the proposed new buildings project at ARU shall have costs to community, government and the environment. For instance, community shall have inherent costs associated with noise, impairment of air quality, and Safety and health risks. However, the introduction of mitigation measures will reduce the anticipated impacts. The government has secured the loan for this project; and there will be costs for mitigating environmental impacts. On the other hand, the proposed new buildings project has both direct and indirect benefits to university, neighbour and the government as well. The benefits of the project is experienced in all phases from mobilization, construction, operation to decommissioning phase. Several benefits are associated with the proposed

development both at local and national level in terms of revenue generation and the multiplier effects associated with linkages with local and national economy. However, building construction projects may generate negative benefits though; they are usually minimal compared to the positive benefits. Some of those benefits are non- quantifiable thus cannot be used in the cost- benefit analysis estimations.

SUMMARY AND CONCLUSION

The proposed project will contribute to socio-economic benefits to both ARU and the nation at large. These socio-economic benefits include: Creation of employment opportunities; increase income to the ARU and the Country as whole. On the other hand, the proposed project will entail some adverse environmental impacts of which adequate mitigation measures have been proposed and incorporated in the project design. The environmental impacts identified from this project include but not limited to: Increased noise levels; increased dust levels; waste management problems, storm water generation and safety and health risks.

It is, therefore, concluded that the proposed ARU buildings project will entail no significant impacts provided that the recommended mitigation measures are adequately and timely implemented. The identified impacts will be managed through the proposed mitigation measures and implementation regime laid down in this ESIA. ARU will implement all the recommendations given in this ESIA and carry-out the environmental auditing and monitoring schedules.

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ACKNOWLEDGEMENTS

Ardhi University wishes to thank all people who contributed to the preparation of this Environmental and Social Impact Assessment report. In particular, ARU would like to thank the Local Government Authority at Sengerema District and Mwanza Region at large for their support, advice and guidance on the proposed project. The University also wish to thank the all government ministries, agencies, utility providers and private institutions in Sengerema District and Mwanza Region who provided input during the preparation of this report. Without the support of these institutions, much of the information that is presented in this report would not have been gathered.

Further, the University acknowledges the work done by the ESIA team which comprised of registered experts Mr. Emmanuel Hanai (ESIA team Leader), Dr. Nicholaus Mwageni (Environmental Analyst); Ms. Paula Kakoko (Environmental Engineer); Dr. Restituta Paul (Air Quality Expert); Dr. Nyangi Chacha (Botanist); and Mr. Eliud Salila (GIS expert); and non-registered experts who are Dr. Mussa Muhoja (Social Development Expert) and Mr. Jimson Chumbula (GBV Expert).

The ESIA team was backed by other teams of experts, comprising of Planners, Surveyors, Engineers, and Quantity Surveyors.

ACRONYMS AND ABREVIATIOS

AQI	Air Quality Index
AIDS	Acquired Immune Deficiency Syndrome
ABR	Anaerobic Biogas Reactor
AADTN	Annual Average Daily Traffic Number
ARU	Ardhi University
BATNEEC	Best Available Technology Not Entailing Excess Cost
CITES	Convention on International Trade an Endangered Species
CRB	Contractors Registration Board
CNG	Compressed natural gas
DoE	Division of Environment
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental management Plan
ESMP	Environmental and Social Management Plan
ERB	Engineers Registration Board
GHGs	Green House Gases
GOT	Government of Tanzania
HIV	Human Immune Deficiency Virus
IUCN	International Union for Conservation of Nature
LGA	Local Government Authority
LULUCF	Land Use Land use –change and Forestry
NACP	National HIV/AIDS Control Programme
NAFORMA	National Forest Resources Monitoring and. Assessment
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGO	Non-Governmental Organisation
NCCSR	National Climate Change Statistics Report
PLHAS	People Living with HIV/AIDS
RHA	Risk Hazard Assessment
STD	Sexually Transmitted Diseases
TANESCO	Tanzania Electricity Supply Company
TCU	Tanzania Commission for Universities
ToR	Terms of Reference
UASB	Up-flow anaerobic sludge blanket
UHI	Urban Heat Island
URT	United Republic of Tanzania
UN	United Nation
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax
WHO-GPA	World Health Organization Global Programme on AIDS

CHAPTER ONE

1. INTRODUCTION

1.1 Background and justification

Ardhi University (ARU) is a public academic institution established under the Ardhi University Charter, 2007, ARU, has traversed through various transformations from Survey Training Centre (1956 – 1972), Ardhi Institute (1972-1996) to University College of Lands and Architectural Studies (UCLAS), a constituent college of the University of Dar es Salaam (1996 – 2006). ARU is a unique University being the only institution of its kind in Tanzania and in Africa offering integrated training and conducting research in land, the built environment and other environment related issues under the same roof.

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As a prerequisite to the construction of new buildings, the project will involve various site excavation activities including the demolition of the buildings currently on site. Building construction and associated activities will inevitably 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 Standards and the Environmental Management Act of 2004 of Tanzania requires project developers to carry out an Environmental Impact assessment (EIA) prior to project implementation.

The First Schedule of the Environmental Impact Assessment and Audit (Amendment) Regulations, 2018, categorizes 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 this, ARU submitted Terms of References (TOR) to World Bank and NEMC for approval.

The prepared TOR provided guidance under which the environmental and social assessment for the propose project was done. The Environmental Management Act, Cap 191 and First Schedule to Environmental Impact Assessment and Audit (Amendment) Regulations, 2018, and the World Bank Environmental and Social Framework (ESF) as well as the project's Environmental and and Social Management Framework (ESMF) were observed in the study.

Ardhi University commissioned Emmanuel Hanai and his team of Environmental Experts to conduct Environmental and Social Impact Assessment for the proposed Project. The core ESIA study team is composed of the following experts: Environmental Expert, Environmental Engineer, botanist, Air quality and GIS experts; and Sociologists and Urban Planners.

1.2 Project Rationale

The National FYDP III 2021/22-2025/26; and the national Higher Education for Economic Transformation (HEET) project 2021/22 – 2025/26 provide the room for ARU to expand its Training and Learning Infrastructure and to increase students enrolment. These policies and plans are translated in the University Corporate Plan (CP) and the MTRSP, which highlight the need for ARU to establish new campuses in up-country regions as one of the strategies to expand its training and learning infrastructure and increase students' enrolment. Thus, through HEET project, ARU will produce sufficient numbers of quality graduates relevant to the labour market demand who will play an active role in supporting the national economy. In addition, the proposed project at ARU shall create many employment opportunities throughout the project life time.

1.3 Objectives of the HEET project

1.3.1 ARU-Mwanza Campus HEET Project Main Objective

According to the HEET Project Appraisal Document (PAD) of 2021, the main objective of the 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 stipulated objective is in line with University Corporate Plan (CP) and the Medium Terms Rolling Strategic Plan (MTRSP) which highlight on the need for ARU to establish new campuses in up country regions as one of the strategies to expand its training and learning infrastructure and increase students' enrolment. Strategic Plan which focuses on expanding infrastructures to match with increase in the student's enrolment. The strategic plan of the University is to enrol 10,000 students by year 2024/25. This calls for the need to expand its facilities including infrastructures so as to create supportive environment towards achieving its goal.

1.3.2 Specific Objectives for ARU – Mwanza Campus HEET project

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

i) To construct class rooms, offices, hostel, dispensary, studios, staff housing building and associated facilities;
ii) To update curriculum and introduce innovative pedagogical methodologies;
iii) To promote applied research and innovation capacity;

iv) To building functional linkages with private sector/industry;
v) To promote self-generated income; and
vi) To building capacity of academic staff and university leadership.

1.4 Need for ESIA Study

Prior to the construction of the proposed project, Environmental and Social Impact Assessment is required by World Bank's ESF and Tanzanian laws and governing in order to protect the environment and lives of people. The ESIA study needs to be conducted so as to understand the environmental and social sensitivities associated with the project implementation phases and to implement mitigation measures in order to avoid adverse impacts during the Project's lifecycle. The development of facilities may have certain Environmental and Social impacts which may be negative or positive. The negative environmental and social impacts need to be avoided as far as possible. The impacts which cannot be avoided need to be mitigated or managed.

Therefore ESIA study will take environmental and social impacts into account in the selection of preferred project options and to determine appropriate measures for mitigating/compensating anticipated environmental and social impacts at different stages of the project including the preparation of site and Environmental and Social Management Plan for affected persons for the Project; and to ensure the compliance with the World Bank's Environmental and Social Frameworks, safeguards Policy and Standards as well as Tanzanian regulatory requirements.

1.3 Objectives of the EIA 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 and World Bank ESF 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;

ARU undertook this Environmental and Social Impact Assessment in order to address the above objectives.

1.5 Scope of Work

This study entailed the following:-

i. To provide description of the relevant parts of the project including project location, design, components and activities;
ii. To review of policies, legislation, standards and regulations governing Environment at International, Regional and Local levels;
iii. To assemble, evaluate, and present baseline data on the relevant environmental and social characteristics of the project area;
iv. To make consultation with Government agencies, local communities and the private sector operating near the project area;
v. To assess and quantify the potential environmental impacts resulting from the building development, especially within the zone of influence of the project;
vi. Describe alternatives that were examined in the course of developing the proposed project and identify other alternatives, which would achieve the same objectives;
vii. To develop an Environmental Management Plan (EMP) detailing actions and responsibilities for impacts mitigation and monitoring.

1.6 Methodology

The ESIA being a multidisciplinary field involved a team of experts, the key ones being EIA Expert (Team Leader), Environmental Engineer, Botanist, Air quality and GIS experts, and Sociologist. The team identified key stakeholders and potential social and environmental impacts (positive and negative).

1.6.1 Desk study

Desk study involved: identification and review of the country policies and laws which are relevant to the project; collection and review of previous study reports (including design reports) pertaining to the project; collection and review of information and data on the physical, social, economic, cultural as well as archaeological (if present); preliminary identification of key issues to be included in scoping report and the main EIA study; and preparation for fieldwork, including notification of all stakeholders on the intention to conduct EIA study as well as seek their co-operation. This was done by making phone calls, writing e-mails, and distribution of letters seeking appointment to the stakeholder.

1.6.2 Fieldwork

The field visits were essential to fully realizing the scope of the project assessment. Two visits were made to Sengerema, during the scoping phase (in September 2022) and the EIA phase (in January 2023), where by the ESIA team collected specialised data.

Fieldwork intended to facilitate acquisition of information and data on physical, biological and social-economic aspects of the project site and neighbouring area. The collection of baseline data was conducted after defining the scope of the EIA. Data collected during scoping allowed the study team to determine whether more detailed information on environmental

conditions at the development site and its surroundings are needed and where such information can be obtained.

Measurement of Baseline Air Quality Data

The ESIA team collected and analysed baseline air quality and noise level at the site, and adjacent areas within the University Campus. Seven (7) sampling locations were selected based on relative distance to the proposed project sites, and existing multiple sources of air pollution in the proposed campus.

Sampling and analysis methodology for dust, gaseous pollutants and noise levels are presented in the following sections. Apart from the air quality data, some meteorological data of the site which have direct relationship with project implementation were collected once to enable interpretation of air quality data. These include temperature and relative humidity. The collection of data was done during the busiest day and hours (10am to 2pm) so as to predict the level of air quality during the construction phase. Statistical basis was considered but due to variation of activities during the day, the statistical data could mislead the prediction.

Measurement of ambient dust levels ($PM_{2.5}$ and PM_{10})

Dust levels were measured in terms of $PM_{2.5}$ and PM_{10}. Dust levels were measured using a portable device, brand Temtop M2000C. The Elitech Temtop M2000 2nd Generation sensor unit uses a Temtop PM200 particulate sensor, which separates dust particle size in 2.5 ug/m^3 and 10 ug/m^3 size range. The measurement principle is based on laser scattering to convert particle number to mass concentrations through its proprietary algorithm. During measurements, the device was mounted at a breathing height of approximately 1.5 meters above the ground, and samples were collected for one hour.

Measurement of Ambient gaseous pollutants

Baseline levels of ambient gaseous pollutants were measured using a FD-4S Portable Multi-Gas Detector (pictured in Figure 1.3). The instrument operates using a heated metal oxide semiconductor. The gas molecules adsorb onto the heated surface where an oxidation-reduction reaction occurs causing a change in the electrical conductivity of the metal oxide. This change is proportional to the concentration of the gas of interest. Parameters measured included: carbon monoxide (CO) in parts per million (ppm), Oxygen (O_2) in %, and hydrogen sulphide (H_2S) in ppm. At the sites, the equipment was mounted at 1.5m above the ground. Three reading were collected at each sampling point, and the mean value was used as a representative value of that particular point. Results were compared with local and international standards.

Meteorological conditions

Temperature and relative humidity were measured at the same sampling points used for ambient air quality, using the same device (i.e. Temtop M2000C). Four readings were recorded for each parameter and the average value was used.

Collection of biological information

The survey was based on qualitative method where by field observation using car for travelling within the entire proposed project site aided with ocular survey in places where a car couldn't go through was conducted.

The vegetation types were classified basing on their physiognomic characterization. Identification of plant species was conducted directly in the field by botanist aided by various plant identification books includes Flora of Tropical East Africa series and various reports for the coastal forest vegetation especially Frontier Tanzania expeditions.

For those plants which couldn't easily identified in the field, plant specimens were collected pressed and taken to the herbarium of the University of Dar es Salaam for further identification and preservation for future references. Existing two documents of **CITES** list (Convention on International Trade an Endangered Species of Wild Fauna and Flora) and the **IUCN** (International Union for Conservation of Nature) Red List of Threatened plant species, have been used to identify those plant species which falls in any of its categories and appendices respectively. Digital Camera was used to take photographs for further illustrations as well as GPS used for marking various important points.

Water samples collection

Water samples were collected in three locations namely upstream, downstream and at the Lake Victoria. Currently there is no water flowing in the area but the water sample No.1 was collected in a small artificial pond (2°30'57.63"S 32°48'30.42"E)which resulted from sand mining before, sample No.2 at the bridge downstream the proposed project site in a small stream (2°30'35.21"S 32°48'29.37"E) and sample No.3 at the Lake Victoria (2°29'54.83"S32°48'5.14"E). The sampling locations were selected in order get an overview of the water quality at the site, downstream after the site and at the lake to see what pollutants are transported into the lake. This will provide adequate baseline information of the water quality at the site and the lake. Figure 1.4 shows satellite image with sampling locations where water samples were taken during field visit.The collected samples were analysed at Ardhi University Laboratory.

Soil samples collection

Soil samples were taken in three locations. Sample 1 was taken close to the artificial water pond with mainly sand soil material. Sample No.2 was taken in an area which used to be a paddy area which is characterized as a water-logged area during rainy season used for paddy farming. Sample No.3 was taken in an area used to be farming are characterized as loamy soil. Currently the area is no longer used for farming or any other human activities. However, illegal grazing is taking place in some of the area. Figure 1.5 is the satellite image showing the soil sampling points where samples were taken during field visit. The soil samples were analysed at Ardhi University Laboratory, Dar es Salaam Tanzania.

Collection of socio-economic data

Both primary and secondary data were collected. Primary data were collected by direct measurement, observations and using semi-structured interviews with respective and

targeted parties (as explained in the previous section). Secondary data were obtained from various relevant sources of information such as education and many other official and non-official documents.

1.6.3 Public participation

The EIA study identified stakeholders to be consulted and involved throughout the project life cycle. Stakeholders' identification in this study was done through a continuous and comprehensive brainstorming process to collect an exhaustive list of people/ groups or institutions that are likely to be affected by the project/affect the project, influence the direction of the project or have those having interest over the project. In this study the following stakeholders were identified and consulted:

i. Public institutions who have influence on the project (or some components of the project). The identified stakeholders under this study were the Mwanza Regional Secretariat, Sengerema District Council, Ministry of Education Science and Technology (MoEST), Tanzania Commission for Universities (TCU), the Occupation and Safety Authority (OSHA) - Mwanza Office and Fire and Rescue Army;
ii. Service providers, including the Sengerema Water Supply Authority (SEUWASA), Tanzania National Electric Supply company (TANESCO), Tanzania Telecommunication Company Limited (TTCL), the Tanzanian Lake Victoria Basin Water Board (LVBWB), the Rural and Urban Roads Agency (TARURA), the Lake Basin Water Board and the operators of the Kamnga Ferry: Kamanga Ferry Ltd (the ferry will be used for ferrying construction materials and people);
iii. Project Affected Communities- the Karumo and Kamanga villagers in Nyamatongo ward, including vulnerable groups of people (elderly people and women).
iv. Project affected people (PAPs) – specific individuals who were the previous owners of the proposed land (i.e. the Gulai clan);

1.7 Project impact assessment

The environmental and social assessment has been undertaken in close interaction with the master plan team and the design team. In this process environmental impacts have been evaluated for various alternatives. Several project alternatives were considered including that of not implementing the project. The fundamental environmental protection strategy and environmental considerations influencing engineering design were incorporated. However, reasonable regard to technological feasibility and economic capability were taken into account. *Inter alia*, the assessment entailed the following:

1.7.1 Project impacts identification

Superimposing project elements onto the existing social and environmental natural conditions made it possible to identify the potential impacts of the proposed project. The checklist method was used to identify the impacts in which the contender list of key impacts such as noise pollution, waste management was developed etc.; Further, environmental impact matrix method was adopted in identifying impacts of major concerns. A key guiding assumption in this study is that the project will be designed, constructed and operated with due care for safety and environmental matters using current and practical engineering practices and/or Best

Available Technology Not Entailing Excess Cost (BATNEEC). The implementation schedule of the mitigation measures is summarized in the ESMP.

1.7.2 Impact Assessment

The actions undertaken to determine the significance of potential project impacts involved the following three key steps:

i. **Prediction**: What will happen to the status of specific receptors as a consequence of this project activities (primarily; what is the magnitude of the impact?);
ii. **Evaluation of significance**: How significant is the impact to the identified receptors namely, affected communities and the wider environment – land, air and water? What is its relative significance when compared to other impacts?;
iii. **Residual Impacts**: After mitigation, are the impacts still of concern and/or significant? If yes, the process needs to be repeated at least once before the 'final' determination of residual impact significance occurs.

Potential impacts arising from planned activities, cumulative impacts with other developments and unplanned events (e.g. accidents, natural disasters, etc.) were also assessed. Stakeholder engagement is undertaken throughout the implementation of the proposed project to ensure that Affected and Interested Parties are aware and informed of the proposed project and have an opportunity to provide input regarding potential proposed project impacts and mitigation measures.

1.7.3 Development of Mitigation Measures

As part of the EIA process, when impacts (adverse and/or significant) were identified and could not be managed via design controls, mitigation measures were developed in line with the Mitigation Hierarchy. First, efforts were made develop measures to avoid, or prevent, then minimize or reduce adverse impacts or to enhance potential beneficial impacts. For remaining significant and moderate residual impacts, mitigation measures were developed.

1.8 Report Structure

- **Chapter one** contains the introduction including the background information of the proposed project, its development objectives, rationale and methodology
- **Chapter two** covers the project description, in which the location and relevant components of the project and their activities are described.
- **Chapter three** analyses policy, legal and administrative framework applicable to building construction projects, which are relevant to Tanzania.
- **Chapter four** describes the baseline information relevant to environmental characteristics covering details concerning the bio-physical environment and socio-economic environment at the project area.
- **Chapter five** covers the consultation exercise at the project area detailing the list of stakeholders consulted and the issues raised.
- **Chapter six** describes the positive and negative environmental impacts of the project that are likely to be generated from the different phases (the planning and designing, construction, operation and maintenance and the demobilization phases).
- **Chapter seven** gives the mitigation measures for the potential negative impact of the project.

- **Chapter eight** presents the Environmental and Social Management Plan (ESMP).
- **Chapter nine** presents the Environmental Monitoring Plan, which contains the proposed institutions to carry out the monitoring activities, the monitoring indicators, time frame and the proposed budget for monitoring.
- **Chapter ten** gives the cost benefit analysis of the project.
- **Chapter eleven** provides the decommissioning plan for the proposed project although the decommissioning is not anticipated in the foreseeable future.
- **Chapter twelve** gives the summary and conclusions of the study.

CHAPTER TWO

2.0 PROJECT DESCRIPTION

2.1 Location and Accessibility

2.1.1 Location

The proposed projects shall be located on plot no.1 &2 block 'A", Karumo Village, Nyamatongo ward, Sengerema District, Mwanza Region, Tanzania. The project site is bordered by Karumo village settemment to the West, Nyamatongo Secondary school and Kamanga Village settlement to the East, Sengerema-Kamanga road to the South and Village land to the North. The site lies within the four coordinates; -2.524531S32.804508E; -2.523042S32.814420E; -2.514735S 32.818889E; and -2.518746S32.804968E (Figure 2.1). The site is at 500m from Karumo village and 1km from Kamanga Ferry.

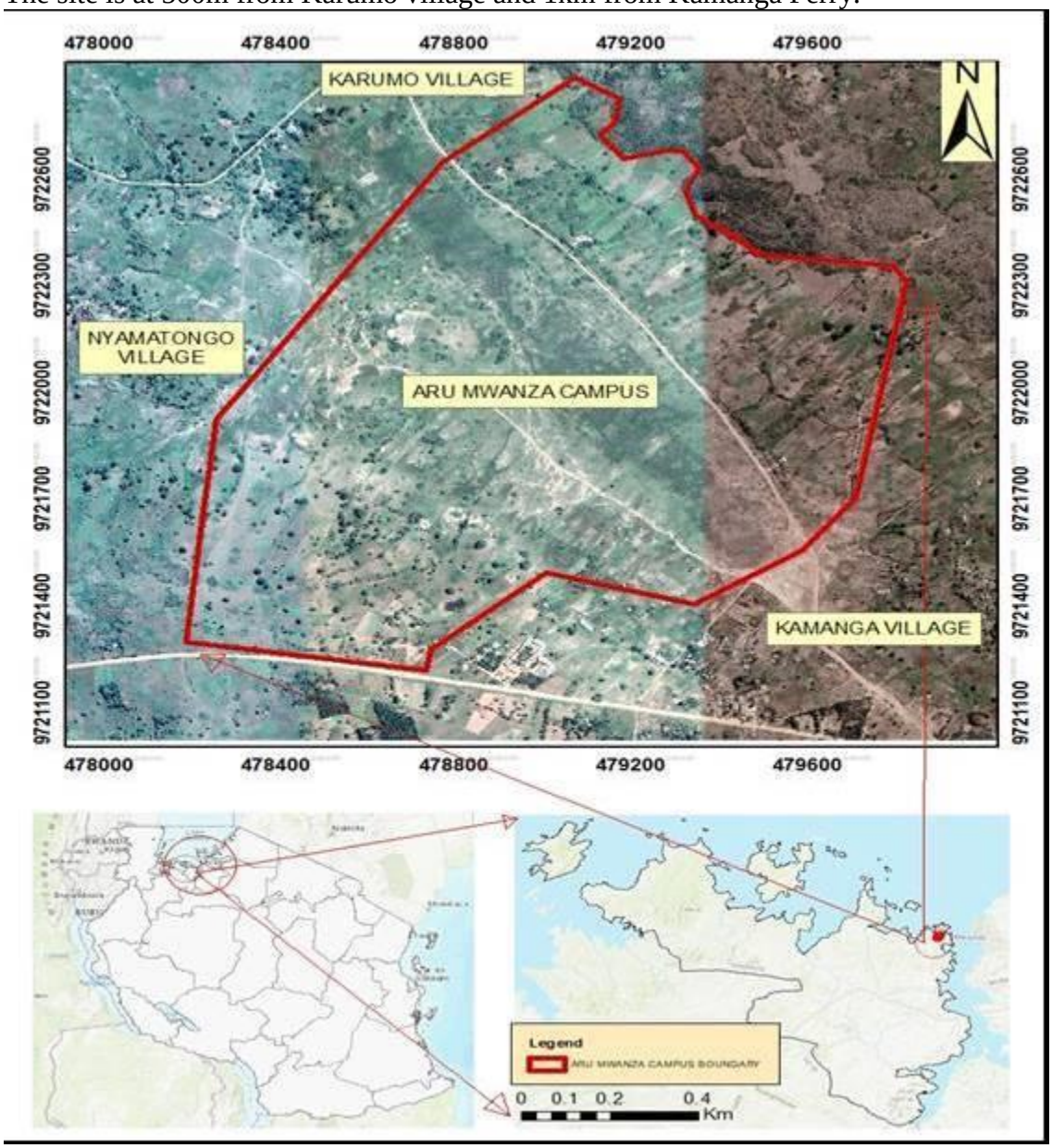

Figure 2.1: Map showing proposed site location. Source: Consultant analysis, 2023

2.1.2 Accessibility

The ARU Mwanza campus is accessible by the main road from Mwanza town to Sengerema via Kamanga Ferry or from Sengerema to Karumo at 45km. The campus is also accessible via Kamanga-Karumo Road, which passes through the site to Karumo village. The road is unpaved and lacks traffic separation for motorized and non-motorized traffic. According to TARURA traffic counting, the Annual Average Daily Traffic Number (AADTN) across Mwanza-Sengerema Road is about 256 vehicles.

2.1.2 Sites description

The ARU-Mwanza Campus site covers 378 acres (1.53Km^2) of land which is equivalent to 12.1% of the total Karumo village land. The proposed site is characterized by grassland, open bush land with scattered trees. The area was previously used for farming activities particularly paddy, yams, maize, etc. though currently, there is no more farming activities taking place. Grassland areas is mainly used for grazing by local people. There are no other human activities apart from grazing in the project area. In addition to that, there are no human settlement within the proposed project site but few of them exists adjacent to the area as one moves downstream to Lake Victoria. Part of the site were previously used for sand mining which have left some few small gullies and one of them has become a small pond retaining some water particularly during the rainy season. The topography of the site is characterized by an undulating plain sloping gently downward from South to North and then towards the Western side of the site. The project is transacted by Karumo road which is passable throughout the year and the electrical transmission line.

2.2 Project Components

The site is irregular in shape and allows a high-rise development. The site is located in a prime area whereby it links closely with the local public and private transport facilities, which reinforce its sustainable credentials.

2.2.1 Project Components

Once completed the proposed project will be a full functional campus that will accommodate various amenities. For the first phase, the project shall consist of three (3) storey administration building, 24 hostel buildings of three storeys to accommodate 9,600 students, lecture rooms to accommodate 1,720 students at a time, workshops and laboratories; two cafeterias for accommodating 1,200 students, dispensary, and departmental buildings. The other common facilities in the building will include; staircase, common lobby, and elevator. Also, there will be fenced wall, security systems, parking lots for staffs, students and visitors, firefighting system, power room, toilets, generator, water storage tanks, storm water drainage systems and garbage collection points. In general, the project will cover the total built up area of 13,760.20 SQM and circulation area of 3535.5 SQM. Table 2.1 presents the components of the project.

Table 2.1: Main components of the proposed Buildings

Project components	**Functions**	**Capacity**	**Circulation area**	**Total area (SQM)**
Academic office	Three (3) storey buildings with Offices, pantry, storage, toilets, library, examination room, departmental library, photocopy and printing room, meeting room, staffs offices, parking area,	124 staff		**2684**
Studios and classrooms	Two (2) storey class rooms, studios, ablution area.			
Hostel building	24 Three(3) storey buildings with janitor's office, store, sleeping rooms, courtyard and parking	9,600 students	812.2	2,842.7
Dispensary	Office, toilets, reception, drug store, pantry, immunization room, triage, janitor's room, nurse station, consultation rooms (2), dressing room, injection room, sample collection room, observation room, ablution area.		95.7	414.7
Staff housing block	8 four (4) storey apartments equipped with kitchen, sleeping rooms, toilets, and seating rooms.			

2.2 Project Design

Buildings are constantly subject to several climatic and environmental elements (wind, sunlight, temperature, rain, earthquakes, and other factors). During the preparatory phase of the project, ARU engaged experts in assessing and understanding risk and integrating risk management in development planning of the Mwanza Campus as per Environmental and Social Standards (ESS1: Assessment and Management of Environmental and Social Risks and Impacts). Several studies were conducted during the preparatory phase of the project, as part of Risk Hazard Assessment (RHA). The studies include geotechnical investigation, topographical surveys and environmental and social impacts assessment. Furthermore, with inputs from these studies, the project design took into consideration aspects of climate change risks, disaster risk management, gender, and occupation health and safety.

2.2.1 Climate Change risks mitigation and adaptation in the Project Design

To mitigate and adapt the climate change risks (e.g heat, drought, floods, water scarcity, etc), the design of the ARU Mwanza campus shall accommodate the infrastructures to enhance low energy use, rainwater harvesting, storm water management systems, adequate natural ventilation and lighting, and maintaining a significant green spaces, as described hereunder.

- ***Park and open space:*** A park and public open spaces are planned to maximize the tree canopy cover and shade provided by trees in the area and more provision of ecosystem services. In the open spaces, native plants have been recommended to add the benefit of being useful for storm water treatment and infiltration in the valley, which is in the central part of the site.
- ***Greenery walkways:*** The design maximizes pedestrian movement and minimizes motorized transport within the site to reduce air emissions (greenhouse gasses (GHGs)) and maximizing Carbon sequestration. Walkways are provided to restrict free movement that causes vegetation destruction in the site and reducing land cover important for carbon sequestration. Trees are proposed to be planted along the vehicular access road and footpaths to improve landscape and reduce effects of sun radiation during the day.
- ***Botanical garden:*** The zoning of different land uses at the proposed site was guided by inner roads, which act as veins dispersing from the artery and provide vistas of the hills on the eastern part and crossing the botanical garden, which acts as the heart of the whole site. The botanical garden which include the green belt and conservation area, the constraints areas, and the University Park is the breathing space for the whole site and an urban filter in terms of urban climate. Botanic garden is found at the middle of the site in the valley that links the site with the wetland along Lake Victoria in the north-west part of the site. Further, the botanic garden will allow cross ventilation and other sanitary waste treatment.
- ***Green areas:*** Green areas are distributed in every zone/ block to allow cross fresh air into the buildings. Due to the topographical nature and natural vegetation cover, green belt and conservation zone intend to preserve the ecosystem and control land degradation and enhance mountainous scenery in the eastern part of the site. Vegetation including artificial forests will reduce soil erosion in sloping plains and all areas prone to soil erosion.
- **The building with low energy use**; Provisions for adequate openings for cross ventilation, that will ensure easy flow of clean air and reduce energy use (thus reducing emissions); provisions for motion sensors in public areas, to enable auto switch ON/OFF of lights; installation of *presence sensors* in offices, class rooms,

laboratories and workshop areas; proper orientation to reduce indoor discomfort and capture natural air as much as possible and minimization of the sun effects (installation of fins; and provisions for solar lights along the pathways for sun shading); maximizing the potential of utilization of renewable energy options such as solar and wind; Utilization of biogas from the wastewater treatment plant for cooking; buildings to be oriented and constructed to take advantage of natural lighting and cross ventilation as a means of minimizing energy consumption during operation;

- **The buildings with low footprint.** This increases green spaces; and accommodation of rainwater harvesting, storm water and waste management systems and embracing water-efficient processes.

2.2.2 Disaster risk management

The proposed project shall have provisions for fire prevention and firefighting facilities. Also, the building shall have provisions for solid waste and liquid waste management for diseases prevention. In addition, two possible access roads shall be used to ensure easy walkability and vehicular access to and from the building to avoid car accidents. The roads shall be safely connected to the parking area huge enough to accommodate cars. ARU Mwanza campus shall have an emergency management plan that assigns the responsibilities for various emergency tasks, specifically to WHO does, WHAT, WHEN AND HOW.

2.2.3 Gender inclusivity

The University buildings shall be developed to be smart and friendly to gender, including considerations of persons with special needs (e.g. physical, learning impairment, emotional and behavioural). These include provisions of lamps, toilets, etc.

2.2.4 Occupational health and safety (OHS)

ARU will protect workers throughout the project lifetime as per Environmental and Social Standards, ESS2 (Labour Working Conditions) and ESS4 (Community Health and Safety).

OHS During pre-construction phase

During the demolition period the contractor shall provide, adequate and necessary personal protective equipment. Appropriate protective gear including, but not limited to helmets, heavy duty gloves, safety vests and boots, shall be provided to site workers and visitors. Hazards and risk awareness will be provided to workers to ensure that they are not affected with hazards during demolition. Further, structural elements of a project will be designed and constructed by competent professionals and certified or approved by competent authorities or professionals. Where the project includes new buildings and structures that will be accessed by members of the public, the ARU will consider the incremental risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events. Where technically and financially feasible, ARU will also apply the concept of universal access to the design and construction of such new buildings and structures.

OHS During construction phase

ARU with support from the supervision consultant will ensure regular training to permanent and temporary workers (including community workers) on occupational health and safety to workers and information relevant to health risk including cholera, HIV/AIDS, COVID-19, and impacts of dust to workers health will be provided to workers. During the construction

period the contractor shall provide, equip and maintain adequate personal protective equipment, first-aid stations and sign boards directing where these services are situated and transport in case of emergency. Appropriate protective gear including, but not limited to helmets, heavy duty gloves, safety vests and boots, shall be provided to site workers and visitors. Training related to hazards and hazard management will be provided to workers and particularly as stipulated in the general IFC general EHS guidelines during construction the contractor will be required to put emphasize on training related to specific hazards such as working at height, ergonomic, slips and falls, dust and moving machinery and any other relevant hazard that will be identified during construction.

OHS During operation phase

All the emergency situations associated with building operations will be included as part of the design aspects including allocation of emergency assembly point. Emergency plans procedures will be developed to prevent and mitigate likely consequences associated with each incident. The document that details potential emergencies and response to such situations and how to prevent and mitigate the environmental aspects will be in place. Occupational Health and Safety hazards related to the daily operations of the like exposure to eruption disease, risks of fire explosion and security will be given due considerations. Fire extinguishers of powder foam type and fire hose reel will be placed in several strategic areas at the site and serviced on time.

OHS during decommissioning phase

If decommissioning must happen, it is anticipated that the project will have hazards resulting from noise and vibration that may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people. According to IFC Guidelines specifically the general Environmental Health and Safety guidelines, slips and falls on higher elevation associated with poor housekeeping, such as excessive waste debris, loose decommissioning materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at decommissioning site. To control these challenges during decommissioning phase, the contractor shall be required to have a clear understanding on the historical use of the land with regard to the potential presence of hazardous materials or oil prior to initiation of decommissioning activities, preparing plans and procedures to respond to the discovery of contaminated media to minimize or reduce the risk to health, safety, and the environment but equally important to provide adequate and the right PPEs for the anticipated hazards during decommissioning.

2.3 Development Conditions

The proposed project is in line with the priority of the fifth phase government on industrialization and Vision 2025 in general, requires higher learning institutions to produce high quality, ready to use skilled labor. ARU ought to expand its physical infrastructure to accommodate this need. Furthermore, the project is in line with 2018 - 2038 Ardhi University Master Plan. Establishment of the ARU – Mwanza campus is, therefore, characterized by two major factors. The first factor was to accomplish the need for ARU to expand its services in up country regions as highlighted above. The second factor was to fulfil the objectives and requirements of the HEET project. The HEET project required the campus to be established and operated within the project time frame, that is, the campus to be in operation by June, 2025.

2.4 Land ownership and Requirement

The history of the proposed campus dates back in 1960s. The Tanzania Government had an idea to develop the University in Karumo village. The Karumo residents offered the land (now ARU-Campus site) to the government to develop the University. The government idea was not realized by then; in the later years, at different times, the Mwanza region thought to have the idea shifted from Karumo to Magu District and Sengerema town. However, Karumo residents still wanted the University to be developed on the same land allocated for since 1960s.

The Karumo residents' desire of since 1960s is now being realized by development of the Ardhi University Mwanza Campus. The site land is covered under two Plots Nos. 1 and 2 of Block 'A' covering 107.68Ha and 45.41Ha respectively. The site registered plans No.127952 and 127953 are extracts of TP Drawings No.TP 14/SGM/71/122020 and TP 14/SGM/72/122020 respectively as indicated on the Title Deeds No. 102718 and 102719 respectively. Further, the acquisition of the land was in consistency with Environmental and Social Standard, ESS5 (Land acquisition, restriction on land use and involuntary resettlement).

2.5 Manpower and Utility Requirements

ARU shall ensure that workers are deployed in a manner that the opportunities are equitably shared among men and women. Also, extraction of the materials is in response to Environmental and Social Standards, ESS3 (Resource Efficiency and pollution prevention and Management).

2.5.1 Manpower Requirements

The proposed project is expected to temporarily deploy about 150 to 200 people during construction phase. Employment during construction phase will be under contractor and will be in the form of managers, skilled as well as unskilled laborers, considering all gender types.

2.5.2 Energy Provisions

The proposed site for the ARU-Mwanza campus is connected to the National grid through the Kamanga-Sengerema. The medium transmission line (33KV) has passed across the proposed site, thus making it easy for connection after stepping down the transformer. Based on the power use, the average electricity Demand for the ARU-Mwanza campus is **4125KVA** a month. It is equivalent to a consumption of 137.5KVA per day. It is expected that the power consumption of the campus will increase to 385KVA/day in 2033 when the campus will be in its entire operation. To meet this demand, the following has been proposed in the master plan, installation of three transformers to serve areas to be developed. The proposed transformers, two of them will have a capacity of 500KVA each for metered power (T2) and one of 200KVA for individual connection (T3).

The project design has provision for installation of backup power (generators) to operate in zones with a capacity of 500 KVA each to serve administrative and academic purposes only. One generator will serve the administration building, and another generator to serve the academic zones. There are also provisions for installation of solar panels on the buildings to serve for lighting and running the beamers and laptops. All the buildings in the proposed ARU-Mwanza campus Master Plan will have a total surface area of 25451.5m^2. If half of the

roof surface is installed with solar panels, the ARU-Mwanza campus can harness about 55KWd.

2.5.3 Water Requirement

The Sengerema Rural Water Supply Authority (RUWASA) is the leading water supplier in the Sengerema District from Lake Victoria. Other water sources include pipe schemes, boreholes, shallow wells, springs, and rainwater harvesting. The water supply network in Sengerema serves 128 villages out of 158 villages in the district. Karumo village, where the ARU Mwanza campus is located 1.5km from the storage tank ($1000m^3$) of the water supply scheme which is under construction. The Karumo village is among the Sengerema villages planned to be served by the water scheme under construction. The ARU-Mwanza campus site is within the water scheme catchment area. On the Eastern side of the site, there is one pipe of HDPE 63, the HDPE 80 pipe traversing the site from Northern to Southern, while the HDPE 150 pipe passes on the North-West side of the site. Water will be used for construction activities and for domestic purpose (flushing of toilets) and cleaning activities during construction and operation phases of the project. The water required to be used during construction is estimated to be 50.8 m^3/day.

2.5.4 Access and Service Roads

The project site is accessed through feeder roads, the ARU Mwanza campus is accessible by the main road from Mwanza town to Sengerema via Kamanga Ferry. The campus is also accessible via Kamanga-Karumo Road, which passes through the site to Karumo village. This road is unpaved and lacks traffic separation for motorized and non-motorized traffic. According to TARURA traffic counting, the annual average daily traffic number (AADTn) across Mwanza-Sengerema Road is 256 therefore with the upcoming project it is anticipated that there will be an increased pressure for roads and therefore the project will require additional onsite access roads to connect existing roads for delivery of construction materials and also to easy movements during operation phase of the project. In addition, the provision of the access roads shall be in a manner consistent to ESS4 where community health and Safety is given priority.

2.6 Project activities in general

The undertaking involves various phases from the planning phase all the way to the construction and operation phase. Each specific phase has its own activities and as a result different waste fraction. Waste types and generation varies depending on implementation phases as elaborated in these sections. The sections identify expected waste generation, storage, options for pollution prevention, necessary treatment, and disposal infrastructure. It involved the following:

- Gathering information about project activities and processes, description of waste streams by type, quantities, and potential environmentally friendly methods for handling the wastes;
- Establishment of priorities based on potential Environmental Health and Safety risks risk anticipated by the waste streams and the available infrastructure to manage the waste in an environmentally sound manner;
- identification of options for waste reduction at the generation point but equally important the possibility for reuse and recycling;
- Identification and proposing procedures and operational controls for onsite storage, treatment and final disposal of wastes.

2.6.1 Pre -Construction Phase

Activities in this phase entails

i. **Topographical Survey**- The topographical survey shall be done by Surveyors to establish the boundaries and the ground levels;
ii. **Geotechnical investigations**- Geotechnical investigation will involve drilling the ground to study the soil profile the underling geological formations.
iii. **Architectural and Services Designs**- Preparation of Architectural drawings is done by architects to provide drawings which fits the proposed plan.
iv. **Environmental Impact Assessment** (EIA)- EIA is being conducted by following the EIA and Audit (Amendment) regulations of 2018 and World Bank Environmental and Social Standards.
v. **Acquisition of various permits/ certificates**-This include getting building permit from relevant authorities.

Duration

The duration of this phase will be Six (6) months.

2.6.2 Demolition Phase

The existing buildings on site shall be manually demolitioned by using labourers. Equipments such as hammer, shovel, trolleys shall be used. The demolition wastes shall be used for leveling considering that some sites have a gentle slope.

Duration

The duration of this phase will be Three (3) months.

Types, Amounts and Sources of Project requirements

Types, amounts and sources of project requirements during the demolition phase are shown in Table 2.2.

Table 2.2: Types, amounts and sources of project requirements during the demolition phase

Requirements	Type	Source	Quantity (Estimates)	Mode of Transport
Manpower	Skilled	Contractor	1	Communal buses
	Unskilled	Karumo, Nyamatongo and Kamanga	5	Communal buses
Water	Clean water for domestic use: (drinking and sanitation services)	RUWASA	0.36 m^3/day (Based on the estimation that 6 workers will demand 60l/day)	RUWASA water supply scheme.
Equipment	Excavator	Contractor	1	
	Bulldozer	Contractor	1	
	Motor grader	Contractor	1	
	Trucks	Contractor	1	

Source: *Consultant Analysis, 2023*

Types, Amounts and treatment/disposal of Wastes

Types, amounts and treatment/disposal of wastes during the demolition phase are shown in Table 2.3.

Table 2.3: Types, amounts and treatment/disposal of wastes during the demolition phase

Waste	Types	Amount	Treatment/ Disposal
Demolition Waste	Demolished wastes; bricks, roofing materials, steel and wooden materials	According to Wang et al., (2004) 40% - 60% of the demolition waste can be recycled the remaining part (50%) becomes waste. The estimate is based on ✓ The total floor area of the current buildings to be demolished (60 m^2) Floor wastes = 50%*60m^2*0.25m(thickness)*7 houses = 52.5 m^3 ✓ Walling wastes is estimated to be 50%*5(width)*6(Length)*0.15(Thickness of the brick) *7 houses = 15.75 m^3 ✓ Roofing wastes 50%*60m^2*0.2m(thickness)*7 houses = 42 m^3 Total demolition waste= 52.5+15.75+42= 110.25 m^3	The demolished wooden materials shall be sold to people to be used as fire wood, steel and iron sheets (roofing materials) shall be sold to recyclers while demolished bricks shall be used for filling during construction phase.
	Food remains,	35.4 kg/day (Based on generation rate of 0.3kg/day/ person and 118 people)	To be collected in the large skip bucket at site ready to be disposed at the designated dumpsite at Ibondo area
Solid Waste (Degradable)	Tins, glasses and plastics	2-6 kg	To be Sold to Recyclers
	Sewage	0.17 m^3/day (Based on 6 people, water consumption rate of 40L/capita/day and wastewater discharge factor of 80%, 90% of the workers shall use the Site Toilet)	To be directed to the Septic Tank-Soak away System to be constructed at the site

Waste	Types	Amount	Treatment/ Disposal
Liquid waste	Oils and greases	None	Service and maintenance of vehicles will be done at designated garages

Source: *Consultant Analysis, 2023*

2.6.3 Construction Phase

The construction activities was done in a manner consistent with ESMF and Environmental Social Standards, 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), and ESS 6(Biodiversity conservation and sustainable Management of Living Natural Resources). The activities to be executed on the site during construction phase of the project are;

- **Earthworks (site clearance)** - This shall be done by means of motor grader. The proponent shall ensure as many indigenous trees as possible are left intact. This will also ensure that the drainage pattern of the site is not interfered with.
- **Foundations excavation**- Most part of the site is covered with vegetation. The same will be removed and disposed off by a licenced waste handler to pave way for the construction.
- **Material transportation**- Materials (fine and coarse aggregates) from quarries will be transported by trucks to the construction site. Water will be brought to the site by tanker trucks from within Sengerema area. Other materials like cement, timber and reinforcement bars will be transported by trucks from Sengerema Mwanza and Geita to the construction site.
- **Material Storage**- Materials like aggregates and sand will be stored at the site ready for use. Cement and reinforcement bars will be stored in special storage rooms. Timber will directly be used at the required areas and consequently there will be no stockpiling of timber at the camp sites. Fuel will be stored in drums in secluded areas.
- **Masonry, Concrete works and related activities**- The construction of the building walls, foundations, floors, pavements, drainage systems, perimeter fence and parking area among other components of the project will involve a lot of masonry work and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labour intensive and will be supplemented by machinery such as concrete mixers.
- **Steel Structure works**- The buildings will be reinforced with structural steel for stability. Structural steel works will involve steel cutting, welding and erection.
- **Roofing and Sheet metal works**- Roofing activities will include sheet metal cutting, raising the roofing sheets and structural timber to the roof and fastening the roofing materials to the roof.
- **Electrical Work**- Electrical work during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

- **Plumbing-** Installation of pipe-work for water supply and distribution will be carried out within all units and associated facilities. In addition, pipe-work will be done to connect sewage from the premises to the effluent treatment plant.
- **Landscaping-** To improve the aesthetic value or visual quality of the site once construction ceases, the proponent will carry out landscaping. This will include establishment of flower gardens and lush grass lawns where applicable and will involve replenishment of the topsoil. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping.

Duration

The duration of this phase will be Two (2) years.

Types, Amounts and Sources of Project requirements

Types, amounts and sources of project requirements during the construction phase are shown in Table 2.4.

Table 2.4: Types, amounts and sources of project requirements during the construction phase

Requirements	Type	Source	Quantity (Estimates)	Mode of Transport
Raw Materials	Aggregates	Sengerema	2,000-3,000m^3	Trucks traveling on roads
	Sand	Sengerema	6,000-10,000m^3	Trucks traveling on roads
	Cement	Mwanza, Sengerema and Geita	3,000-4,000 tons	Trucks traveling on roads and ferry
	Water	RUWASA	✓ 200 m^3 for construction activity and ✓ 12 m^3/day for domestic use (assuming that 200 people will demand 60 l/day)	✓ Trucks will serve the campus in seasons of intermittent supply ✓ The water supply infrastructure plan will comprise two water storage tanks and a distribution network that will serve the campus during operation phase
	Reinforcement bars	Mwanza, Sengerema and Geita	2,500Tons	Trucks traveling on roads and ferry
	Timber	Mwanza, Sengerema and Geita	50 Tons	Trucks traveling on roads and ferry
Manpower	Skilled	Contractor	30	Communal buses
	Unskilled	Nyamatongo area	170	Communal buses
Equipment	Excavator	Contractor	1	Trucks traveling on roads and ferry
	Bulldozer	Contractor	1	
	Motor grader	Contractor	1	
	Plate compactor	Contractor	1	
	Trucks	Contractor	5	
	Construction Crane	Contractor	2	

Source: *Consultant Analysis, 2023*

Types, Amounts and treatment/disposal of Wastes

Types, amounts and treatment/disposal of wastes during the construction phase are shown in Table 2.5.

Table 2.5: Types, amounts and treatment/disposal of wastes during the construction phase

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Vegetation	Approximately 80% of the area that contain vegetation that will be cleared during construction. The estimate is based on the total built up area (1,483,785.764 m^2*0.5 (average height of vegetation) = 741,892.882 m^3 0.8*741,892.882 = 593,514.31 m^3	✓ The logs shall be given to people to be used as fire wood ✓ Other vegetation will be left at site for soil conditioning
	Remnants of timber.	Estimated to be 2500m^3. The estimate is based on activities expected to generate remnants of timber such as formworks	They shall be given to people to be used as fire wood
	Food remains, cardboards and papers	52.5 kg/day (based on generation rate of 0.3kg/day/ person and 175 people)	To be collected in the large skip bucket at site ready to be disposed at the designated dumpsite at Ibondo area
Solid Waste (Non-Degradable)	Demolition waste and Spoil Soil	1000 $m^{3.}$ The estimate is based on the area to be excavated	This soil shall be stock piled along the foundation trenches. The soils shall be used to reinstate site at the end of construction activities
Liquid waste	Sewage	3.2 m^3/day (based on 175 people, water consumption rate of 40L/capita/day and wastewater discharge factor of 80%, 50% of the workers shall use the Site Toilet)	-An onsite treatment system consisting of screens and grit chambers; septic tank-soak away system; UASB and a clarifying wetland shall be adopted. -Only effluents meeting discharge standards (TZS 860, 2019) will be released.

Source: *Consultant Analysis, 2023*

2.6.4 Demobilization phase

Demobilization of temporary structures will be done for proper restoration of the site. Other activities include rehabilitation of the workshop and stockpile yard, at least to the original condition, clearance of all sorts of wastes including sewage and solid wastes (plastics, wood, metal, papers, etc.). All wastes will be deposited at the designated dumpsite and temporary employment will be terminated.

Duration

Demobilization stage will last for a period of two (2) months.

Types, Amounts and Sources of Project requirements

Types, amounts and sources of project requirements during the demobilization phase are shown in Table 2.6:

Table 2.6: Types, amounts and sources of project requirements during the demobilization phase

Requirement	Type	Source	Amount
Manpower	Skilled	Contractor	5
	Unskilled	Local area (Karumo, Kamanga, Nyamatongo and, Sengerema area)	30
Water	Domestic water use (drinking and sanitation hygiene)	RUWASA	2.1 m^3/day. Assuming the phase will have 35 workers each demanding 60 l/day
Equipment	Bull dozer	Contractor	2
	Motor grader	Contractor	1
	Plate compactor	Contractor	1
	Tippers	Contractor	1

Source: Consultant Analysis, 2023

Types, Amounts and treatment/disposal of Wastes

The demobilization of the temporary structures will result mainly into solid wastes such as timber, iron sheets and rubbles from demolitions. Timber and metal sheets will be sold to people in the nearby communities for reuse while rubbles will be used for levelling.

2.6.5 Operation phase

The activities that are expected to be executed during operational phase include

i. Tenancy/ Occupancy;
ii. Imparting Knowledge;
iii. Occupational health and safety management;
iv. Good housekeeping of the area;
v. Project Maintenance.

Duration

The duration of this phase will be more than fifty (50) years

Types, Amounts and Sources of Project requirements

Types, amounts and sources of project requirements during the operational phase are shown in Table 2.7.

Table 2.7: Types, amounts and sources of project requirements during the operational phase

Requirements	Type	Source	Quantity
Water		RUWASA	444,864 m^3/day estimated based on the number of occupants for all buildings ((10,090 Students +502 (staff))*60l/c/d*70%). Assuming that 70% of the population will use the structure full time
Energy	Electricity	• TANESCO (National Grid) • Standby generator at the Site	• 1050kwhr per day • 1500kVA

Source: Consultant Analysis, 2023

Types, Amounts and treatment/disposal of Wastes

Types, amounts and treatment/disposal of wastes during the operation phase are shown in Table 2.8.

Table 2.8: Types, amounts and treatment/disposal of wastes during the operation phase

Waste	Types	Amount	Treatment/ Disposal
Solid Waste (Degradable)	Food remains, cardboards and papers	3.7 tons/day (based on generation rate of 0.35kg/day/ person, campus intended to accommodate ((10,090 Students +502 (staff)) people, worst case scenario)	•Sorting will be done onsite and a large refuse collection point shall be provided to facilitate collection of Solid wastes from Building. •The solid waste from the refuse collection point shall be collected by Municipal/Private trucks for disposal at the designated dumpsite found in Ibondo area
Solid Waste (Non-Degradable and recyclable)	Scrap metals, drums, Tins, glass and plastics	5-10 kg/day	Sorting will be done at site to reduce waste fractions Scrap metals and drums will be sold to Recyclers disposal at the designated dumpsite, currently at Ibondo area
Liquid waste	Sewage	355.9m^3/day (The campus intended to accommodate people, water consumption rate of 60L/capita/day and wastewater discharge factor of 80%) and 70% will use facilities Q= 0.8*(60*((10,090 Students +502 (staff)) people, worst case scenario) *0.7 =355,891.2 l/day	All the liquid wastes from toilets, kitchen, bathrooms etc. will be collected and directed to the Treatment plants –Septic tanks and soak away pit and Upflow Anaerobic Sluge Blanket (UASB) present at the campus
Electronic wastes	Worn out computers, telephones and other non-functioning electronics		

Waste	Types	Amount	Treatment/ Disposal
Hazardous waste	-Oils and greases -Chemicals -Scrap metal -Tins, -glass -Electronic waste -Medical waste	-Assumption is that 1 person may generate 5kg of E-waste annually and 70% of the occupants will produce the E waste, therefore E-wastes generated will be: ((10,090 Students +502 (staff)) people, worst case scenario) *5= 37,072 kg/year	-Service and maintenance of vehicles will be done at designated garages -Sorting of wastes will be done onsite to allow recycling of electronic wastes since these wastes contain important materials such as cupper etc. sorted recyclable e-wastes will be sold to recyclers -Chemicals from dispensary will be managed following SOPs for managing medical waste. The project will have an incinerator for hazardous solid waste management from the dispensary

Source: Consultant Analysis, 2023

2.7 PROJECT BOUNDARIES

Identification of boundaries within which the EIA study is undertaken is an important component of the environmental and social assessment study. There are three types of boundaries that are considered in this ESIA study: institutional, temporal and spatial boundaries.

2.7.1 Institutional boundaries

Institutional boundaries refer to those institutions and sectorial boundaries in which the project lies or mandated. These can be determined from political boundaries, Acts, regulations and institutional mandates and administrative structures. The proposed development is about the construction of new ARU buildings in Nyamatongo ward, Karumo village Sengerema District council. Many institutions and administrative units in Tanzania are of interest;

- Ministry of Education Science and Technology
- Sengerema Municipal Council
- Tanzania Commission of Universities (TCU)
- Fire and Rescue Force
- Occupational Safety and Health Authority (OSHA)
- RUWASA Sengerema
- TANESCO Sengerema
- Nyamatongo ward
- Karumo village

These institutions will be consulted in this EIA process, as they are key stakeholders with vested interest in the development at ARU for environment and economic prosperity of the local people and Tanzanians in general.

2.7.2 Temporal boundaries

Temporal boundaries refer to the lifespan and reversibility of impacts. For example, the impact of construction work for the affordable housing project may be short-lived, but the presence of these buildings in the selected site may have implications that stretch far into the future until when decommissioning is undertaken. Also, consideration needs to be given to what happens when the project ends, where there is a need for site restoration and decommissioning of the water supply system. Therefore, some of the impacts that may occur during construction, e.g., noise caused by bulldozers will disappear as soon as the construction phase will be completed. The construction period will last for not more than

sixty months while the operational phase is designed for more than 99 years unless unforeseen event occurs.

2.7.3 Spatial boundary

The spatial dimension encompasses the geographical spread of the impacts regardless of whether they are short term or long term. The spatial scale considers the receptor environmental component and can be local or broader. Two zones of impacts namely core impact zone and influence impact zone are considered.

1. The core Impact zone- The core impact zone includes the area immediately bordering the project (0-500m radial distance). In the case of this project, local impacts will include the site of the construction and the immediate surrounding areas.
2. The influence impact zone- includes the area beyond 500m from the proposed site. Most of impacts are expected to be within this boundary.

CHAPTER THREE

3.0 POLICY, LEGAL AND INSTITUTIONAL REQUIREMENTS

3.1 Introduction and state of the Art

A clean and safe environment is the constitutional right of every Tanzanian citizen (see article 12-28 of the Constitutional of the United Republic of Tanzania, 1977 as amended from time to time). The management of the environment in Tanzania is mainly vested on two public institutions, the National Environment Management Council (NEMC) and the Division of Environment (DoE) in the office of the Vice President. The NEMC undertakes enforcement, compliance, and review of environmental impact statements whereas the DoE provides the policy formulations and technical back-up and executes the overall mandate for environmental management in the country. The EIA certificate is issued by the minister responsible for environment. There are many policies and pieces of legislation on environmental management in Tanzania, the relevant ones and their applicability to the establishment of ARU Mwanza Campus; are hereinafter discussed;

3.2 POLICIES RELEVANT TO THE PROJECT

Environmental awareness in the country has significantly increased in recent years. The government has been developing and reviewing national policies to address environmental management in various sectors. Among others, the objective of these policies is to regulate the development undertaken within respective sectors so that they are not undertaken at the expense of the environment. The national policies that address environmental management as far as this project is concerned and which form the cornerstone of the present study include the following:

3.2.1 The National Environmental Policy (2021)

The National Environment Policy for mainland (NEP 2021) is the main policy document addressing environmental management issues in Tanzania main land. The policy covers sectors that include land and human settlements; forestry; water and sanitation; health; transport; energy; industry; wetlands; agriculture; livestock; fisheries; wildlife; tourism; and mining. The National Environmental Policy, 2021 has relative policy statements to other sectoral and cross-sectoral policies upon which the Tanzanian environmental laws are premised. Thus, all economic and development activities are implemented in accordance with the policy.

The policy requires EIA to be mandatory for all development projects likely to have significant environmental impacts. The establishment of ARU-Mwanza Campus will take on board all relevant measures to ensure that the projects is implemented in an economically sustainable manner whilst safeguarding environmental and social issues for the benefit of the present and future generations.

3.2.2 The National Land Policy (2019)

The National Land Policy states that, “the overall aim of a National Land Policy is to promote and ensure a secure land tenure system, to encourage the optimal use of land resources, and to facilitate broad - based social and economic development without upsetting or endangering the ecological balance of the environment”. The project will be required to ensure protection of existing cultural heritage and conservation of ecological and socially

sensitive areas. The proposed building project is located within the area planned for institutions and as such it is compatible with the land use in the project area as required by the National Land Policy. In the context of this project, ARU in collaboration with the financier (World Bank and the Ministry of Education, Science and Technology will ensure proper disposal of wastes, especially within the project sites. Implementation of the project will ensure that provisions of the Policy are adhered to.

3.2.3 The Construction Policy (2003)

Among the major objectives of the policy, which supports a sustainable block development sector, include the promotion and application of cost effective and innovative technologies and practices to support socio-economic development activities such as blocks, road-works, water supply, sanitation, shelter delivery and income generating activities and to ensure application of practices, technologies and products which are not harmful to either the environment or human health. This project is in-line with this policy as ultra-modern technology shall be used during construction and its operation. Implementation of the proposed project will as much as possible make use of cost effective and environmentally friendly technologies to minimise wastage of resources especially building materials, water and energy.

3.2.4 The National Gender Policy (2002)

The key objective of this policy is to provide guidelines that will ensure that gender sensitive plans and strategies are developed in all sectors and institutions. While the policy aims at establishing strategies to eradicate poverty, it is relevant to the project as it puts emphasis on gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of society. It also requires that women and men are given equal employment opportunities in the project, whenever possible. This project shall ensure that women will be adequately involved at all levels of project planning to implementation.

3.2.5 The Energy Policy (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. ARU 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.

3.2.6 The National Water Policy (URT, 2002)

The overall objective of the policy is to develop a comprehensive framework for sustainable management of the national water resources. Policy directs concerted efforts in the protection of water sources and catchments. The policy also advocates the conservation, wise-use and minimisation of water uses. The proposed project shall be designed in such a way that water use is kept to the minimum by, for example, installation plumbing fixtures such as faucets

and flushing cisterns, which minimises use of water. It will also ensure that pollution of water sources is avoided or minimized during the construction and operation phases.

3.2.7 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.

3.2.8 The Urban Planning and Space Standards Policy 2012

The policy provides guidance for continuing delivery of a high-quality pedestrian and other people friendly public realm within the city centers to support the economic, social, cultural and environmental attractiveness of the city centers to businesses, residents and visitors. The policy explains more as the management of space is a key foundation of the asset management strategy. Also, the provision of appropriate space is becoming even more important as institutions increasingly competing in urban areas. Therefore, the project will plan for proper utilization of project area during its implementation.

3.2.9 The Tanzania Education and Training Policy (2014)

Tanzania aims at improving the quality of education. This is through the collaboration with all education stakeholders to modernize the curricular at all levels and make sure that it meets requirements. The education training policy, 2014 stressed that for improvement of the quality of education in Tanzania there should be a shift from using many textbooks into using single text book for each subject. The policy also emphasizes all private schools need to have affordable school fees based on "Unit per course" and analyse its operation as well. The school fees should relate with the service offered by the school. This project is in-line with this policy as will modernize education training and put in place the state-of-the-art equipment for training. In addition, the university fees will be affordable to all people.

3.2.10 The National Mineral Policy (2009)

The National Mineral Policy also addresses that the mining activities should be undertaken in a sustainable manner. Reclamation of lands after mining activities is recommended. As far as this project is concerned, mining activities is directed to quarrying activities for obtaining stones and aggregates. Fine and course aggregates for the proposed project will be strictly purchased from authorised vendors.

3.2.11 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.

3.2.12 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.

3.2.13 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.

3.2.14 The National Research and Development Policy (2010)

Tanzania recognizes the power of science and technology in national development. The policies echo the need to embrace science and technology in development. Thus, in aspiring to achieve the objectives of these policy frameworks, government take cognizance of the weak links between research and development and continued low transition of youths into science and technology disciplines. Low transition into science and technology disciplines is partly as a result of weaknesses of science teaching foundation, which is partly attributed to inadequate numbers of qualified science teachers. The university will also addressee research issues and thus in line with the policy requirements. Proponent shall address research issues and thus in line with the policy requirements.

3.3 LEGAL FRAMEWORK

3.3.1 The Environmental Management Act (EMA), 2004

The Environmental Management Act No. 20 of 2004 is the principle legislation governing environmental management in the country. The Act was established to address the

environmental management priorities set in the NEP (2021). The Act provides a legal framework for managing environment in the country. Furthermore, the act made possible provision of environmental management tools namely: Environmental Management (Environmental Impact Assessment and Audit) Regulations 2005 (Amendment), 2018; Environmental Management (Hazardous Waste Control and Management) Regulations (2009); and Environmental Management (Soil Quality Standards) Regulations (2007).

The EMA requires an Environmental and Social Impact Assessment (ESIA) to be carried out for the development of any project which is likely to have a significant impact on the environment. The ESIA provides the institution responsible for environment sufficient information to justify, on environmental, social and community development grounds, the acceptance, modification or rejection of the project and its implementation. Moreover, the ESIA is targeted to provide the basis for guiding subsequent actions of the project life cycle which -through management and monitoring plan - will ensure that the proposed project is carried out considering the environmental, socio-economic issues, and resettlement initiatives identified along with requirements for compliance throughout the project's life cycle.

The Act makes it mandatory for any person to comply with the environmental and social impact assessment requirement of the Project which includes environmental screening, scoping, preparation of the Environmental Impact Statement and its review before the decision on environmental clearance is made. As per the Act, there is ESIA screening, scoping and the review process, while the preparation of the EIS is carried out by the registered expert forwarded by the project proponent and only after having been approved by the National Environmental Management Council (NEMC). The HEET project has to conform to all requirements of environmental clearance and safeguards and they include EIA, Auditing, Monitoring, and implementation of the environmental and social management plans for the project.

The Act is relevant to the project because it is expected to have some negative impacts to the environment during its implementation. The act requires the EIA report to be submitted to NEMC for review and subsequently issuance of Environmental Impact Assessment Certificate.

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

These laws declare all land in Tanzania to be "Public land" to be held by the state for public purposes. The Acts empower the President of the United Republic of Tanzania, to revoke the "Right of Occupancy" of any landholder for the "public/national interest" should the need arise. The laws also declare the value attached to land. The land Act among other things, will determine the ownership of the land where the project will be implemented.

The law as amended in 2004 recognizes the role of land in economic and urban development. The law provides for technical procedures for preparing land use plans, detailed schemes and urban development conditions in conformity with land use plan and schemes. The Local Government Authority has the power to impose conditions on the development of any area

according to the land-use planning approved by the Minister. The proposed site has been planned for institutional purpose.

3.3.3 The Urban Planning Act (2007)

The law provides for the orderly and sustainable development of land in urban areas, to preserve and improve amenities; to provide for the grant of consent to develop land and powers of control over the use of land and to provide for other related matters. Section 29-(1) of the law states that "*Notwithstanding the provisions of any other written law to the contrary, no person shall develop any land within a planning area without planning consent granted by the planning authority or otherwise than in accordance with planning consent and any conditions specified therein*".

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

The law requires employers to provide a good working environment to workers in order to safeguard their health. The employers need to perform medical examinations to determine fitness before engaging employees. Employers must also ensure that the equipment used by employees is safe and shall also provide proper working gear as appropriate. This shall be adhered to during construction and operational phase of ARU building projects.

The Act is relevant to the project because it will involve construction of buildings. Therefore, project is responsible to provide to workers /constructor/ students with a safe environment during project implementation. In addition, the project construction sites are required to implement safety measures, regulations and precautions and ensure health and welfare of workers and proper handling of hazardous materials and chemicals.

3.3.5 The Engineers Registration (Amendment) Act of 2007

The Acts regulate the engineering practice in Tanzania by registering engineers and monitoring their conduct. It establishes the Engineering Registration Board (ERB). Laws require any foreigner engineer to register with ERB before practicing in the country. Foreign engineers who will be involved in this ARU project shall abide to the law requirements.

3.3.6 The Contractors Registration (Amendment) Act, 2008

The Contractors Registration Act requires contractors to be registered by the Contractors Board (CRB) before engaging in practice. It requires foreign contractors to be registered by the Board before gaining contracts in Tanzania. Only registered contractors shall be involved in the implementation of the proposed project. The proponent shall comply with the law requirements during the recruitment of contractors for ARU project implementation.

3.3.7 The Architects and Quantity Surveyors Act (2010)

Similarly require architects and quantity surveyors (QS) to be registered with the Board before practicing. Only registered architects and quantity surveyors shall be involved in the implementation of the proposed project.

3.3.8 The Public Health Act, 2009

An Act provide for the promotion, preservation and maintenance of public health with the view to ensuring the provision of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters.

This Act is relevant to the project especial through Section 66 of the Act state that: *(1) A block or premises shall not be erected without first submitting the plans, sections and specifications of the block site for scrutiny on compliance with public health requirements and approval from the Authority. The proposed project will comply with the articles of this Act.*

3.3.9 The Fire and Rescue Act, No. 14 of 2007

According to the Act, among others, the functions of the force are to: '(a) Extinguish fire (b) grade cities, municipalities, townships and villages into various fire and rescues services levels (c) conduct fire inspection and investigations for purposes of obtaining information relating to the causes of fire and loss inflicted by fire (d) Conduct studies on investigation of arson and accidental fire (e) Conduct training for fire department personnel, other officers and voluntary fire fighters (f) Prepare fire statistics and fire service information (g) Conduct fire tests on protection facilities, equipment and materials. In section 3(1) (g), it covers premises of facility used as a place for storage flammable liquids, gas or chemicals. The Act also obliges the owners and managers of the structures to set aside places with free means of escape, and install fire alarm and detection systems, or such other escape and rescue modalities in the event of fire. Design and construction of all buildings shall take into strict considerations requirements specified in this Act.

3.3.10 The Employment and Labour Relations Act, No.6 of2004

The Act prohibits forced labour and discrimination of any kind in the workplace. It provides employment standards such as contracts with employees, hours of work, remuneration, leave, unfair termination of employment and other incidents of termination. The Act makes provision for core labour rights, to establish basic employment standards, framework for collective bargaining, prevention and settlement of disputes and other related matters. The Act strictly prohibit child labour, it provides that no person shall employ a child under the age of fourteen years, it further provides that a child under eighteen years of age shall not be employed in any worksite including construction where, that being a case. The Act prohibits discrimination, being direct or indirect in any employment policy or practice on any of the following grounds; colour, nationality, tribe or place of origin, race, national extraction, social origin, political opinion nor religion, sex, gender, pregnancy, marital status, or family responsibility, disability, HIV/AIDS, age or situation of life. It is an offence for this provision to be contravened by any employer. The proposed project will follow this Act requirements in matters related to labour and employment, during its implementation.

In the Employment and Labour Relations Act, Section 7(1) provides details on conditions of a good and reliable employment environment. Furthermore, sections 11-91 makes provision for wage determination that stipulates a minimum term and condition of employment as shall

be the employment standard. Section 11(2) and 14(1) provide detail on employment contractual conditions, while sections 19(1), (2), (3) and (5) state the working duration and overtime conditions. Moreover, section 31 provides information on employment leave and sections 32(1), (2) and (3), provide information on sick and maternity leave.

ARU will ensure that it operates within the requirements of this legislation and will comply with stipulated conditions of the Employment and Labour Relations Act, 2004 for ensuring that employee are motivated in discharging their duties for maximum productivity.

3.3.11 The Workers Compensation Act (No.20), 2008

The Act focuses mainly on:

- Provision for adequate and equitable compensation for employees who suffer occupational injuries or contract occupational diseases arising out of, and in the course of their employment, and in the case of death to their dependents.
- Provision for the rehabilitation of employee who have suffered occupational injuries or contacted occupational diseases in order to assist in restoring their health in dependence and participate in society.
- Provision for a framework for the effective, prompt and empathetic consideration, settlement and payment of compensation benefits to employees and their dependants.
- Provide for the establishment, control and administration of workers to compensation fund, and the legal framework for the contribution to, and payment from, the fund.
- Give effectiveness to international obligations with respect to compensation.
- Promote prevention of accidents and occupational diseases.

This Act provides the right for compensation to workers for occupational injury in section 19(1) - (5) or accident in sections 20 and 21. Also in sections 22(1) - (5), an employee has the right to compensation for occupational diseases. The proposed ARU project will operate within the requirements of this legislation and abide by all relevant sections provided by this Act.

3.3.12 The Prevention and Control of HIV/AIDS Act (No.28), 2008

This Act focuses on the prevention, treatment, care, support and control of HIV and AIDS, and to provide for appropriate treatment, care and support using available resources to people who are living with or at risk of HIV and AIDS. Further Section 4(1) provides details to promote public awareness on the cause, mode of transmission, consequences, prevention and controls of HIV and AIDS. Further it describes the mode of curbing the spreading, prevalence of STIs in the population and adverse impacts resulting from HIV and AIDS, as well as protection rights for orphans. The increase of care, support and access to persons living with HIV and AIDS is also stipulated in Section 4(1) (f). Further, Sections 6(1) and (2) describe the necessity for private sectors, in collaboration with government, to implement programs and plans geared towards prevention, care of patients and control of HIV and AIDS in their respective area. Section 6(4) stipulates that TACAIDS is the main coordinator and adviser of such matters.

Section 8(1) describes the necessity to operate within the requirements of this legislation and be conscious of the public awareness of HIV and AIDS. In addition, Section 9 illustrates how to operate within the requirements of this legislation, to coordinate and establish workplace programs on HIV and AIDS for employees under his control, and such programs should involve the provision of gender responsive HIV and AIDS education, distribution of condoms and support to people living with HIV and AIDS (awareness creation). Finally, Section 19(2) describes the provision of community based HIV and AIDS prevention, support and care services. The project may involve construction of a workers' camp site, this may lead to the possible interaction between the workers and the local community members, which may lead to the increased transmission of HIV / AIDS to both the workforce and the local communities. In this case ARU project will have to operate within the requirements of this legislation in adherence to the requirements of its respective regulations in addition to HIV/AIDS Policy.

3.3.13 The Standard Act of 2009

This Act aims at the promotion of specifications of commodities and services, re-establish the Tanzania Bureau of Standards (TBS), the designated national standards authority established under the TBS Act 1975 and repealed by this act. TBS is responsible for developing all kinds of national standards, including environmental standards.

The Standards Act has established National Environmental Standards Compendium (NESC) which is a collection of various standards prepared at different times and recognized by EMA 2004. NESC is divided into three parts. Part 1 comprises of standards that require compulsory compliance. Compulsory standards are categorized as generic or specific. Specific standards cover those industries with peculiar effects to the environment while other industries without a specific standard for Tolerance Limits of Emissions discharge including water quality, discharge of effluent into water, air quality, control of noise and vibration pollution, sub-sonic vibrations, soil quality, control of noxious smells, light pollution, and electromagnetic waves and microwaves

Part 2 of NESC contains those standards that may be implemented on voluntary basis. These include guideline standards, codes of practice, and other such standards that may not necessarily be directly enforced, but whose results are implied in some legal requirements. One of such standards include the Environmental Management Systems (EMS) standards, like TZS 701/ISO 14001 whose compliance specifications include the relevant legal requirements. Part 2 thus has important requirements for companies and developers who wish to demonstrate their commitment to sustainable development by way of self-regulation mechanism. On the other hand, some companies or developers may be compelled to follow these standards because of requirements from mother companies and for other various reasons like certification requirements by environment friendly banks or tenders. Part 2 also includes standards used in evaluating environmental performance.

Part 3 has the requisite test methods that should be followed when testing for compliance. The test methods included are referred to in at least one of the specification standards appearing under Part 1. Although it is not stated in the Act, in the absence of national

standards, project proponents are encouraged to use international standards such as those of the World Health Organisation (WHO), World Bank, British Standards (BS), European Union (EU), American Public Health Association (APHA), United States Environmental Protection Agency (US EPA) etc. Standards set by the relevant sectors, which also make use of the international standards, are also applicable. Such standards include the environmental standards set under the Mining (Environmental Management and Control) Regulations, 1999. Relevant national environmental standards include:

- TZS 860: 2005 Municipal and Industrial Wastewaters – General Tolerance Limits for Municipal and Industrial Wastewaters: This standard provides permissible limits of important environmental parameters such as BOD, COD, pH, color, temperature range, total suspended solids and turbidity. It also gives permissible limits of a range of inorganic and organic components. All effluents discharged from the project activities during all phases shall comply with these specifications. Special attention will be paid to treatment of effluents from laboratories as some are hazardous in nature.

- TZS 845:2005 Air Quality – Specification: This standard gives permissible emission limits of sulphur oxides, carbon monoxide, hydrocarbons (as total organic carbon), dust, nitrogen oxides and lead. The emissions from earth moving equipment, power generation plant and other will include SO_2, CO, dust and NO_X; as such the project will have to observe these limits.

- TZS 983:2007 Air Quality - Vehicular Exhaust Emissions Limits: This standard is mainly derived from EU Directives 96/69/EC, 91/542/EEC and 97/24/EC. This Tanzania Standard gives permissible limits of some common substances found in exhaust emissions of motor vehicles, namely carbon monoxides, suspended particulate matter (PM), oxides of nitrogen, and hydrocarbons. The standard covers all types of vehicles namely, passenger cars, light commercial vehicles, heavy-duty vehicles, and two and four strokes motorcycles and scooters. In order to carry out quarrying activities and processing operations, the project will operate a fleet of heavy duty and light vehicles in addition to hiring other vehicular equipment. As such, the project will need to observe the provisions of these standards.

- TZS 932:2006: Acoustics - General Tolerance Limits for Environmental Noise: This standard focuses on urban environmental noise, and does not cover occupation environment. In the absence of other standards it may be used to give indication of permissible noise levels in factory/workshop environment.

- TZS 789:2003 - Drinking (potable) water – Specification: This standard prescribes the quality requirements for drinking water other than packaged drinking water. It does not cover the requirements for natural mineral water. It prescribes the quality requirements for drinking water distributed in the food industry, domestic and catering purposes. It applies to bacteriological, biological, virological, physical, chemical and radiological quality criteria. It is intended also to community piped water supplies i.e. those water systems serving cities, municipalities and townships, community standpipes and wells

and drinking water distributed by tankers. For protecting the health of consumers, portable water during all the project phases shall comply with these standards.

- TZS 931:2006 Protection against ionising radiation - Limits for occupational exposure: This standard aims at protecting workers, whose practices expose them to ionising radiation, namely; gamma- and X-rays, alpha, beta and other particles that can induce ionisation. The Standard does not apply to non-ionising radiation such as microwave, ultraviolet, visible light and infrared radiation. It applies to all workplaces in which employees are occupationally exposed or in which there is a potential for occupational exposure to ionising radiation, unless exempted by the Regulatory Authority.

The proposed ARU project will be adhered to this Act requirement, during the implementation.

3.3.14 The Universities Act No. 7 of 2005

Universities Act No. 7 of 2005 provides for establishment of the Tanzania Commission for Universities (TCU) to provide the procedure for accreditation of institutions of higher learning and other related matters. Among other functions, the TCU accredits higher education institutions; coordinates admissions into state institutions of higher education; examines and accredits academic programmes submitted to it by institutions of higher education; make regulations in respect of admission of persons seeking to enrol in institutions of higher education; and, make visitations and inspection of higher learning institutions for ensuring compliance with relevant regulatory instruments. The proposed ARU will be regulated by the Tanzania Commission for Universities (TCU) for ensuring that quality education is offered, which meets the needs of all the stakeholders in line with this Act.

3.3.15 The Education (Amendment) Act, 1995

This Act establish the Higher Education Accreditation Council, to provide the procedure for accreditation and other related matters. Among other functions, the council accredits higher education institutions; approve admissions into state institutions of higher education, to examine and approve proposals for courses of study and course regulations submitted to it by institutions of higher education; make regulations in respect of admission of persons seeking to enroll in state institutions of higher education and to provide a central admission service to higher education institutions; and make visitations and inspection of higher institutions. ARU under HEET project will be monitored by Accreditation Council.

3.3.16 The Water Resource Management Act, No. 11 of 2009

The Water Resource Management Act 2009 is a new 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.

This Act repeals the Water Utilisation Act of 1974 and its subsequent amendments. It provides right to water for domestic uses by any person from any surface water sources and rainwater without a permit as long as no works are constructed for the purpose. The Act

indicates the need of a water use permit for any works for water abstractions or water abstraction for uses other than domestic ones. The Act further prohibits discharge of waste streams into any water body including rivers (e.g., small rivers within the project areas) without written permit from the water officer. The Act requires adherence to present environmental standards of receiving water bodies when legally discharging waste waters. The Contractor shall observe this legal provision throughout construction, operation and decommissioning phases. Proponent will connect the project to public sewage system and also ensure the provisions of this Act are observed.

3.3.17 The Water Supply and Sanitation Act No. 5 of 2019

Part IV of the Act states obligations of water supply and sanitation authorities to provide water supply and sanitation services, indicates their functions, powers and duties. Consequently, it gives responsibilities for provision of adequate and reliable water supply and sanitation services in urban areas to Urban Water Supply and Sanitation Authorities (WSSA). With respect to their responsibilities to ensure adequate and reliable service provision, the Act gives power to WSSA to enter any land for the purpose of laying water pipe network and charge fees to facilitate financial obligation necessary for operation and maintenance of the water supply and sanitation networks. The proponent shall use clean to water from Mwanza Urban Water Supply and Sanitation Authority.

3.3.18 The Electricity Act No 10 of 2008

This Act provides for facilitation and regulation of generation, transmission, transformation, distribution, supply and use of electric energy, cross border trade in electricity and the planning and regulation of rural electrification. Section 25 details the relevant Power Purchase Agreements concluded subsequent to the entry into force of this Act. Section 25 (2) A licensee may by rules made by the Authority conclude agreements for the purchase or sale of electricity. This section provides for (among others) agreements relating to electricity purchase and sale in the market determined by the authority, to be competitive Standardized Power Purchase Agreement and Tariff for small power projects. The primary power supply for the project will be the Tanzania Electricity Supply Businessman (TANESCO). Therefore, proponent shall adhere to the requirement of this Act in the process of the Electricity purchase from TANESCO.

3.3.19 The Roads Act No. 13 of 2007

The Roads Act governs the deviation, widening, construction or realignment of a road or access road, as well as describing the compensation details for people that need to be resettled as a result of these. Section 15 provides details on the power of the Minister for provision of consent for the new construction of such infrastructure. Section 16 provides details on the compensation for land and cut vegetation during road construction. Section 35 describes owner to be given power concerning the decision of creating an access road in line with laid conditions.

Section 39 and regulation 42 detail the prohibition of certain classes of traffic, and sets out maximum weight, speed and dimensions of vehicles. Section 40 provides the chance for appeal to the proponent if not given consent for the proposed access road construction. Furthermore, the Act provides for road safety through creating road signs and bumps to avoid any occurrence of accidents, and the authority that has jurisdiction for carrying out road undertakings. The proposed project will utilise the current public roads and therefore obliged to observe the requirement of this Act.

3.3.20 The Local Government (Urban Authorities) Act, Cap. 288 R.E 2009]

Tanzania is implementing the Local Government Reform Programme (which has instituted "Decentralization by Devolution". District and Urban councils have extensive powers under

the two acts, both in governance aspects and in the management of natural resources and land in their respective jurisdictions. The administrative aspects of valuation and payment of compensation are assigned to local government authorities' and Regional administration. It is on the basis of this Act that, the proponent is determined to ensure continuous conservation of the project site while maintaining environmental and public health safety.

3.3.21 The Local Government Law (Miscellaneous Amendment) Act, 2006

This act established the local governments and urban authorities with mandates to spearhead developments in districts and urban centres (for cities and municipalities) respectively. By this law, the authorities have mandates to formulate bylaws to enhance environmental management within their district/urban authorities.

Commitments: Proponent shall observe the bylaws set by Sengerema District.

3.3.22 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. The project proponent will fulfil this legal requirement in all project phases, from design, construction and operation.

3.3.22 The Child Act, 2010

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. The project proponent will protect against child labour, especially during the construction period.

3.4 Relevant National Plans, Strategies

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

3.4.1 The Tanzania Development Vision 2025

The Tanzania Vision 2025 aims at achieving a high quality livelihood for its people attain good governance through the rule of law and develop a strong and competitive economy. Specific targets include:

1. A high quality livelihood characterized by sustainable and shared growth (equity), and freedom from abject poverty in a democratic environment. Specifically, the

Vision aims at: food self-sufficiency and security, universal primary education and extension of tertiary education, gender equality, universal access to primary health care, 75% reduction in infant and maternal mortality rates, universal access to safe water, increased life expectancy, absence of abject poverty, a well-educated and learning society.

2. Good governance and the rule of law moral and cultural uprightness, adherence to the rule of law, elimination of corruption.

3. A strong and competitive economy capable of producing sustainable growth and shared benefits a diversified and semi-industrialized economy, macro-economic stability, a growth rate of 8% per annum, adequate level of physical infrastructure, an active and competitive player in regional and global markets.

ARU is one of the important projects to enable Tanzania achieve its Development Vision objectives notably eradicating poverty. ARU project will contribute to the attainment of the 2025 Vision through provision of adequate skilled labor force for implementing various development plans.

3.4.2 The Third National Five-Year Development Plan (FYDP III; 2021/22 – 2025/26)

The Plan is a continuation of Government's efforts in achieving the goals set in the National Development Vision 2025 enduring exertion to further improve the standard of living for all Tanzanians. The main objective of the Third Plan is to contribute to realisation of the National Development Vision 2025 goals. These goals include Tanzania becoming a middle-income country status and continue with transformation of becoming an industrial country with a high human development or a high standard of living. Upon reaching its vision, which have the following attributes: peace, stability and unity; good governance; an educated and learning society; and a strong economy that can withstand competition and benefit many people. The FYDP III, therefore, will seek to enable the country to more effectively use her geographical opportunities and resources for production and economic growth, while, ensuring that the outcomes benefit all citizens in line with the Vision's goals of a high quality of life. FYDP III will continue to implement the projects and programmes aimed at opening up economic opportunities, build an industrial economy, strengthen competitiveness in domestic, regional and global markets as well as strengthen human development including the education sector. The proposed project supports this development plan by increasing academic, research and innovation opportunities in various geographica areas of Tanzainia including Sengereme District, Mwanza region where the ARDHI University will be constructed.

3.4.3 The National Plan of Action to End Violence Against Women and Children (NPA-VAWC) 2017/18-2021/22

From a situation analysis of this plan, violence is a daily reality for large numbers of women and children in Tanzania. The NPA-VAWC recognizes that reducing violence has positive implications for inclusive growth and has ambitious targets that could positively impact the agency of women and girls. The plan aims to dramatically lower rates of teenage pregnancy, reduce the practice of female genital mutilation/cutting (FGM/C), and drastically reduce child marriage throughout the country. The plan incorporates strategies to help local authorities and police, service providers, and communities better provide prevention and response services

that have the greatest potential for reducing violence against women and children. To put the plan in action, ARU should with relevant government officials, social welfare officers, religious leaders, and police officers during implementation of the proposed project to end existing Violence against Women and Children.

3.5 National Regulations

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

The Environmental Management (Environmental Impact Assessment and Audit) Amendment Regulations, 2018 are read as one with the EIA and Audit regulations, 2005 are made under Environmental Management Act No. 20 of 2004. The regulations provide the basis for undertaking Environmental Impact Assessment (EIA) and Environmental Audits for various development projects with significant environmental impacts in the country. These regulations set procedures for conducting EIA and environmental audit in the country. The regulations also require registration of EIA experts.

In accordance with the Tanzania Environment Impact Assessment and Audit Regulation of 2005 and revised in 2018, project activities to be funded will be categorized according to the extent of environmental and social impacts of the sub-projects. That is whether impacts are low impact, site specific and that can be prevented and mitigated if all responsible parties apply the prevention and mitigation measures.
The First Schedule gives list of projects requiring and not requiring EIA and it categorizes projects into four categories:

Type A – Category for mandatory project
Type B1 – Category for borderline project
Type B2 – Category for Non-Mandatory and

Special Category – project where potential risks are uncertain and requires detailed specialized study prior to EIA.

According to the schedule, Type B2 Projects are small scale activities and not enterprises and shall require registration but shall not require EIA. Further the project shall not require screening and scoping, rather the project brief shall be examined and issued with the Environmental Impacts Assessment Certificate.
Regulation 6(1), 8(1) and 10(1) provide procedures for application for EIA certificate for B2, B1 and A categories respectively. The Regulations also, specifies issues to be covered by the proponent in the project brief and scoping reports. Section 6 (2) requires a project brief to be prepared by an environmental expert registered as such under the environmental (Registration of Environmental Experts) Registrations.

Part IV Regulation 13(1) requires the Project Proponent to conduct EIA in accordance with the general environmental impact assessment guidelines and in accordance with the steps outlined in the Fourth Schedule of the regulations. Regulations 16 specifies EIA study should cover environmental, social, cultural, economic and legal issues.

Part X Regulation 49 and 50 outlines the objectives of carrying out annual self-auditing and control audit to check and verify the adequacy the environmental management plan in mitigating the negative impacts of the project.

Part XII Regulation 60(1) stipulated that "notwithstanding any license, permit or approval granted under any written law, any person who commences, proceeds with, executes or conducts any project or undertaking without approval granted under these Regulations commits an offense and on conviction shall be liable to the punishment prescribed under the Act.

The regulation is relevant to the ARU project as may falls under Type A, B1 or B2 categories and therefore project registration or EIA study is mandatory and should be carried out in accordance with the guidelines stipulated in the Fourth Schedule to the Regulations.

3.5.2 The Environmental Management (Registration and Practicing of Environmental Experts) Regulations, 2021

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 study has been carried out by the registered expert by NEMC.

3.5.3 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 to undertake to monitor 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.

3.5.4 The Environmental Management (Air Quality Standards) Regulations, 2007

The objective of this standard is to set baseline parameters for air quality and emissions within acceptable standards. It enforces minimum air quality standards prescribed by NEMC to industrialists for the purpose of adopting environmental friendly technologies to ensure protection of human health and environment pollution sources.

The standards prohibit emissions above the prescribed standards unless the emitter obtains permission to be exempted or obtain air pollutant emission permit. Fugitive dust emissions represent the most likely issue requiring avoidance or mitigation during the mobilisation and construction phase. The limit for dust emissions in terms of the Second Schedule to the Regulations is 250mg/Nm^3 (mean over a 24 hour period). The proposed project will have to abide to Environmental Management (Air Quality Standards) Regulations 2007, and the current assessment is within the required standards. During project implementation the

regulations will be complied with to ensure dust emissions from the project are within the acceptable limits.

3.5.5 The Environmental Management (Soil Quality Standards) Regulations, 2007

The objective of this standard was to set limits for soil contaminants in agriculture and habitat. It enforces minimum soil quality standards prescribed by NEMC to maintain, restore and enhance the sustainable productivity of the soil.

The standards prohibit discharge onto soil any material which will interfere with its natural quality or be polluted unless the person obtains permission to be exempted or obtain soil pollutant discharge permit. Contaminants of heavy metals in habitat and agricultural soils shall comply with parameters and upper limits specified in the standards.

Elevated levels of heavy metals may occur naturally within the soils surrounding. However, any proposed expansion projects will be designed to avoid the release of contaminants, with elevated levels of heavy metals, to the environment. The proposed project will have to abide to this regulation by discouraging haphazard disposal of wastes to the environment.

3.5.6 The Environmental Management (Water Quality Standards) Regulations, 2007

The objective of this standard is to enforce minimum water quality standards prescribed by the NEMC. it ensure all discharges of pollutants take account the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned, so as to protect human health and conservation of the environment.

The standards prohibit discharges above the prescribed standards unless the emitter obtains permission to be exempted or obtain water pollutant emission permit. The regulation recognizes the requirement to obtain a water user permit as detailed Water Resources Management Act, 2009 and attaches additional conditions to securing the permit which requires an EIA statement of the permit application to be submitted to NEMC.

These regulations also include effluent standards (First Schedule – Permissible Limits for Municipal and Industrial Effluents), drinking water standards, specific effluent standards for particular industries and distances from pollution sources to water sources of which the proposed project must adhere to specifically when managing discharges from the project activities including research training and undertakings.

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

The power of formulation of standards for the control of noise and vibration pollution is delegated to the national environmental management standard committee. Among the responsibilities of the committee is to set minimum standards for emissions of noise and vibrations pollution into the environment. The regulation prohibits a person to made any loud, unreasonable, unnecessary on unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and of the environment describes the

permissible noise levels from different facilities. According to Regulation 8 Part V, the owner of the machinery or the occupier of the facility or premises has a duty to control noise. Second schedule of the regulation stipulate the tolerance limits for environmental vibration. The provisions of these regulations will guide in ensuring that noise and vibration levels do not exceed the maximum thresholds specified.

3.5.8 The Environmental Management (Hazardous Waste Control and Management) Regulations, 2019

The Regulations require every person living in Tanzania to have a stake and a duty to safeguard the environment from the adverse effects of hazardous wastes and inform the relevant authority on any activity and phenomenon resulting from hazardous waste that is likely to affect the environment and human health. Further the regulations require a generator of hazardous waste to be responsible for the sound management and disposal of such waste. They shall be liable for damage to the environment and injury to human health. ARU shall observe the provisions of these regulations and comply if there is any hazardous waste generated.

3.5.9 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, ARU shall comply with all these requirements during the implementation of the project in all phases. The management of solid waste should be carried out in accordance with the proposed ESMP.

3.5.10 The Fire and Rescue Force (Safety Inspections & Certificates) amendment Regulations, 2014

These Regulations cover many aspects, such as administration, responsibilities and powers of the Fire and Rescue Force, its activities, fire and rescue operations, the welfare of its staff, the Minister's power, and the property groups' classification determine the levy. These regulations require fire safety inspections to be conducted and the certificate renewed annually. Failure to renew it within one month incurs a penalty of 25 percent of the fee. Thus, ARU shall comply with all these requirements during the implementation of the project.

3.5.11 The Environmental Management (Control and Management of Electrical and Electronic Equipment Waste) Regulations, 2021

These Regulations apply to all categories of electrical and electronic equipment wastes with respect to generation, collection, storage, transportation, importation, exportation, distribution, selling, purchasing, recycling, refurbishing, assembling, dismantling and disposal of electrical and electronic equipment waste or components, and their movement into or outside Mainland Tanzania. The amount of waste electrical and electronic equipment (widely known as WEEE or e-waste) generated every year in Tanzania is increasing rapidly.

Waste from electrical and electronic equipment includes a large range of devices such as computers, printers, fridges and mobile phones at the end of their life. This type of waste contains a complex mixture of materials, some of which are hazardous. These can cause major environmental and health problems if the discarded devices are not managed properly. These regulations require the separate collection and proper treatment of WEEE and sets targets for their collection as well as for their recovery and recycling. Thus, ARU shall comply with all these requirements during the implementation of the project.

3.6 Relevant International Agreements, Conventions and Treaties

Tanzania is party or acceded to several international agreements and conventions relating to the environment. Agreements of potential relevance for the proposed development are briefly mentioned below.

3.6.1 The Convention on Biological Diversity (CBD) (1992)

Tanzania signed the CBD in 1992 and ratified it in March 1996, thereby committing to the conservation and sustainable use of biological diversity. The objective of the Convention on Biological Diversity (CBD; 1992) is to conserve biological diversity, promote the sustainable use of its components, and encourage equitable sharing of the benefits arising from the utilization of genetic resources (see *www.biodiv.org*). Relevant to this project is Article 6 of the CBD, which provides general measures for conservation and sustainable use of biodiversity. Article 14, which requires parties to carry out EIA on all projects and development which may have adversely impact on the environment. It is expected that during construction, the project activities will involve clearing of secondary vegetation at the project site. However, landscaping and re-vegetation will be carried out upon completion of the works.

3.6.2 The United Nations Framework Convention on Climate Change (1992)

The UNFCCC or FCCC is an international environmental treaty produced at the UNCED, informally known as the Earth Summit, held in Rio de Janeiro from June 3 to 14, 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Article 4 commits parties to develop, periodically update, publish and make available national inventories of anthropogenic emissions of all greenhouse gases not controlled by the Montreal Protocol (by source) and inventories of their removal by sinks, using agreed methodologies. It commits parties to mitigate GHG as far as practicable. Tanzania having ratified this convention and putting into consideration the nature of the proposed project, there is an apparent need to ensure the project activities live within the carrying capacity of the environment and to avoid the emission of potentially atmospheric debilitating gases.

3.6.3 The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 1989

This Convention was adopted on 22nd March 1989 by 116 states in Basel, Switzerland and come into force on 5th May 1992 in accordance with article 25(1) of the Convention. Tanzania acceded to the Basel Convention on 7th April 1993. In the context of the Basel Convention, wastes are considered hazardous to people and the environment if they are toxic, poisonous, explosive, corrosive, flammable, eco-toxic, or infectious. These can be in liquid, solid or in other forms. According to the Convention various types of wastes fall under these

categories. These are listed in Annex I of the Convention (as amended in Annex VIII). A list of hazardous characteristics is contained in Annex III of the Convention. The Convention requires any Party to ensure that management of hazardous wastes or other wastes is done in a manner, which prevents pollution so as to minimize the consequences thereof for human health and the environment. The proposed project will generate different types of hazardous waste, and different measures have been proposed in the mitigation chapter on how to manage generated hazardous waste.

3.6.4 ILO Convention: C182 Worst Forms of Child Labour Convention, 1999

The Worst Forms of Child Labour Convention, was adopted by the International Labour Organization (ILO) in 1999 as ILO Convention No 182. The Convention supports the prohibition and elimination of the worst forms of child labour, including slavery, forced labour and trafficking in human beings. The convention was ratified by Tanzania on 12:09:2001 and by ratifying this Convention, Tanzania commits itself to taking immediate action to prohibit and eliminate the worst forms of child labour. Thus, ARU shall ensure no child is employed in the project activities.

3.6.5 ILO Convention: C138 Minimum Age Convention, 1973

This Convention C138 (the Minimum Age Convention) provides for a minimum age of 15 years for admission to employment (temporarily set at 14 for some developing countries). The minimum age for access to employment that is likely to 'jeopardise the health, safety or morals of young persons'– that is, hazardous work – is set at 18 years of age (16 under certain conditions). A difficulty arises in relation to the definition of such hazardous work, as there is no international list of the forms of work that are considered as posing a hazard. According to the Minimum Age Convention, hazardous types of employment or work that are prohibited up to the age of 18 have to be determined by the competent national authorities after consultation with employers and workers (Article 3(2)).The Minimum Age Convention allows 'light work' to be performed by persons aged 13 to 15 (or even 12 to 14 in certain countries), provided: a) it is not likely to be harmful to their health or development; and b) it does not prejudice their attendance of school or vocational training. The convention was ratified by United Republic of Tanzania on 16:12:1998. As such, ARU shall ensure no child is employed in the project activities.

3.6.6 ILO Convention: C148 Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

The objectives of the convention are to protect workers against occupational hazards in the working environment. The convention applies to all branches of economic activity, except where special problems of a substantial nature exist. Parties may accept the obligations of this Convention separately in respect of air pollution, noise and vibration. Measures to be taken for the prevention and control of, and protection against, occupational hazards in the working environment due to air pollution, noise and vibration shall be prescribed by national laws and regulations. Criteria for determining the hazards of exposure to air pollution, noise and vibration in the working environment and exposure limits on the basis of these criteria shall be established by the competent authority. Tanzania ratified the convention on 30:05:1983 and as such ARU shall ensure workers are protected against occupational hazards.

3.6 Institutional Framework for the Management of Environment

Tanzania is among countries in East Africa with an Act for environmental management legislation. The legislation, Environmental Management Act (EMA) (2004), provides a legal and institution framework that guides the implementation of the environmental management activities. The framework provides a pre-requisite for effective implementation of Environment Policy at all levels (National, Region, Council, and Village/Mtaa/Hamlet). According to the Environmental Management Act (EMA) (2004), there is the Environmental Management Committee established at the Hamlet/Village/Mtaa, Ward, Council and at National level with the responsibility for the proper management of the environment in respect of the area in which they are established. The functions and responsibility of these committees are well explained in the Act. Moreover, section 36 (1), (2) of EMA stipulates that each City, Municipal, District and Town councils shall designate or appoint an Environmental Management Officer (EMO) who shall perform among the following functions:

i) Advice the environmental management committee to which he/she belongs on all matters related to the environment.
ii) Promote environmental awareness in the area he/she belongs on the protection of the environment and the conservation of natural resources.
iii) Monitor the preparation, review and approval of Environmental Impact Assessment for local investments.

The Institutional set up as presented in Table 3.1 explains the layers of decision making from national to Village/Mtaa/Hamlet levels.

Table 3.1: Key Institutions to the ESIA Process

Level	Institution	Role and Responsibility
National level	Vice President's Office (Division of Environment,)	• 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

	Vice President's Office - NEMC	• 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 stakeholders environmental education and public awareness;
	Ministry of Education Science and Technology	• Issuing policy guidance • Providing legal frameworks • Issuing licenses, provisions of certificates of compliances • Enforcement of laws and regulations • Project monitoring.
	Ministry of Lands, Housing and Human Settlements Development	• Issuing rights of occupancy, • Overseeing land use planning and issues relating to compensation and physical and economic resettlement (if any)
	Ministry of Water Basin Water Offices	• Responsible for issuing water use permits, • Enforcing laws and regulation of water quality and utilization, as well as permitted discharge levels. • Co-operate between sectors at the local level. • Resolve conflicts between water users.

	Tanzania Commission for Universities (TCU)	• Mandate to recognise, approve, register and accredit Universities • Conduct regular and impromptu periodic evaluation of universities, their systems and programmes • Advise the government and the general public on matters related to higher education in Tanzania as well as international issues pertaining to higher education, including advice on program and policy formulation and other best practices. • Providing support to universities in terms of coordinating the admission of students, offering training and other sensitisation interventions in key areas like quality assurance, university leadership and management, fund raising and resources mobilisation, entrepreneurial skills and gender mainstreaming.
	Occupation Safety and Health Authority OSHA	• Approval of building plans for the proposed project • Monitoring Health and Safety of workers in working premises
Project Funding Institutions	World Bank	• Project financing • Ensure the project is carried out to the highest environmental standards strictly in accordance with the ESIA and the mitigation measures set out in the ESMF. • Provide second line of monitoring compliance and commitments made in the ESMPs through supervision.
Project Proponent	ARU_Mwanza Campus	• Project implementation including mitigation measures. • Ensure environmental compliance by the Sector Ministry. • Liaise with the DoE and the NEMC on matters involving the environment and all matters with respect to which cooperation or shared responsibility is desirable or required. • Oversee the preparation of and implementation of all ESIA‟s required for investments.

Regional level	Mwanza Regional Secretariat Office	• Responsible for environmental coordination of all advice on environmental management in the region and liaises with the Director and the Director General on implementation and enforcement of the Environment Act. • A Regional Environment Management Expert appointed by the Minister responsible for Regional Administration heads the secretariat. • The Regional Environment Management Expert is responsible for advising the local authorities on matters relating to the implementation and enforcement of the Environment Act. The Expert links the region with the Director of Environment and Director General. • Advice on implementation of development projects and activities at Regional level.
District level	Sengerema District	• Oversee and advice on implementation of national policies at Municipal level • Oversee enforcement of laws & regulations • Advice on implementation of development projects and activities at Municipal level
Ward Level	Nyamatongo Ward	• Oversee general development plans for the Ward. • Provide information on local situation and Extension services • Technical support & advice • Project Monitoring
Street (*mtaa*) level	Karumo village office	• Information on local social, economic and environnemental situation • View on socio-economic and cultural value of the sites and on proposed plant operations • Rendering assistance and advice on the implementation of the project • Project Monitoring (watchdog for the environment, ensure wellbeing of residents and participate in project activities.

3.7 ARU Project Implementation Team

ARU Mwanza Campus Project Implementation Unit (PIU) has been established. It has a total of 27 members. Out of this, there is one environmentalist, one social and one gender experts locally known as ESS Team. At the project level both contractors and a Consultant have been guided in the contracts to employ experts in environment, social and gender. The Environmental and Social Safeguard Team will make sure that this is implemented. The ESS Team is involved in SE, providing inputs in all ToR and contracts for procurement of contractors and consultants. It has also developed GRM which is operational as well as developed an ESS Office. There is also a suggestion box. The rest PIU members include Coordinator, Deputy Coordinator, infrastructural Development, Capacity building, Curricula development, Finance, ICT, Procurement, M&E, Industrial linkage and Communication

officer. A high proportion of PIU members have been appointed based on their expertise and thus their contribution to this project is based on their expertise.
This ESIA has consulted most of these institutions at various stages as part of this ESIA undertaking and their views and concerns have been incorporated in the report. Key institutional arrangement for HEET Project Implementation is stipulated Table 3.2 summarizes responsibilities for each institution involved in ESIA.

Table 3.2: Key Institutions for implementation of the project

LEVEL	Institution	Roles and Responsibility
	World Bank	• Review sub-project screening including risk level categorization; • Review the ESIAs, ESMPs and site specific ESMPs; • Review quarterly reports by the implementing agencies; • Monitor compliance with the ESMF; and • Undertake implementation support missions.
Ministerial level	MoEST (NPIT)	At the national level, NPTI to oversee key project functions including: • project coordination, • procurement, • financial management (FM), • and M&E.
Regional Authorities	Regional Commissioner's Office District Executive Director Office Functional Departments – Planning, Water, Health, Community Development, Natural Resources, etc.	• Issuing relevant permits • Land ownership and road reserves, current land uses, neighbouring activities and developments • Relevant permit, official public notices
District /local level	Land Allocation Committee	• Land approval
	District/Ward Functional Departments – Planning, Water, Health, Community Development, Natural Resources, etc.	• Extension Services • Key stakeholder in project implementation
	Environmental Committees	• Project Monitoring (Watchdog for the environment)
	Ward Development Committee	• Project Monitoring
	Local Stakeholders	• Project Monitoring
Water Supply and Sanitation Authorities	Water Supply and Sanitation Authority (RUWASA)	• Managing and maintaining sewerage networks • Managing and maintaining of water supply networks • Ownership of utilities within the road reserves • Placing, managing and relocating utilities on, over within or along the proposed project route

TANESCO Regional Level	TANESCO Regional Office	• Power supply
EWURA National Level	Energy and Water Utilities Regulatory Authority	• Setting of the tariffs and charges • Monitoring performance and standards with regards to quality, safety, health and environment
Project Proponent - ARU	ARU HEET Project has established a Project. Implementation Team (PIT) as stipulated in POM 2021 which states that Each PIU will be headed by a Project Coordinator/Leader and have staff responsible for FM, procurement, environmental and social safeguards, and M&E. However, according to MoEST letter of 2021 14 specialists were required to be appointed to form a PIT . Accordingly at ARU 27 staff have been appointed by the Accounting Officer (VC) and issued letters of appointments including roles and responsibilities: They include: • Coordinator • Deputy Coordinator • Other specialists include: • Environments • Social • Gender • Infrastructure • Capacity building • Curricula (2) • ICT (2) • Communication • Industrial linkage • Procurement • Finance • Monitoring and Evaluation The Environmentalist, Social sand Gender specialists, refereed to as ESS Team, are part of the PIU Team. PIU Team has competence in	Overall, PIT main task is oversee Project implementation involving development of ToR for consultants and contractors, developing specifications and performing procurement process for equipment and facilities, procurement of consultant and contractors, meeting regularly for assessment of project development, providing specifications for ICT procurement and related facilities, overseeing and implementing capacity development, developing curricula, establishing and working with Industrial Advisory Committee conducting capacity building for its members and undertaking M&E of the project. **Roles and responsibilities of ESS Team** • Capacity building for GRM focal persons and members of the Grievance Redress Integrity includes; • Oversee project implementation including mitigation measures through contractors • Ensure environmental compliance by the environmental standards. • Liaise with the DoE and the NEMC on matters involving the environment and all matters with respect to which cooperation or shared responsibility is desirable or required. • Oversee the preparation of and implementation of all ESIA"s required for the project • Monitoring the implementation of HEET Project as per POM and PAD. • Attend meetings and provide guidance in the bid documents developed by PMU to ascertain that the different challenges identified and duly covered from risk for each sub-project/activity • The ESS Team also supports the procurement officer 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. • The ESS Team coordinates the preparation of ESIA and environmental and social management

	performing the implementation of the project and ESIA duties through ESS Team acquired both through learning and practical experiences. PIU Members have attended several capacity buildings conducted by MoEST and WB	plans (ESMPs) done by consultant and site-specific ESMPs (SSESMP). • They ensure that contractors have an Environmental Health and Safety Officer (EHS), is familiar with the compliance requirements, including WB EHS guidelines. • To review progress reports by the supervision engineer/consultant during civil works and conduct inspection of the sites regularly • To make sure the Contractor complies with the WB guidance on Community Health and Safety and Gender-Based Violence
	Design Consultants	• Understand the sub-project setting and site-specific requirements with discussions with the PIU; • Incorporate the issues identified in the ESIAs, ESMPS into the project design • Provide cost estimates for implementing the design requirements.
	Occupational Safety and Health issues	• Perform hazard identification • Hazard assessment and management • Risk assessment and management • Emergency preparedness plan and Response • Risks and crises management • Stakeholder engagement and grievance management, including in relation to the worker grievance mechanism, for the social and environmental staff.
	Supervision Engineer/Consultant	• Assist the PIU to ensure that the necessary environmental, health and safety authorizations and permits have been obtained; • Maintain open and direct lines of communication between the PIU and contractor(s) with regard to environmental matters; • Review and approve the contractor's site-specific construction ESMPs (CESMP), Health and Safety, Labour Management Plans and Traffic Management Plans together with the PIU; Conduct regular site inspections of all work areas to ensure compliance with CESMPs and E&S specifications for contractors Assist the contractor in finding environmentally responsible solutions to problems; • Instruct the contractor(s) to take remedial actions within a specified timeframe, and carry out additional monitoring, if required, according to the contractual requirements and procedures in

		the event of non-compliances or complaints; • Instruct the contractor(s) to stop activities which generate adverse impacts, and/or when the contractor(s) fails to implement the ESMP requirements / remedial actions; • Provide training to the contractor on the EHS requirements to be followed; • Monitor the contractor's environmental awareness training program for all personnel working onsite; • In case of any accidents or incidents, immediately notify the PIU and support the process of documenting and reporting the case to the WB; • Prepare written reports for the PIU such as weekly report of non-compliance issues; summary monthly report covering key issues and findings from supervision activities; and consolidated summary report from contractor's monthly report.
	Contractor	• 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 PIU and Environmental Supervision Engineer/consultant; • 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.

3.8 Key players in implementing the ESMP

To ensure the sound development and effective implementation of the ESMP, it will be necessary to identify and define the responsibilities and authority of the various persons and organizations that will be involved in the project. The following entities will be involved in the implementation of this ESMP:

i) The Ardhi University of Tanzania
ii) National Environmental Management Council (NEMC)
iii) Contractor;

3.8.1 ARU – Mwanza Campus

The proponent 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 (ESS1). ARU has the Project implementation Team (PIT) responsible for supervision and monitoring the implementation of the project construction activities. The management of all project activities during operation is under the PIT, in collaboration with other departments and units depending on the nature of the activity. In general, the PIT falls under the management of the ARU executing day-to-day activities in the project. The PIT is guided by management meetings that are chaired by the Deputy Vice Chancellor. The management meetings provide support, guidance and oversight of the progress of the PIT. Further, the PIT will designate among PIT staffs an Eenvironmental and Social Safeguard Specialist(s) who will monitor the implementation during the construction and operation phases of the project. The PIT team has enough staffs with capacity to undertake the required monitoring and supervision roles to include Environmental and Social specialists.

3.8.2 NEMC

NEMC is charged with the overall role of providing oversight regarding monitoring for all project activities that have potential impacts on the environment. NEMC will undertake periodic monitoring of the project during the mobilization, construction and operational phases to ensure that the mitigation measures set out in chapter 8 of ESMP are fully implemented. In respect to this project, NEMC has a specific role of monitoring and ensuring that the mitigation measures are fully implemented as per certificate conditions (to be issued). It will ensure that its Zonal staff are fully trained and equipped to perform its monitoring role. It will review the results of any monitoring and Audit reports generated as part of the project implementation phase and will issue directives based on the monitoring activities to ensure full compliance with the mitigation measures required and address any issues that may arise.

3.8.3 The Contractor

The project will be implemented by a Contractor and will be responsible to ARU for constructing the proposed project in accordance with the Technical Specifications required. The Contractor shall implement the project entirely in accordance with the ESIA mitigation measures detailed the ESMP. It is recommended that before commencement of actual construction, the Contractor should submit a work site plan that complies with the national environmental guidelines and an ESMP for the different phases of the work. The

environmental plan shall specify the location of sources of materials and disposal area of construction debris as well as other related matters. The plan shall take into consideration the mitigation measures proposed in this ESIA project report.

The Contractor shall nominate a Project Environmental Site Officer (ESO) and Project Social Site Officer (SSO) who will be the Contractor's focal point for all environmental and social matters. The ESO and SSO will be routinely on-site for the duration of the construction works. Both officers will have minimum of Bachelor Degree in their respective specialization. The officers among others will be responsible for the following tasks:

i) Drafting environmental and social aspects during project implementation;
ii) Managing environmental, social, health and safety aspects at the worksites;
iii) Participating in the definition of the no working-areas;
iv) Recommending solutions for specific environmental and social problems;
v) Facilitating the creation of a liaison group with the stakeholders at the project site and shall monitor the compliance of ESMP;
vi) Organizing consultations at critical stages of the project with the stakeholders and interested parties;
vii) He/She will be required to liaise with ARU Safeguard specialist on the level of compliance with the ESMP achieved by the contractor regularly for the duration of the contract;
viii) Controlling and supervising the implementation of the ESMP;
ix) Preparing environmental and social progress or "audits" reports on the implementation status of measures and management of site works.

3.9 WORLD BANK ENVIRONMENTAL AND SOCIAL STANDARDS

There are 10 approved Environmental and Social Standards (ESS) to address environmental and social issues within the Bank's supported development projects. Thus, all projects under World Bank financing must comply with Environmental and Social Standards (ESS) before is cleared for implementation. Table 3.3 shows standards which will be applicable to the construction of ARU new projects. In this section, the capacity of ARU in complying with Environmental and Social Standards is assessed.

Table 3.3: Application of World Bank's Environmental and Social Standards to te proposed project

Environmental and Social Standard(ESS)	**Applicability**	**Requirements**
ESS1:Assessment and Management of Environmental and Social Risks and Impacts	YES	The types of E&S risk and impacts that should be considered in the environmental and social assessment. The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects where appropriate.
ESS2: Labor and Working Conditions	YES	Requirement for the Borrower to prepare and adopt labor management procedures. Provisions on the treatment of direct, contracted, community, and primary supply workers, and government civil servants. Requirements on terms and conditions of work, non-discrimination and equal opportunity and workers organizations. Provisions on child labor and forced labor. Requirements on occupational health and safety, in keeping with the World Bank Group's Environmental, Health, and Safety Guidelines (EHSG).
ESS3: Resource Efficiency and Pollution Prevention and Management	YES	Requires an estimate of gross greenhouse gas emissions resulting from project (unless minor), where technically and financially feasible. Requirements on management of wastes, chemical and hazardous materials, and contains provisions to address historical pollution. ESS3 refers to national law and Good International Industry Practice, in the first instance the World Bank Groups' EHSGs.
ESS4:Community Health and Safety	YES	Requirements on infrastructure, taking into account safety and climate change, and applying the concept of universal access, where technically and financially feasible. Requirements on traffic and road safety, including road safety assessments and monitoring. Addresses risks arising from impacts on provisioning and regulating ecosystem service. Measures to avoid or minimize the risk of water related, communicable, and non- communicable diseases. Requirements to assess risks associated with security personnel, and review and report unlawful and abusive acts to relevant authorities.
ESS5:Land Acquisition,	YES	ARU through Sengerema district council has offered affected persons compensation at replacement cost, and other assistance as may be necessary to help them improve or at least restore their standards

Restrictions on Land Use and Involuntary Resettlement		of living or livelihoods following the fact that, despite acquisition of land from Sengerema District Council but the same were acquired from the local communities before
ESS6: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. Thus, there is no identified specie with significance conservation status (i.e. threated or endangered as per IUCN guidelines/CITES List) in the area.
ESS7:Indigenous Peoples/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.
ESS8:Cultural Heritage	NO	This ESS is not relevant as the project area has already being developed and there is existing ARU building
ESS9:Financial Intermediaries (FIs)	NO	This ESS is not relevant to the project.
ESS10:Stakeholder Engagement and Information Disclosure	YES	Requires stakeholder engagement throughout the project life cycle, and preparation and implementation of a Stakeholder Engagement Plan (SEP). Requires early identification of stakeholders, both project-affected parties and other interested parties, and clarification on how effective engagement takes place. Stakeholder engagement to be conducted in a manner proportionate to the nature, scale, risks and impacts of the project, and appropriate to stakeholders' interests. Specifies what is required for information disclosure and to achieve meaningful consultation.

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

This Environmental and Social Standard is applicable to this project due to its potential adverse social and environmental risks and impacts on site and in the areas of influence. These include impacts on natural environment such as air, water, land, human health and safety. Thus, ARU shall analyze project activities and associated environmental and social risks and impacts during construction and operation phase.

The project has prepared an Environmental and Social Impact Assessment (ESIA). Therefore, the project components have been screened to determine potential adverse impacts and mitigation measures for their planned activities. According to social relation that has started to develop between ARU and the nearby community of Karumo and Kamanga, the social services like playing grounds, churches, mosques and accommodation facilities within and outside the campus to be built ARU can be pressurized due to the increased students' enrolment. Thus, the current social services provision at the nearby communities needs to be rechecked to prevent pressure on local accommodation and rents.

3.9.2 Labor and Working Conditions (ESS2)

The standard recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. ESS2 is applicable to the project given that the project will employ/engage both skilled and non-skilled workers, including through contractors/subcontractors, and primary suppliers, to undertake various activities. In order to comply with the provisions of ESS2, ARU will take worker safety seriously by laying out internal controls and procedures that will protect workers employed or engaged in relation to the project from occupational hazards during all relevant project phases. All works will be done in compliance with relevant environmental and health and safety standards to minimize impact on workers as well as the local area and citizens. The ESIA contains robust procedures for worker safety, requiring plans for accident prevention as well for health and safety of workers and communities, which are also part of contracts for civil works.

ARU will ensure that the project contractors and sub-contractors operate under policy-led objectives that promote gender equality, non-discrimination and fair treatment in recruitment and employment, respect for national labor laws, including prohibiting child and forced labor, and combatting gender-based violence, in particular sexual harassment.

Contractors/subcontractors, primary suppliers and sub-contractors shall ensure equal employment opportunity and not discriminate anyone based on color, nationality, tribe, social origin, political opinion, religion, gender, pregnancy, marital status/family responsibility, disability, HIV/AIDS, age or station of life, sexual orientation, or union membership.

ARU will ensure that workplace sexual harassment of any nature by workers directly hired or project workers engaged through contracts/subcontracts companies shall be prohibited, and those determined to be guilty will be subject to disciplinary action, including summary dismissal.

3.9.3 Resource Efficiency and Pollution Prevention and Management (ESS3)

This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project lifecycle. In order to ensure efficient use of resources, ARU projects will source construction materials from government authorized sources and water from DAWASA throughout the project implementation. ARU has a total area of 79.78Ha (797,800m2) but the developed area consists of 12.8% of the total area. The proposed new buildings are expected to utilize a maximum of 7.8% of the total plot size. This implies that the big portion (79.4%) of the Ardhi University is covered by green spaces. The amount of tons of CO_2 generated per year from main sources like cafeteria, vehicles and generator will be sequestered by the available green spaces. Moreover, the project will utilize the pollution prevention and emergency response plan drafted as part of the ESIA to mitigate any potential source of pollution from the planned activities. The risks identified for strengthening the system for complying with ESS1 are applicable to ESS3.

3.9.4 Community Health and Safety (ESS4)

The ESS requires beneficiary to avoid or minimize safety and health risks and impacts of the project, with particular attention to people who, because of their particular circumstances, may be vulnerable. Implementation of project components has the health and safety risks and impacts on project-affected communities. These risks and impacts could include increased rates of crime, and social conflict and violence, increases in traffic accidents, increased pressure on local accommodation and rents, increased transmission of HIV/STDS, as well as increases in gender-based violence. The project will ensure compliance with national law requirements regarding the COVID-19 situation. ARU shall work closely with street leaders to communicate to local communities' related health and safety risks and preventive measures for accidents associated transportation of materials and other human health issues including covering mitigation measures to GBV risks and prevention of HIV and AIDS during construction.

All works will be done in compliance with relevant environmental and health and safety standards to minimize impact on workers and the local area. During the project's operational phase, waste will be disposed as per instructions from the Sengerama District Council Environmental offices.

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

3.9.5. Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5)

ARU through Sengerema district council has offered affected persons compensation at replacement cost, and other assistance as may be necessary to help them improve or at least

restore their standards of living or livelihoods following the fact that, despite acquisition of land from Sengerema District Council but the same were acquired from the local communities before the existence of the project. However, ARU will develop grievances redress mechanism to take on board all complaints emanating from the communities around the campus including those connected with compensation and or both negative and positive impacts of the project.

3.9.6 Stakeholder Engagement and Information Disclosure (ESS10)

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

3.10 WORLD BANK GROUP EHS GUIDELINES

The World Bank Group Environmental, Health, and Safety Guidelines ("EHS Guidelines") are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP) and contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. The World Bank Group requires borrowers/clients to apply the relevant levels or measures of the EHS Guidelines. In cases when host country regulations differ from the levels and measures presented in the EHS Guidelines, projects will be required to achieve whichever is more stringent.

The General EHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. The EHS guidelines are living documents and are occasionally updated. These documents (EHS guidelines) can be accessed through https://www.worldbank.org/en/search?q=health+and+safety+guidelines. This ESIA recommends the proposed construction of ARDHI University Mwanza Campus to apply these guidelines to ensure all issues regarding environmental, occupational health and safety (OHS) and community health and safety (CHS) requirements are incorporated into the project design and during implementation phases. The links to these guidelines are indicated in Table 3.4.

Table 3.4: Environment, OHS, CHS and Construction and Decommissioning Guidelines

Guideline	Link
Environment Guidelines	https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines
Occupation	https://www.ifc.org/wps/wcm/connect/1d19c1ab-3ef8-42d4-bd6b-

health and safety guidelines	cb79648af3fe/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES&CVID=nPtgxyx
Community health and safety guidelines	https://www.ifc.org/wps/wcm/connect/eeb82b4a-e9a8-4ad1-9472-f1c766eb67c8/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES&CVID=nPtgxTd
Construction and decommissioning	https://www.ifc.org/wps/wcm/connect/7d708218-2a9e-4fcc-879d-9d5051746e7d/4%2BConstruction%2Band%2BDecommissioning.pdf?MOD=AJPERES&CVID=nPtgy6x

CHAPTER FOUR

BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 Introduction

This chapter provides the baseline environmental condition of the project area that makes a reference frame to mark out the potential environmental impacts that might arise during implementing the proposed project. The affected environment includes the social, economic and biophysical environment that could be affected by, or could affect the project.

4.2 Physical Characteristics

4.2.1 Climate

Changes in the local climatic conditions have potential to affect the nature and location of project and infrastructure. Thus it is important to assess the baseline climatic condition, and design projects with knowledge on the climate. Sengerema District is located in the northern Tanzania, on the southern shore of lake Victoria, at an altitude of 1,100 meters. The Climate of Sengerema is subtropical tempered by altitude and with a dry season from June to September. Climatic elements described here include rainfall, temperature, wind, solar radiation (sunlight/ultraviolet) and humidity. Climatic analysis detects better decision-making processes in master planning and development proposals.

The nature of the proposed project is perceived as one with minimal impact on the local climate. There are a few activities that may produce emissions with potential to affect the local climate, including clearance of vegetation on site, emissions from construction equipment and trucks; and emissions from standby generators. The management options for these emissions shall be provided in detail in the ESMP.

Temperature

The temperature at Nyamatongo ward, Karumo village, where the campus is located, does not differ from the temperature of Sengerema District. The area experiences both low and high temperate periods. In the hottest month, the average temperature ranges from 21^0C to 23^0C (*Sengerema District, 2017*). The monthly mean temperature range varies from 3.9 ^{0}C to 5.6 ^{0}C. Table 4.1 presents the mean monthly temperature distribution for the Sengerema District.

Table 4.1: Mean Monthly Temperature (°C) Distribution in Sengerema District

Monthly Temperature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mean max.	24.9	25.9	25.6	25.2	25.6	25.6	25.3	25.3	25.4	24.9	24.2	24.3	25.18
Mean min.	20.7	21.3	21.2	20.8	20.9	20.3	19.7	20.2	20.6	20.7	20.5	20.4	20.61
Mean range	4.2	4.6	4.4	4.4	4.7	5.3	5.6	5.1	4.8	4.2	3.7	3.9	4.57

Source: en.climate-data.org/Africa/mwanza/mwanza-3111

The proposed developments at the site, have potential to cause changed in to the local mean temperature. Clearance of local vegetation and the establishment of paved area may increase the local temperature. Pavements absorb and store solar radiation, leading to a further increase in the surface temperatures. This phenomenon is known as the urban heat island (UHI) effect. Large quantities of solar radiation are absorbed by these materials during the day and released during the night time.

Sunlight or ultraviolet

Sengerema District experiences UVI ranging from 11 to 14. High UVI predominates the area in September, October, November, December, January, February and March compared to other months of the year. The area, part of the Mwanza region, receives the highest solar power of approximately 1200W/mm^2, while the lowest solar power received in the area is 450W/mm^2 in September and October (available at: weatheronline.co.ck). According to a World Bank report on Solar Irradiation in Tanzania (WB, 2017), Mwanza Region has the following attributes, presented in Table 4.2. A comparison is made with other regions in Tanzania.

Table 4.2: A comparison of sun hours, solar production and insolation for some regions

SN	Region	Sunhours (kWh/m^2/day)	Solar Production (kWh/kWp/year)	Minimum available insolation in 3-day period (worst month)
1	Dar es Salaam	5.5 / 5.2	1550	8.8% (mar)
2	***Mwanza***	***5.9 / 5.4***	***1700***	***25.6% (oct)***
3	Arusha	5.3 / 5.6	1580	32.3% (jun)
4	Dodoma	6.3 / 6.1	1800	40.7% (dec)
5	Mbeya	5.7 / 6.1	1770	43.9% (dec)
6	Morogoro	5.1 / 5.3	1510	29.3% (feb)
7	Tanga	5.7 / 5.6	1620	19.6% (apr)
8	Kahama	6.0 / 5.6	1720	33.1% (oct)
9	Tabora	6.2 / 6.0	1770	36.7% (oct)
10	Stonetown (Zanzibar)	5.6 / 5.2	1580	23.5% (feb)

Source: The World Bank (2017).

As presented in Table 4.2, Mwanza region is one of the areas with high solar production, at 1700 (kWh/kWp/year). This information is important when considering the potential for installation of solar panel at the proposed Sengerema Campus. Also, the design of structures and buildings for the campus has considered a design. The design of the campus has provided for solar lights along the pathways, open spaces and parking areas.

Rainfall

The proposed site in Sengerema is considered to be one of the areas with high rainfall among the Lake regions of Tanzania (Sengerema District, 2017). The district receives short and long rains. The short rain season occurs between October and December, and the long rain season last between February and May. The average annual rainfall for Sengerema District ranges from 900mm to 1200mm per year (Sengerema District, 2017).

Sengerema rainfall data were used in the design process of the proposed ARU campus structures. Rain water harvesting and storm water management facilities have been provide to manage excess rainfall, to avoid flooding and water ponding in the area, and its surrounding.

Humidity

Sengerema District experiences relatively high humidity, averaging 68.83% daily. The overall minimum humidity condition in Sengerema is around 64.08%, and the maximum humidity is 73.5%. The maximum humidity is experienced in April and May, while the lowest is in February. The same conditions are expected for the ARU Mwanza campus. The daily relative humidity varies from 45% to 90%; the highest daily humidity is experienced in January and February, whereas the lowest is in July and August. The monthly relative humidity in Mwanza Region is presented in Table 4.3

Research indicate that, high humidity in the air has impacts on concrete structures in two common ways:

- ***Decreased strength****: When relative humidity levels increase, the compressive strength of concrete decreases, affecting its durability.*
- ***Microbial growth****: Moisture creates the ideal conditions for the growth of mold, mildew, and bacteria. When mold and bacteria grow and reproduce within the concrete, they affect its strength. At the same time, the organisms may affect the health of the individuals within the affected buildings.*

The design of the Sengerema Campus has considered the high humidity condition of the area by adopting whether resistant construction materials such as water proof roof (concrete slabs) & Aluzinc sein coated iron sheets, and even water proof for wall paints.

Table 4.3: Mean Monthly Relative Humidity Distribution in Mwanza Region

Mean RH (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mean max am	70	69	74	77	77	75	74	73	72	72	74	76	73.5
Mean min pm	62	55	60	70	70	69	64	62	60	60	64	73	64.08
Average	66	62	67	73.5	73.5	72	69	67.5	66	66	69	74.5	68.83

Source: en.climate-data.org/Africa/mwanza/mwanza-3111

Climate Change

- ***Greenhouse Gas (GHG) Emissions in Tanzania***

Countries are struggling to reduce GHGs emissions, in line with the Kyoto Protocol. However, due to increase in urbanisation and industrialisation, GHGs emissions continue to increase and many countries have not taken adequate measures to reduce emissions in line with scientific findings and recommendations of the Protocol and related climate discussion (NCCS, 2012). Tanzania has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 1996 and 2002 respectively and has participated in the annual Conference of the Parties (CoP). The outcomes of these CoP meetings include decisions to put in place national policies, strategies and programmes to reduce greenhouse gas emissions and respond to the impacts of climate change (TNCCFA, 2013). The national estimates indicate that, Tanzania has negligible emissions levels of GHGs in terms of total and per capita whereby per capita emissions are estimated at 0.2 tCO2e (NCCSR, 2019). The principal source of GHGs emissions in Tanzania is the Land Use, Land-Use Change and Forestry (LULUCF). Emissions from the LULUCF sector contribute about two-thirds of overall emission levels in Tanzania (NCCSR, 2019). *However, although the proposed project fall under LULUCF, the campus land use plan indicate that more than 44.2% of the total land will be not undergo land use change, but rather be better maintained.* Other sectors which contribute to greenhouse gas emissions in the country are Agriculture, Energy, Waste and Industrial Process and Product Use.

According to the National Climate Change Statistics Report (NCCSR, 2019), evidences of climate change in recent periods are observed. The mean monthly maximum temperatures (28.5 °C) for the short period (2012 - 2018) are slightly higher than the long term monthly means for 1981-2010 recorded at 28.2 °C which indicates an increasing pattern of temperature over the same shorter period. The data also indicate increased trends of precipitation in recent period. The monthly average rainfall (85.4 mm) observed for the short period of 2012 - 2018 is slightly higher than the monthly average rainfall (83.3 mm) recorded for the long term period, 1981-2010. In addition, there is a gradual rise of mean sea level from 1,992 mm in 2000 to 2,115 mm in 2019.

- ***Potential Impacts of Climate Change***

Climate change is now recognized to have a significant impact on disaster management efforts in Tanzania and pose a significant threat to the efforts to meet the growing needs of the most vulnerable populations (NCCSR, 2019). Climate change is a cross cutting issue affecting a number of sectors including forestry, agriculture, water, lands, energy, infrastructure and others. Anticipated impacts of climate changes are basically on the energy sector, transport sector, and water and sanitation sectors and on trade.

4.2.2 Existing land use

The proposed land use plan generally makes provisions for various land use components namely: academic functions (28.2ha), administrative facilities (2.1 ha), students support facilities (12.3ha), sports facilities (4.1ha), Science park (1ha), community facilities (3ha), staff housing (4.1ha) waste treatment facilities (2.5 ha), main roads (7.1), environmental conservation areas (in steep slopes and valleys) (10.5ha) and investment zone (5ha).The proposed project will be implemented as per land use planning stipulated in ARU master plan 2018-2038.

4.2.3 Existing land cover

The proposed project area is characterized by various features including; normal residential buildings, small farms, grazing areas, shallow wells as sources of water and some abandoned sanitary facilities. More features are concentrated in the Eastern part of the area stretching through the Northern direction. However, the large portion of the project site is covered by different species of trees and grasses. Both natural trees like *misambwa, mkoma, mvuyo, mfuku* and acacia where the artificial trees includes; mango trees, eucalyptus and guava.

Also, the area has existing road traversing the area from Kamanga to Karumo, access routes from the Southern part to North-West part while other access route emerges from the Sothern exit part of the project area to the North East part of the site, not only that there is electricity infrastructure passing through the area along Kamanga-Karumo road and the large part is thick shrubs which cover the North East part (the hilly area). *The implementation of the project (ARU Mwanza Campus) entails the clearance of natural vegetation and distortion of the land cover for some portions of the project site due excavations and leveling of the areas for setting out buildings.*

4.2.4 Topography

ARU Mwanza campus is characterized by gently and undulating surface with disconnected valleys, hills, relatively flat areas and sloppy areas as indicated on the digital elevation model (Figure 4.2). Administratively, it is located within the highlands of Sengerema District, which lies from 900m to 1300m above sea level. Both high- and low-land areas characterize the site. The lowest part at the project area is 1140m *amsl*, while the highest is 1175m *amsl* as recorded from the topographic survey of the area. The highland parts of the project site are both North-East and North –West parts of the area. The Southern part of the project site has medium elevations. The current built up area is situated on an undulated area towards the hilly part of the site. *The topography at ARU Mwanza campus portrays the potential for natural storm water drainage and rain water harvest systems. Infrastructure design may consider to utilize this potential while conserving the environment at the campus. In addition, the presence of valleys imply that storm water produced at the University will flow towards lowland valleys. They may also guide the design of water retention ponds, storm water drainage and choice of location to set up waste water treatment plants.*

4.2.5 Soils

The surface soil of the proposed site is characterized by sandy soils derived from granite, red loamy derived from limestone, and black clay soils. The soil characteristics based on Lead, Copper, and Chromium tends to vary in levels from one point to another. The site is partly surrounded by rocky hill to the eastern side. According to Geotechnical study the subsurface soil is characterized by dry, loose, light brown silty sand with some organic content at a depth of 0-0.3m. The moist, loose to medium dense, light reddish brown silty sand at the depth of 0.3m to 1.0m. From 1.0 – 1.9 m, the soil is a moist, very stiff, Greyish brown sandy silty clay with some gravel. At the depth between 3.0 to 3.5 m, a moist, very stiff, whitish yellowish brown gravely silty clay layer. *Generally, the geotechnical study has affirmed that the site is suitable for construction of the proposed building blocks as the soil has the required strength to bear the buildings' load. However, the undercut or stabilization may be required to achieve the same.*

4.2.6 Soil erosion potential

Physical observation revealed that soil erosion was evident in the Western part of the proposed site. This is attributed by sand mining activities conducted by village community. The major type of soil erosion observed at the site is rill erosion as small channels were observed. *The construction of the proposed buildings shall increase storm water volume. It is probable that the slopes and the erosion will continue to grow, and multiple rill erosions may merge into one very wide valley which will hamper the other land development activities at the campus. This implies that the effective soil conservation measures and proper storm water management methods are needed during project implementation.*

4.2.7 Hydrological characteristics of Ardhi Mwanza campus

The Campus site, as it is for the whole Sengerema District, is located within the Lake Victoria basin, which defines the catchment of Lake Victoria. The Chamihigwa seasonal stream collects surface runoff from the site to the Lake. The quality of water collected from three sampling locations shows that water has high turbidity, Amonia Nitrate and colour above TZS standards. The highest levels were found in the sample collected from the pond followed by Stream and lake. This is due to high organic matter from the proposed site. The primary runoff flow during the rainy season moves from South East to North West of the site. The wet zone of the campus site is between contours 1140m and 1150m amsl. This implies that 1650.sqm area of the site is water lodged during the rainy season which needs to be controlled by good drainage design. *The construction of the building structures at the campus contributes to impervious surfaces leading to higher generation of surface runoff that need more attention in their management.*

4.2.8 Air Quality

Through literature review, the team was able to establish online published ambient Air Quality Index (AQI) for Mwanza Region. Data on current air quality conditions in Mwanza with information on the main pollutants and the levels of each of them. The data is shown using the standard established by the EPA Environmental Protection Agency. Based on the figure, the forecasted AQI is perceived as unhealthy for sensitive groups (i.e. children and adults performing physical activities and people with respiratory diseases. This group is recommended to avoid excessive and prolonged physical exertion outdoors. However, the risk is only high for $PM_{2.5}$. Monitoring data reports a $PM_{2.5}$ concentration in Mwanza to be 2.6 times the WHO annual air quality guideline value.

With regard to the rest of the listed pollutants, the quality of air was to be *good* (*air pollution poses little or no risk*). However, higher ambient concentrations could be measured in

ambient air around specific emission sources i.e. industrial areas, and waste disposal area. Specific baseline air quality data were established through physical measurements at the ARU Mwanza Campus site, in seven (7) locations shown in Table 4.4.

Ambient Dust Levels

Results of dust particulate measurements are presented in Table 4.4. The average measured ambient concentration of $PM_{2.5}$ and PM_{10} ranged between (7.7 - 15.5) µg/m^3 and (10.7 - 22.1)µg/m^3, respectively, both below the Tanzania and the WHO standards.

Table 4.4**:** The recorded PM $_{2.5}$ and PM $_{10}$ concentrations

Location	**Site and GPS Coordinates**	**Dust µg/m^3 (for 15mins)**	
		$PM_{2.5}$	PM_{10}
Village area (northern side)	Latitude: -2.51068 Longitude: 32.80865	9.7	13.6
Village area (eastern side)	Latitude: -2.52019 Longitude:32.81650	9.8	14.1
Secondary school (southern side)	Latitude: -2.52129 Longitude:32.81682	8.9	13.1
Village area western side)	Latitude: -2.52067 Longitude:32.80720	15.5	22.1
Within the campus site	Latitude: -2.51997 Longitude:32.81173	7.7	10.7
Within the campus site	Latitude: -2.52019 Longitude:32.81650	25.8	19.5
Within the campus site	Latitude: -2.52053 Longitude:32.86710	20.2	15.2
Local standard: TZS 837 Parts 1, 2 and 3 (EMR , 2007) [µg/Nm^3]		n.m	60-90
International Standard WHO: [2005] [µg/Nm^3]		25	50
IFC Guidelines and National Environmental Standards Compendium General Tolerance Limits for Environmental Noise(1) of 55 dB(A			

Source: Site measurements, 23rd September 2022

Ambient Gaseous Pollutants levels

The fugitive sources of pollutants includes at the site are cars and motorcycles incidentally traversing the site (via the Karumo road), and probably smoke from nearby cooking stoves. Ambient air quality was measured in terms of concentrations of NOx HS, SO_2, CH_4 and CO_2. With were below detectable limits. The percentage concentration of CH_4 varied between (2-3)%, probably emitted by natural sources such as animals and decomposition of organic matter. These results is an indication of the good air quality at the site, which had no any visible sources of air pollution. The main Noise receptors would be the adjacent residential area. However, the closest residential in the adjacent the Kamanga and Karumo village Centre, including the Nyamatongo secondary school, which boarders the site.

Relevant meteorological conditions

Relevant meteorological conditions were also measured on site, to assist in air quality data analysis. These include:

Weather	*Clear day*
Mean Temperature	*27^0C*
Humidity	*46%*
Wind	*9.9. km/h*
Pressure	*1008 mbar*

4.2.9 Noise Levels

There are no human activities with potential for noise generation at the proposed site. The main source of noise is from motorcycles using the Karumo road, transecting the site. The road is passable throughout the year. Recorded noise levels are basically form wind, birds and animals grazing at the site. Noise level at the site ranged from 40-47 dBA. This is in comparison to the IFC Guidelines and National Environmental Standards Compendium General Tolerance Limits for Environmental Noise (1) of 55 dB(A) for the day, set for mixed residential land use. The main Noise receptors would be the adjacent residential area. However, the closest residential in the adjacent the Kamanga and Karumo village Centre, including the Nyamatongo secondary school, which boarders the site (Table 4.5).

Table 4.5**:** Thenoise levels

Location	**Site and GPS Coordinates**	**Average Noise dBA**
Village area (northern side)	Latitude: -2.51068 Longitude: 32.80865	43.4
Village area (eastern side)	Latitude: -2.52019 Longitude:32.81650	41.3
Secondary school (southern side)	Latitude: -2.52129 Longitude:32.81682	47.0
Village area western side)	Latitude: -2.52067 Longitude:32.80720	47.1
Within the campus site	Latitude: -2.51997 Longitude:32.81173	46.3
Within the campus site	Latitude: -2.52019 Longitude:32.81650	47.2
Within the campus site	Latitude: -2.52053 Longitude:32.86710	40.1
Local standard: TZS 837 Parts 1, 2 and 3 (EMR , 2007) [µg/Nm^3]		
International Standard WHO: [2005] [µg/Nm^3]		
IFC Guidelines and National Environmental Standards Compendium General Tolerance Limits for Environmental Noise(1) of 55 dB(A		45

Source: Site measurements, 23rd September 2022

4.2.10 Potential natural disasters risks

The proposed project is at risk of climate change and climate variability risks. The rainfall trends at Mwanza where the project is going to be implemented has been erratic for the past decades leading to food insecurity and loss of natural springs. On the other hand, there is evidence of the decline of environmental resources around the project area routed by climate change and increase of human pressure on natural resources. *The proposed project shall attract more people in the project area which my compromise water and food availability. The location of the proposed site is influenced by Lake Victoria water level fluctuations. The rise of Lake Victoria water level due to rainfall and other natural factors not yet known has been leading to outflow and flood occurrences in the middle part of the proposed site. The proposed project shall increase the water level due to generation of storm water flowing towards the middle part of the site hence intensifying the flood occurrences.*

4.3 Biological Characteristics

Data from satellite image show that green space which includes plants at ARU-Mwanza campus covers about 1,630,508 square meters, grey surface (Roads-unpaved and buildings) covers about 23,811 square meters and blue pace (shallow wells) has a coverage area of

2,491 square meters. The estimated areas include the existing roads and their reserved areas. The project area has no native large animals, only domestic animals from nearby communities coming for grazing and drinking water were observed. The description of vegetation characteristics of the project area is provided in the subsequent section.

4.3.1 Type of habitat

The type of habitat exist at ARU-Mwanza Campus is modified habitat based on the IFC Performance standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012). Most of its area has pad fields which indicated that the area prior to be owned by Ardhi University was used for agricultural activities implying that its natural state has been altered. This was also testified by the individuals living near by the site during the consultation meeting to use the same land for production of pads, cassava, sweet potatoes and maize. In addition, its large area consists of grasses and it also it has exotic species. Also, according to Hamilton (1989), based on the botanical assessment conducted most species found are the species grows better in lowlands or submontame *(*Species occurring at altitudes of between 800 and 1,800 above sea level).

4.3.2 The Flora

The botanical survey found that, the vegetation types of the project site are composed of 22 species with high diversity plant species of different life forms including climbers, herb, grass, shrubs and trees (Table 4.6). The area is dominated by trees species which account for 43% of the vegetation types found in the proposed construction area, followed by shrubs (29%), herbs (14), grass (10%) and climber which accounts for 5% as indicated in Figure 4.7. Though the results showed that the area has two types of grasses but their coverage in terms of land space is larger compared to other species. These grasses are scattered throughout the site.

Table 4.6: Types of vegetation types identified in the proposed construction areas

S/N	Vegetation type	Botanical Name
1.	Shrubs	*Senna singueana,Lippia ukambesis,Lantana auleata,Psidium guajava,Lantana camara, Grewia bicolar*
2.	Herbs	*Ocimum Basilicum,Agave sisalan, Hoslundia opposita,*
3.	Trees	*Ormocarpum trichocarpu, Eucalyptus globulu, Acacia robusta,Ficus sycomorus,Euphorbia candelabru,Euphorbia tirucalli,Mangifera indica,Acasia nilotica,Acrocarpus fraxinifolius*
4.	Climbers	*Cissus rotundifilia*
5.	Grass	*Digitaria Sanguinali and Cynodon dactylon*

4.3.3 Vegetation categories in the study area

Vegetation is an integrator of environmental factors in that it reflects the climatic, physiographic, seraphic and biotic features pertaining to the land on which it grows. An understanding of the vegetation and plants of an area can therefore give good insights into the agricultural or biological potential of that area. Some land uses also depend directly on the vegetation resource and in this case an inventory of vegetation is obviously of great importance. In the project area, a total of three main vegetation categories have been classified, namely; Woodland, Thicket woodland and open bush land.

Woodland

This vegetation category is characterized by trees and herbs, and it was found in the area where estate and warehouse, and multipurpose hall are proposed to be constructed. The area had more than 200 *Eucalyptus globule trees* which are exotic to the site integrated with

Agave sisalana. The Eucalyptus globule trees and *Agave sisalan plants* were planted by local community in their farmland for the production of timber and sisal fibers, as a demarcation to indicate the boundaries between farm lands.

Thicket woodland

This vegetation type is characterised by an assemblage of lower bushes with emergent trees and shrubs, and also patches of grasses. This has been observed in the area where administration block, departmental building, student hostels, and staff houses are proposed to be constructed. Common shrubs and trees include *Ficus sycomorus, Psidium guajava, Acasia nilotica, Senna singueana, Lantana camara, Lantana auleata* and others. This vegetation type supports the lives of the IUCN least concerned plant species.

Grassland with or scattered trees

This vegetation category is being dominated with grasses with scattered tree and bare land and it covers more than 50% of the vegetation areas. This type was observed where the cafeteria, classrooms, playground, student centre and botanical zone are proposed to be developed. Dominant trees observed were *Eucalyptus globulus, Mangifera indica and Acacia nilotica.* The patches of grassland are dominated with the grass species of *Digitaria Sanguinalis* and *Cynodon dactylon*.

4.3.4 List of exotic and endemic species

The database of LEAP Master-1996 was used to screen for endemic plant species occurring within the project area while the list provided by NAFORMA assisted to identify non-native species (exotic). Most of the species identified are native (76%) the rest are exotic species (24%) while no endemic and near endemic species were identified at the site. The exotic species include *Agave sisalana, Eucalyptus globulus, Psidium guajava, Mangifera indica, Mangifera indica,* and *Acrocarpus fraxinifolius*. These species were also scattered within the site as it was seen and reported by the local community that they were planted by local themselves who owned the farmlands within the site prior to ARU.

4.3.5 List of IUCN Threatened Plant Species Categories and CITES identified in the area

The IUCN Red list of Threatened Species is recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. In the proposed sites, no species were recognized to be identified in the IUCN Red list as endangered (0%), vulnerable (0%) and near threatened (0%) species, the rest are of least concern (33%), or lack data (5%) and non-evaluated (62%) species. The specie which lacks data identified at the site was *Mangifera indica*. The species of least concern identified are *Acacia robusta, Ormocarpum trichocarpum, Acacia nilotica, Senna singueana, Eucalyptus globulus, Ficus sycomorus, Euphorbia candelabrum, and Euphorbia tirucalli.* These species are scattered through the constructed site, but since they follow under least concerned IUCN red list categories, they do not need special treatment or handling of the same during construction. No specie has been identified to be included under CITES list (Figure 4.1).

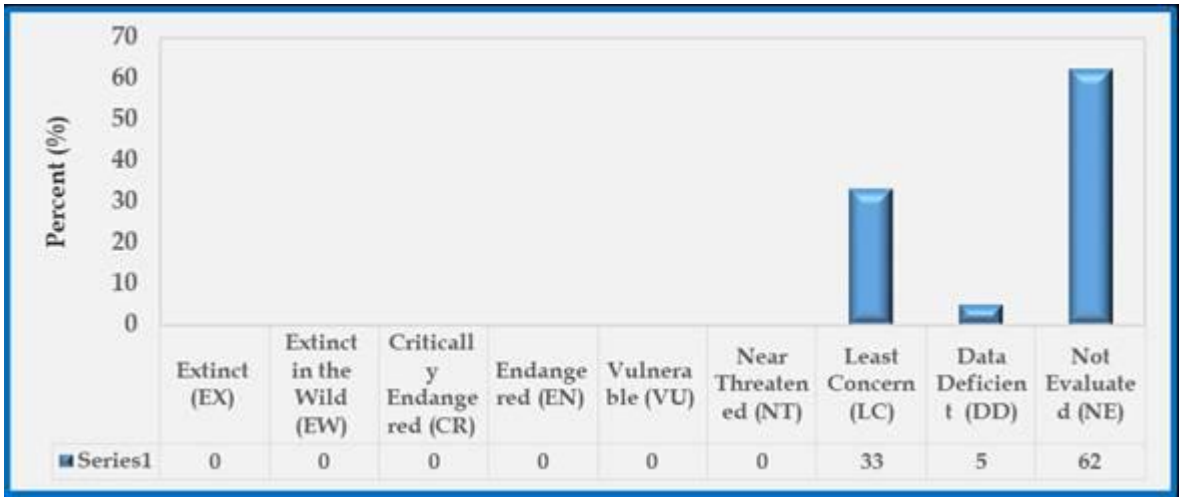

Figure 4.1: Categorization of identified species according to IUCN Red list

4.3.6 Animals

The animals observed during assessment are not included on ether the CITES or the IUCN red list. Most of the animals discovered at the site are domestic animals from nearby community or surrounding residential areas. They usually come to the site for grazing since the site has adequate grasses and shallow wells for feeding and drinking water respectively. These animals include goats, cows, dogs, chicken, birds and others. It was also anticipated that since the site was used for agriculture prior to be owned by Ardhi University and had planted species, it might also provide habitats for different species of microbes for nutrient cycling and also the decomposition of organic materials though the laboratory analysis was not conducted.

4.3.7 Ecosystem and Ecosystem services

The ARU- Mwanza campus site ecosystem provides services (benefits important to human) which have environmental, ecological, social and economic value. The site has been covered by the built environment, vegetation and several artificial water ponds, resulting from sand mining activities. These features provide about 18 ecological services to the community. Table 4.6 shows ecosystem services provided by ARU-Mwanza campus site as per the approach developed by the Millennium Ecosystem Assessment. From Table 4.7, it can be realized that ARU-Mwanza Campus site ecosystem provides useful products (provisioning services), regulation services, non-material benefits (cultural services) and supporting services (services necessary for the production of all other ecosystem services). The benefits provided by the site extend from local to regional and global level. The proposed project will be localised to prevent excessive site clearance.

Table 4.7: Main Ecosystem types and their services

Ecosystem services			Spatial benefits			Example of species
Provisioning	1.	Water	L	R		All and existing shallow wells
	2.	Fuel	L			*Ormocarpum trichocarpum, Senna singueana, Acacia robusta, Lippia ukambesis , Acasia nilotica, and Grewia bicolar*
	3.	Natural medicines	L	R		*Cissus rotundifilia, Ocimum Basilicum, Digitaria Sanguinalis, Cynodon dactylon, Senna singueana, Hoslundia opposite, Euphorbia candelabrum, Lippia ukambesis, Lantana auleata, Euphorbia tirucalli, Psidium guajava* and others
	4.	Fruts	L			*Mangifera Indica, Senna singueana, Ficus sycomorus, Psidium guajava, Grewia bicolar and others*
	5.	Fodder				*Ormocarpum trichocarpum,*
	6.	Fiber (rope and twine)				*Agave sisalana,*
	7	Timber				*Eucalyptus globulus and Acrocarpus fraxinifolius*
Regulating	8.	Biodiversity/biological regulation	L	R		ALL
	9.	Pollination	L			*Grewia bicolar, Lantana auleata,*
	10.	Air quality, temperature regulation and climate	L	R	G	ALL
	11.	Carbon dioxide sequestration	L	R	G	ALL
	12.	Erosion regulation	L			*Digitaria Sanguinalis, Cynodon dactylon and all shrubs*
	13.	Natural hazard –Storm water regulation	L	R		
Cultural	15.	Recreational	L	R		*Acrocarpus fraxinifolius, Euphorbia candelabrum, Euphorbia tirucalli*
	16.	Aesthetics view	L	R		*Euphorbia candelabrum, Euphorbia tirucalli*
Habitat	17.	Nursery services	L	R		
	18.	Genepool protection	L	R		Native species (Appendix 1)

Key: L=Local, Regional and Global

4.4 SOCIO-ECONOMIC SETTING

4.4.0 SOCIO-ECONOMIC AND CULTURAL CONDITIONS

The socio-economic survey documented several activities in the area for people and communities living around. In the area, the dominant social economic activities are small agricultural services. Also, the people in this area engage in other kind of economic activities like retail shops, mama Ntilie, livestock keeping and fishing activities.

4.4.1 Demography

As per the National Population Census of 2012, Nyamatongo Ward had 26,707 people, with 13,441 (50.4%) males and 13,266 (49.6%) females, and a population growth rate of 1.9%. The population distribution in the six villages of Nyamatongo Ward was as presented in Table 4.8. The expect increase in the number of people that are expected to be more 10,000 will increase pressure on the available social services and change the lives of the people of Karumo and the surrounding communities. The Population of Karumo village is expected to triple in the next few years as a result of the ARU-Mwanza campus construction. During construction, the project is expecting to employ more than two hundred (200) people from outside Karumo village. Therefore the village will be having more people than before. The change in population level due to influx of workers and laborers will contribute to the new market opportunities for small, middle and big business persons. This will increase money circulation at the area leading to high income to the local suppliers and service providers.

Table 4.8: Nyamatongo Ward Population Distribution

Sn	Village	Population	Land coverage (Km^2)	Density
1.	Irunda	3,170	18.5	160.0
2.	Ngoma B	3,194	20.1	133.3
3.	Nyalwambu	3,494	20.2	148.8
4.	Kamanga	3,961	7.5	754.5
5.	Karumo	4,024	12.4	126.5
6.	Nyamatongo	7,667	39.2	191.6
	Total	**25,510**	**117.9**	-

Source: Nation Population Census 2012

4.4.2 Education

Sengerema district council, in which ARU Mwanza campus is located, has a total of 105 primary schools; out of these, 98(93.3%) are government schools, and 7(6.7%) are Private schools. The Nyamatongo ward has five Primary Schools and one Secondary school owned by the government. Those schools include Kamanga, Mtakuja, Karumo, Kachuho, Nyamatongo primary schools, and Nyamatongo secondary schools (Table 4.9). However, the ARU Mwanza campus has the potential to stimulate the development of existing educational facilities in Karumo village as well as knowledge dissemination to the surrounding community.

Residences in the project area and surrounding communities do not have sufficient education facilities. In view of this, the influx of people in the project area will increase pressure on the

already limited education institutions and may without the taking of steps to alleviate this place a heavy additional burden on the existing service delivery system.

Table 4.9: Primary Schools Students Enrollment in Nyamatongo Ward

Sn	Name of school	Students enrolment		
		Male	Female	Total
1	Kamanga P/S	333	353	686
2	Mtakuja P/S	408	562	970
3	Karumo P/S	441	470	911
4	Kachuho P/S	423	418	841
5	Nyamatongo P/S	561	588	1,149

Source: Field Survey, September 2022

4.4.3 Health Services

According to Sengerema District Council Strategic Plan (2017-2022), the District council has one District Designated Hospital, 5 Health Centres and 44 Dispensaries. Among the dispensaries, three (3) are located in Nyamatongo Ward. During project life, some of the activities that may endanger the lives of the community members living close to those activities (4.10). This in turn will likely to endanger the lives of the local communities in form of accidents if appropriate measures are not taken. In the areas where raw materials will be taken like sand, stones and water accidents are likely to happen if appropriate measures are not taken on board. On the transportation of raw materials to the site, drivers may fail to observe safety measures along the road something that may result to accidents to other road users like pedestrian, motorcyclist, and bodaboda drivers. Following limited health institutions, health care services are likely to be inadequate to serve the increased population after the commencement of the project.

Furthermore, the influx of job speculators from other parts of Tanzania and neighboring regions will increase interaction, consequently increasing the risk of getting HIV/AIDS infections and other communicable diseases. That, the growth of trading centers in the area will attract different businesses and different people to the extent that the level of prostitution will also increase in the area provided that there will be employees from other areas of the country. Increased prevalence of communicable diseases like HIV/AIDS will likely to happen and consequently cause burden to the existing health services

Table 4.10: Health Facilities

Sn	Health facilities	Number	Ownership		Location	Condition
			Govt.	Private		
1.	Health centre	7	7	-	Sengerema urban	5 Functioning 2 on construction
2.	Dispensary	49	47	2	Sengerema rural and urban	43 Functioning 6 on construction
3.	Pharmacy	1	-	1	Sengerema urban	Functioning
4.	District hospital	2	1	1	Mission ward	1 Functioning
					Mwabaluhi	1 on construction

Source: Field Survey, September 2022

In the Nyamatongo ward, there are three dispensaries, namely Kamanga, Nyamatongo and Karumo, located in respective villages.

4.4.4 Religious Facilities

In the Nyamatongo ward, there are two major types of religions: Muslims and Christians. There are also local traditional believes which are not much popular in the Ward. The Christians denominations include; Roman Catholics, Anglicans, Lutherans, and Pentecostals. In Karumo village, there are ten churches and two mosques.

However, the current religious institutions seems to be enough for the available population which is estimated to be 7,000, and the influx of people and students after the opening of the ARU-Campus in Nyamatongo will likely to cause pressure on these institutions.

4.4.5 Transportation Network

The Sengerema District's Roads cover a total of 3,079.4km. Out of which 47.43km are tarmac, 368.78 are gravel, and 2,663.19 are earth roads. The 370.4km, equivalent to 9% of the total roads, are under TANROAD, while 2,709.1km are under TARURA. About 75 % of the roads are passable for the whole year, and 25 % are not passable during the rainy season (4.11).

Table 4.11: Roads in Sengerema District

Type of Road	**TANROADS**	**TARURA**	**TOTAL**	% of the total
Tarmac road (km)	47.00	0.43	47.43	1.5
A gravel road (km)	323.40	45.38	368.78	12.0
Earth road (km)	0.00	2,663.19	2,663.19	86.5
Total (km)	**370.4**	**2,709**	**3,079.4**	
% of the total	12.03	87.97		

Source: TARURA- Sengerema, September 2022

As highlighted in the preceding sections, the ARU Mwanza campus is accessible by the main road from Mwanza town to Sengerema via Kamanga Ferry. The campus is also accessible via Kamanga-Karumo Road, which passes through the site to Karumo village. The road is unpaved and lacks traffic separation for motorized and non-motorized traffic. According to TARURA traffic counting, the annual average daily traffic number (AADTn) across Mwanza-Sengerema Road is 256.

4.4.6 Telecommunication

The ARU-Mwanza Campus is located 32.81Km away from the terminal point of the National ICT Broadband Backbone (NICTBB) which is located at Sengerema District Hospital. Thus, the connectivity of the ARU-Mwanza Campus to the ICT network infrastructure can be done through Fiber Optic Cable (OFC) from Sengerema District Hospital. Another method of connectivity is through private mobile network operators. It is worth noting that the availability of reliable Information and Communication Technology (ICT) connectivity is crucial to developing digital/innovative campus services to facilitate modern teaching and learning environments.

The mobile network operators providing communications services within Nyamatongo ward, where the ARU Mwanza campus is located, include Vodacom, Airtel, Halotel, and Tigo. Despite

Mobile towers located close to the area, the signal strength varies from firm to weak in some locations. Thus, the site requires improved mobile communications to provide reliable data services to allow interaction within and outside the campus.

4.4.7 Water

The Sengerema Rural Water Supply Authority (RUWASA) is the leading water supplier in the Sengerema District from Lake Victoria. Other water sources include pipe schemes, boreholes, shallow wells, springs, and rain water harvesting. At the district level, there are 467 boreholes, 1037 household connections, 506 domestic and communal points, 750 water kiosks and 24 commercial water kiosks. There are a total of 16 water supply schemes. Six (6) water supply schemes are currently working to make the access to clean and safe water in Sengerema district 57%. Eight (8) schemes are under construction, and at their completion, they are anticipated to cover 85% of the total demand (RUWASA-Sengerema, September 2022).

The water supply network in Sengerema serves 128 villages out of 158 villages in the district. Karumo village, where the ARU Mwanza campus is located, is 1.5km from the storage tank ($1000m^3$) of the water supply scheme under construction. The Karumo village is among the Sengerema villages planned to be served by the water scheme under construction. The ARU-Mwanza campus site is within the water scheme catchment area. On the Eastern side of the site, there is one pipe of HDPE 63, the HDPE 80 pipe traversing the site from Northern to Southern, while the HDPE 150 pipe passes on the North-West side of the site. Also, there is a higher water table in some parts of the ARU-Mwanza campus site. The neighboring communities are using shallow wells. The area's water table provides a potential groundwater source for borehole drilling.

4.4.8 Power

According to TANESCO –Sengerema, the power demand falls under medium distribution (33KV). The power demanded in Sengerema district is 5 - 6.5 Megawatt which is lower than the power produced. The medium transmission (33KV) line passes across the ARU-Mwanza campus site. However, the other source of power at the project site includes kerosene, solar power, charcoal and firewood.

4.5 Economic Context and Analysis of Economic Activities in the Project Area

Fishing activities are the dominant economic activity in Karumo Village. Other economic activities include farming, livestock keeping, and business. About 70% of the residents depend on fishing, 15% on farming activities, while 5% depends on livestock keeping, and the remaining 10% on businesses and commerce (Karumo village Report 2021).

4.5.1 Fishing Activities

The economic base in Nyamatongo ward is fishing due to the presence of Lake Victoria. Fishery activities are primarily conducted along the shore areas of Lake Victoria by using traditional equipment such as netting, light attraction and hooks. The species available are Nile perch,

Tilapias, and Sardines. Fishing products are used for domestic consumption. Moreover, large-scale fishing is also found in the Karumo village. Local investors operate the fish farms and sale fish products beyond the Mwanza region. Therefore, the fishing sector contributes to the local community's income and the district's economy in general. Nevertheless, fishing as the main economic base of Karumo village encounters challenges such as insufficient capital, unreliable market, and poor transportation infrastructures.

4.5.2 Farming Activities

Karumo sub-ward farming activities are both small and larger scale. Farming is conducted mainly seasonally in the area. However, there is small-scale irrigation taking place. The ward has the potential for the cultivation of different crops, such as food and cash crops. Food crops include rice, maize, cassava, sweet potatoes, and millet, while cash crops include cotton and tomatoes. Most farmers use hand hoes, and few of them use tractors. Existing potentials for crop production include the presence of human resources, water sources and the northern plateau, which provide suitable conditions for crop production. Farming activities' challenges include poor infrastructure, poverty, soil erosion, diseases and pests, price fluctuation and climatic change. The effects of climate change have been felt mainly by the farmers due to their dependence on rain-fed agriculture. The changing and unpredictable rainy seasons have significantly affected their ability to plan their farming activities. It brings the need for more exploitation of irrigation farming. It is estimated that intensified irrigation can increase agricultural productivity depending on the crops and incomes.

4.5.3 Livestock keeping Activities

The livestock population in Nyamatongo Ward is estimated to be 4,440, which include cattle (2,550); goats (1,204); pigs (74); chickens (612) (SDP, 2017). Within Nyamatongo Ward, cattle are the dominant livestock in the Ward, followed by goats, chickens and pigs. Due to the lack of land use planning in the Ward, there are conflicts between farmers and livestock keepers. Moreover, livestock keeping is facing climatic change-related challenges and a shortage of extension officers.

4.5.4 Commercial Activities

Nyamatongo ward centre harbours both formal and informal commercial activities. Besides, it includes a weekly market which takes place on Saturdays. At the Nyamatongo centre, there are shops for households' domestic goods. Transacted goods include agricultural products found within the Ward and manufactured goods from Sengerema town and Mwanza city. The Nyamatongo commercial centre serves the purpose of Karumo village. Even though business and commerce is a promising sector for Karumo village residents, the sector operates at a minimal scale due to a lack of market at the village level.

It is envisaged that the establishment of ARU campus at Karumo village; Sengerema district will attract a number of investors from within and outside surrounding communities to invest in meeting the needs of the increased population as well as people seeking for employment in the

area. This is likely to enhance the development of the centers at surrounding areas. It is also expected that service providers such as food venders and general viosks (dukas) may be established and increase to provide services to both students, investors and staff working in the project site.

CHAPTER FIVE

STAKEHOLDERS' ENGAGEMENT AND ANALYSIS

5.1 Introduction

Stakeholder engagement is the continuous and iterative process by which the Borrower identifies, communicates, and facilitates a two-way dialogue with the people affected by its decisions and activities, as well as others with an interest in the implementation and outcomes of its decisions and the project. It takes into account the different access and communication needs of various groups and individuals, especially those more disadvantaged or vulnerable, including consideration of both communication and physical accessibility challenges.

5.2 Goals of the consultation process

The stakeholders' consultation under this construction project of Ardhi University-Mwanza Campus was conducted for the following reasons;

i. To identify stakeholders and build and maintain a constructive relationship with them, in particular project affected parties.
ii. To assess the level of stakeholder interest and support for the project
iii. To enable stakeholders' views to be taken into account in project design and environmental and social performance
iv. To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance
v. To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.
vi. To provide project affected parties with accessible and inclusive means to raise issues and grievances and allow Borrowers to respond to and manage such grievances

5.3 Stakeholder Identification

The study identified stakeholders to be consulted and involved throughout the project life cycle. Stakeholders' identification in this study was done through a continuous and comprehensive brainstorming process to collect an exhaustive list of people/ groups or institutions that are likely to be affected by the project, affect the project, influence the direction of the project or have those having interest over the project. Table 5.1 shows stakeholders identified and level of interest.

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

Authority	Role of the stakeholder	Rate of Interest
Mwanza Regional Administrative Secretary	Political and administrative issues	**HIGH**
Sengerema District Council	Overall advice on both professional works (land, Planning, environments, social, economics) with regards to the execution of the project at ARU-Mwanza Campus	**HIGH**
Tanzania Commission for Universities (TCU)	Provides advice on all work related safety measures to the project	**LOW**
Occupational Safety and Health Authority (OSHA)	Oversees the provision, availability and control of power in the project area at Mwanza Campus and the surrounding communities of Karumo and Kamanga villages	**LOW**
Tanzania Electricity Supply Company (TANESCO	Power supply	**HIGH**
RURAL Water and Sanitation Agency (RUWASA)	Plan, design, construct and supervise rural water supply projects	**LOW**
SEUWASA	Design, maintenance, emergency repairs, spot improvements, rehabilitation, upgrading and construction of roads	**LOW**
TARURA	Provide overall guidance, advice and management of fire and rescue	**LOW**
Fire and Rescue Force		**LOW**
Lake Victoria Basin /HQ	Provides networks which offer a comprehensive range of telecommunication services	**HIGH**
TTCL	Data provider	**HIGH**
Nyamatongo Ward	Beneficiaries of the new campus in Mwanza	**HIGH**
Local Government Members and Community Members of Karumo and Kamanga Villages	Providing information to inform environmental and social plans, baseline information and representation of various groups at local level.	**HIGH**
NON-STATE ACTORS (NGOs, CBOs, FBOs) and PRIVATE SECTOR	Employment opportunities associated with project	**HIGH**
Kamanga Ferry Management Faustine Elikana – Manager Kamanga Ferry	Transporter	**HIGH**
ARUSO	Building users	**HIGH**
ARU staff	Building users	**HIGH**

5.4 Stakeholder engagement Approach during Preparation Phase

During this period the consultations, presentations and discussion with the above-identified stakeholders were conducted (see 5.1 above). In the presentations, the team shared with these stakeholders timely, relevant, understandable and accessible information in a culturally appropriately manner free of manipulation, interference, coercion, discrimination and intimidation. During this stage, the team collected the views and opinions on project design, risk, and impact and mitigation measure associated with the Project.

5.5 Stakeholder engagement Approach during Preparation Phase

The stakeholders view and concerns are summarized in **Tables 5.2a-c.**

Table 5.2a: Stakeholder Views

Institutions /VENUE	Views/Observations
TANESCO	1. The project shall be served by 33kVA line and is not utilized fully. This guarantees for reliable power supply to the proposed campus 2. There is a need to have a standalone transformer for the campus so as to maintain the future power supply considering that the proposed campus shall attract more people in the village hence more load.
SEUWASA	3. The project area has enough water and is being served by RUWASA as it is found in the rural setting of Sengerema 4. The project will be under SEUWASA once it is urbanized.
TARURA	5. The project is good for the benefit of the current and future generations of the project area. However, the project shall limit the accessibility of the people to the project area 6. The University should officially inform theTARURA office concerning the construction of the proposed road, and arrange the day for the discussion at the site
FIRE AND RISK FORCE	7. Fire and Rescue Force is the stakeholder to the project due to the nature of the buildings to be constructed. It is wise to engage the office during planning and implementation of the proposed project
RUWASA	8. The RUWASA office has an ongoing water supply project at the proposed area and the nearby villages. It is 50% to its completion and the contractor is expected to complete the project on January 2023. 9. The design of the project shall ensure reliable water with good pressure to the proposed project components. The project shall have a distribution water tank of 1,000,000m^3 to be located at an elevation of 1260m
Police Force	10. The presence of the university will increase crimes within and outside the campus. The university is advised to have a police post within the campus.
SENGEREMA DC	11. The dumpsite is located at 24km from the proposed site on the way to Sengerema but it is not in use yet.Thus, crude dumping is still being done. 12. The waste water stabilization pond is located in Sengerema and is being used 13. Mwanza seems to be closer in terms of waste dumping; however, it is expensive as it needs to hire a ferryboat for transporting waste. The best option is to transfer waste to Sengerema District waste management facilities. 14. The District has no trucks for solid waste management. The University is advised

	to arrange for its own truck. 15. The District Council has incinerator for burning the hazardous wastes 16. Waste management at village level is under arrangement of ward office. 17. Some villagers have visited the District Office to seek advice and procedure for shifting the tombs present at the proposed site.
	18. The proposed new campus should focus on short course training to increase skills to fishermen and farmers as majority of them did not manage go to formal training. 19. The university may wish to have laboratories and or demo-farms for fisheries, animal keeping and agriculture 20. The University should have enough community outreach programs for in order to help the community around the project areas to harness the knowledge from the university 21. The University should visit Moshi University College when developing curriculum for envisaged diploma programs for agriculture
Regional Commission Offices	22. Establish of Mwanza ARU campus will have several advantages to the local community and Tanzania at large 23. The programs are well designed capturing resources available in Mwanza 24. Skill development training will minimize the employment challenges 25. You need to come up with a solution to capita investment for graduates of the programs you want to establish 26. Value addition of fish and agricultural products is very important considering that most of fruits and vegetables are seasonal, hence during the production season they flood the market leading to significant amount perishing because of the lack of market
Regional Secretary	27. We fully agree with the establishment of the campus and its programs 28. This will assist in training our community member to increase efficiency in their fishing and farming activities 29. Agribusiness will help our community members to minimize wastage of their produce 30. Increase of population is likely also to come with negative impacts to the community, for example our norms may be lost
Lake Victoria Basin /HQ	31. The Basin recommends the project. It will bring massive socio-economic impacts to Sengerema District. 32. The selected course content will have an impact on the local economy through the enhancement of agriculture and fishing technologies; 33. The food preservation and processing program is very useful, as it will help to reduce the amount of food rot; 34. The design team recommended to conduct a study tour to Rock bay hotel, to see the design of a storm water management facility.
TTCL	35. Introduction of ARU Mwanza Campus will increase the opportunity for secondary school leavers to pursue further education 36. The area can be served with Radio waves or fiber Optics for internet services, however, radio waves is recommended as a short tem solution before fiber optic is connected to the area. 37. TTCL has the capacity to provide the internet connectivity as per institution

	demand
Nyamatongo Ward	38. The contractor should use the local artisans and cashew labours from the local community 39. The villages surrounding the projects area will benefit from social responsibility to be offered by the institute
Tanzania Commission for Universities (TCU)	40. The site layout plan was not submitted to TCU's representative which made it difficult to assess some of the important aspects including drop off area; landscaping (Hard and soft Landscaping); main entrance lobby; higher level leaders parking and circulation, relationship between one building and another, sewerage system (Central sewerage or Soak and Septic Tanks), Emergence area, boundary and others. 41. In all the buildings vertical fins should be offset from the building wall. 42. Some buildings, namely, classrooms, laboratory, seminar rooms, lecture theatres and lecture rooms should be equipped with noise abatements (Acoustic Materials) for noise and sound control (noise pollution) during operational 43. The number of latrines/toilets should should be according to the standards (See the Latrine option manual) which indicate ratios for public/institutional toilet 44. The door for disabled toilet should be open to the corridor for easy accessibility, and should have the recommended size according to disabled toilet which allow even the wheelchair to pass. 45. This design of dispensary should follow the recommended National Standard for Health Care Facilities Design (check Healthcare Facilities Guidelines). 46. According to standards, the dispensary should have an area which is open to the sky (Open Courtyard) for natural air circulation. This area should be provided where applicable. 47. The orientation of the lecture rooms affects the ventilation system and somehow might result in noise pollution. Therefore, there is need for design review of all Lecture rooms they need to be separated. 48. The design of lecture theatres should consider architectural acoustic design to create designs that enable efficient distribution of desirable sound and the exclusion of undesirable sound (noise). 49. The design should take into consideration the requirements for people with disabilities. 50. The vertical fins should be offset from the building wall and remove unnecessary building element to reduce construction cost and at the time to achieve building aesthetics. 51. The size of the courtyard open area should be increased to serve for its purpose i.e. allow more air circulation and use of natural light within the building or removed to create more usable space.

	52. The main open entrance lobby should also be provided to create covered drop off area
PRIVATE SECTOR	53. They support the project for construction of ARDHI University campus at Sengerema District, Karumo Area 54. Kamanga ferry is among the stakeholders that will benefit from this project through transportation services it provides 55. The project will increase movements from various demands, activities and material requirements which will need transportation through ferry 56. Every time when there is a big project around, we experience influx of people and increase of transportation movements 57. We also noted this when a new Sota mining started where they were transporting about 10 vehicles daily. We expect similar situation when implementation of ARDHI Campus starts 58. We expect to get many customers/passengers/cargo transportation from this project for material supply, workers, contractors .This was also experienced also when the ARDHI University paid compensation during land acquisition process. Few days after compensation payments there were high traffic of people, cars, material transportation. 59. There were influx of people doing shopping of construction materials and family outgoings for shopping 60. There was a major increase of movements of people and material transportation. Kamanga Ferry has adequate vessels for transportation activities and we will provide service affectively 61. The Kamanga Ferry have plan to construct student hostels when the University starts that will enable to provide students accommodation 62. There will be influx of people in the area which will need various services including transport services 63. We also have speed boats which a packed ready for emergency cases which currently are not properly working, but when the University campus starts, we will strengthen the speed boats service for the University also.The speed boat are there 24 hours ready for emergence cases such as transporting emergence patients' mid-nights when ferry services are not available particularly for pregnant mothers, etc. to rush then to the referral hospital at Bugando. 64. There will be increase of HIV/AIDS also because of increase of businesses, money circulation, economic growth 65. There will be also increase of pollution to the environment from the influx of people, activities and movements 66. In Karumo Area where the project will be located there is no waste water treatment system such as ponds, etc. hence there will be a need for consideration of waste water treatment services 67. The existing City council dumpsite for Mwanza city is accessed from Sengerema

	by ferry transport, which means they will need to transport solid waste into the ferry for disposal. This may not be a good ideal and they need to find an area for waste disposal 68. We recommend the ARDHI University to construct an up-to-date campus with full consideration of environmental protection and conservation and should consider using recent technologies in construction and various services which will be needed.
ARUSO	69. There is a need to build enough houses for staff members so as to ensure improvement of the working conditions 70. Dispensary should be among the priority buildings 71. There is a need to build fence around the campus to ensure Security to workers living in quarters, 72. Air pollution is expected during construction, therefore responsible people have to be keen 73. Internal roads should be well constructed (size and quality) 74. Street lights have to be fixed 75. Police post has to be constructed 76. Religious buildings be constructed if possible 77. Internal Transportation services be available
ARU STAFF (Both Academic and Administrative Staff)	78. That the new projects should use modern technology for controlling wastes and not rely on the traditional and widely used method of septic tank 79. The communities around the University should be allowed to use pathways/roads that cuts across the University at all times of the project 80. Local communities should be given priority in terms of employment and service provision during the implementation of the project 81. The contractor should be encouraged to use local supplies surrounding the project site 82. The University should cooperate with local authorities to implement participatory security systems 83. There must be a mechanism to be established between the University and surrounding local communities for feedback and information sharing about the project 84. The University should rehabilitate/upgrade one of the following roads; the Kamanga B - Mtakuja- Chigolo – Karumo road, Chemagati – Chogoto or Mtakuja – Chigoto road, for people to pass, to avoid disturbance of trace passing the university premises 85. The village has a health center lacking basic infrastructures such as operating theater, wards therefore the university should build a dispensary to help reduce the shortfalls. 86. Security issues should be given high priority. Building a small Police post at the campus (an Outpost) is paramount

Table 5.2b: Stakeholder Views documented during Village meetings

SN	Stakeholders	Comment	Response by Consultant
1.	i. Kamanga Village leaders ii. Secondary and primary school representatives (teachers)	1. The Village leadership is aware that Ardhi University acquired land from the village authority, and some from three clans in Karumo Village.	Noted
		2. There is a TARURA road, traversing the ARU site. Since the operation of the Campus will results to restrictions on the use of the road, the Village authority requested the University to rehabilitate/grade the Kamanga B -Mtakuja-Chigolo – Karumo road.	The requested is noted, will be communicated with the University management
		3. Other two alternative roads to Karumo (from the village) were mentioned -Chemagati – Chogoto - Mtakuja – Chigoto	
		4. Is there going to be any compensation resulting from the road(s) rehabilitation?	According to the village authority, the roads have been there, and are maintained by TARURA. Grading could not result into any compensation
		5. The site in question is in Karumo Village. Why is Kamanga village consulted?	Kamanga village is going to be on of the beneficiaries of the project. Further, there could be people owning land in Karumo Village.
		6. The mentioned academic courses to be taught by the University will highly benefit the community, which is composed of farmers and fishermen.	
		7. The village will benefit from selling of agricultural products, and will open shops, stationery and related facilities.	
		8. The existence of the Campus will boost the village economy.	
		9. Will the project offer employment opportunities to the local community?	Yes, the project will offer non skilled jobs to the local community

	Representative from the Village health Centre (Village Doctor)	The village has a health center has no capacity to service the Village. It lacks basic infrastructures such as operating theater, wards. The health care is requesting the University to back up the village through its CSR	Noted, will be communicated with management. However, the project will establish a dispensary at the campus, to be used by the University and the community
	Village Police Post (represented by a local Police officer)	The Campus establishment will consume millions of money, and will have a lot of valuable materials and infrastructure. Security issues should be given high priority. It is suggested to include a small Police post at the campus (an Outpost)	Taken for consideration in the project design

Table 5.2c: PAPs Views at Karumo Village

S/No	Comment	Response by Consultant
1.	Land was restricted to be used from 12.8.2018 after it was taken from the villagers but they were delayed with compensation process until two (2) years later therefore due to inflation and impacts of COVID 19 pandemic the money was not enough to establish their own new settlements	The requested is noted, will be communicated with the University management
2	PAPs wrote an appeal letter to Sengerema DC regarding their doubts on the compensation process buy todate they have not received any feedback	Noted, will be communicated with management to provide details to PAPs.
3	The compensation process was done but PAPs were not given any document indicating items compensated and the actual compensation cost. PAPs request the university to provide the document indicating what item has been compensated and the actual amount	Noted, will be communicated with management to provide detailed compensation documents to PAPs.
4	Request the owner of the land to allow the villagers to take materials from the properties that are within the campus	Noted, will be communicated with ARU management
5	Roads connecting the village to other areas have to be added because the existing roads will have restrictions during operation phase of the project	Noted, the design and the master plan of the site have taken the issue on board
6	The village is happy with the upcoming project in their village and they hope to benefit a lot from the project	Noted

5.5 Stakeholders Engagement during Implementation

During Project implementation, engagement activities will be undertaken in relation to project activities under Component 1: Transforming Ardhi University with a focus on priority disciplines for Economic growth; Component 2: Strengthening management of the Ardhi University system; and Component 3: Support for Project Coordination and Management. At this stage, the study will conduct a number of structured and formal meetings, focus group discussions, community meetings, one to one interview, distribution of information (pamphlets) and site visits that will involve a number of stakeholders (Table 5.3). The timing for the conducts of the above meetings will be determined by the progress of the project implementation and when seems necessary to invite stakeholders for their comments and observation. However, the sharing of information and progress with stakeholders will be subject to scrutiny with regards to the kind of information to be shared and how the same will be communicated to both stakeholders, PAPs and OIPs. Furthermore, at this stage, the Ardhi University will ensure equal and effective participation from project preparation to implementation stages. To ensure stakeholders' views and concerns are well captured, the SEP will have different methods of collecting information based on their needs i.e. disadvantaged or vulnerable groups.

Table: 5.3: Summary of the stakeholder engagement during Implementation

SN	OBJECTIVE	MESSAGES	MEANS OF COMMUNICATION
PROJECT PREPARATION			
1.	To present the draft SEP (for comment) and final versions of the instruments.	• Presentation of the Project and its implementation schedule • Present potential environmental and social impacts reports and its enhancement and mitigation plan. • Describe Grievance Redress Mechanism • Present a list of identified stakeholders and describe an approach of their engagement.	• Organized public meetings /Consultations based on Stakeholders needs and circumstances (FGD, one on one meetings etc.) • Disclosure on ARU Website • Emailing to respective stakeholders • Email copies of the instruments to Non-State Actors and other institutions. • Sharing of executive summaries in hard copy during meetings • For stakeholders who are illiterate, information will be presented verbally during meetings in local language. • Disclosure of Project documentation in appropriate and accessible manner • The instruments will be disclosed in Swahili language in project offices and hard copies will be accessible to PAPs and OIP.
2.	ESIA / ESMP Preparation and Disclosure	• To inform the preparation of the Environmental Statement/ ESMP etc. and present findings when drafted to all the identified stakeholders	• Face to Face Meetings • Community Meetings • Site Visits based on stakeholders needs and circumstances. • Disclosure on ARU Website • FGD, one on one meetings etc. • Disclosure of Project documentation in appropriate and accessible manner • The instruments will be disclosed in Swahili language at the University, Sengerema district council and in the offices of the identified stakeholders or public meetings
3.	Resettlement Action Plan (RAP) Preparation, disclosure and	• Meetings with affected households as needed to inform the preparation of the RAP, disclosure of RAP and monitoring.	• Face to Face Meetings • Site Visits based on stakeholders needs and circumstances. • Disclosure on ARU Website • FGD, one on one meetings etc.

SN	OBJECTIVE	MESSAGES	MEANS OF COMMUNICATION
	implementation		• Disclosure of Project documentation in appropriate and accessible manner • The instruments will be disclosed in Swahili language at the district council and in household of the PAP
CONSTRUCTION PHASE			
1.	Meeting to Alert stakeholders to the start of construction	• Inform stakeholders on the commencement of construction activities • Provide project Information and education on the risks and impacts, GRM, workers code of conduct etc.	• Public Meetings • Face to Face Meetings • Groups Discussions based on stakeholders needs and circumstances. • FGD, one on one meetings etc.
2.	Alert stakeholders of any new activities and Provide updates on project progress (every month)	• Inform public about any emerging issues; provide information on risks and impacts. GRM, workers code of conduct etc.	• Public Announcements • Focus Group Discussions • Community Meetings • Meetings with village Councils of Karumo and Kamanga
3.	Contact with the Project Coordination Team	• Provide phone number/WhatsApp account and email for stakeholders to submit questions and give out comments	• Meetings with village Councils of Karumo and Kamanga as well as PAP and OIP
THROUGHOUT THE PROJECT			
1.	Information dissemination	• General information on ARU-Mwanza campus HEET implementation	• Posting on bulletin boards; Information leaflets, banners • Outreach activities with Nyamatongo ward communities where presentations, workshops and public meetings will be conducted. • Sharing on ARU social media and website • Information accessible at Sengerema district council
2.	Contact with the Project Coordination	• Maintain website with contact box, email, social media accounts	• ARU's Websites • ARU's phone number for HEET activities and concerns will be

SN	OBJECTIVE	MESSAGES	MEANS OF COMMUNICATION
	Team	and phone number for people to submit questions, comments and concerns.	shared to project sites and all stakeholders • ARU's phone number for HEET activities and concerns will also be found at Sengerema district council

NOTE: The face-to-face consultations with stakeholders will strictly follow national and international guidelines on health and hygiene procedures in order to avoid the spread of diseases including COVID-19 and other respiratory diseases.

CHAPTER SIX

6.0 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF ALTERNATIVES

6.1 Introduction

This section outlines the process of impact identification and assessment of the impacts in each stage of the proposed project. The proposed mitigation measures are outlined in chapter seven of which MoEST through ARU is committed to undertake to prevent or reduce the identified adverse impacts. This study is conducted for envisaging a road map to ensure the investments to be financed under this project are designed and implemented in an environmentally sound and socially acceptable manner that meets both requirements of World Bank Environmental Standards (ESS) and the Government of Tanzania (GoT) legislations.

- Environmental risks and impacts assessment done included: (i) those defined by the WB Environmental Health and Safety Guidelines, EHSGs; (ii) those related to community safety; (iii) those related to climate change (iv) any material threat to the protection, conservation, maintenance and restoration of natural habitats and biodiversity; and (v) those related to ecosystem services and the use of living natural resources;
- Social risks and impacts assessment done included: (i) threats to human security through crime or violence; (ii) risks that project impacts fall disproportionately on individuals and groups who, because of their circumstances, may be disadvantaged or vulnerable; and (iii) negative economic and social impacts relating to the involuntary taking of land or restrictions on land use.

6.2 Impact Identification

Impact identification is a process designed to ensure that all potential significant impacts are identified and considered in project design and implementation. Several 'tools' are available to assist in impact identification. The simplest, and most frequently used, are checklists of impacts, although matrices, network diagrams and map overlays are also commonly used. In this EIA study, a checklist and matrix methods were used. The checklists, which have been developed from previous experiences, provide lists of potential impacts associated with specific activities. They provide a quick method of identifying the impacts and in such help also practitioners to avoid overlooking some of potential of the impacts associated with a particular activity. The matrix provides a rather systematic way of evaluating the identified impacts.

6.2.1 Impacts associated with preconstruction, construction and operational phase

Impacts of the project were grouped into impacts on the physical environment, impacts on the social environment and economic impacts, as listed hereunder:

A: Impacts on the physical Environment

i. Loss of arable land

ii. Loss of biodiversity
iii. Change of habitant
iv. Loss of ecosystems services
v. Acceleration of soil erosion
vi. Generation of liquid waste
vii. Generation of solid waste
viii. Generation of Hazardous waste
ix. Increased runoff/storm water
x. Land pollution
xi. Surface and ground Water Pollution
xii. Air pollution
xiii. Contribution to Climate change
xiv. Noise pollution
xv. Generation of vibrations
xvi. Visual impact
xvii. Increase pressure on natural resources

B. Impacts on Social Environment

i. Employment opportunities
ii. Increase in income generation opportunities
iii. Changes in lifestyle and quality of life
iv. Increased skills and impart knowledge to local communities
v. Increase of academic facilities in Mwanza
vi. Loss of cultural assets and displacement ritual sites
vii. Change of habitant
viii. Population increase
ix. Increased pressure on social services
x. Increased traffic flow
xi. Increased risks of road/ ferry accidents
xii. Increase in level of crimes
xiii. Increased risks of communicable diseases
xiv. Change in social values and ethics
xv. Increase in conflicts
xvi. Food insecurity
xvii. Price inflation of goods and services
xviii. Occupation health, safety and security risks
xix. Community health and safety risks
xx. Child labour
xxi. Increased incidence of GBV/SEA/SH
xxii. Increased transmission of STDs, COVID etc
xxiii. Loss of livelihood
xxiv. Restrictions on use of access road to Karumo village
xxv. Loss of employment

C. Economic Impacts

i. Increased Revenues to local authorities
ii. Increased commercial and social activities around project locations
iii. Increased Income to local suppliers and service providers
iv. Increased land values
v. Loss of revenue to the government and University

6.3 Impact Evaluation

Identification of impacts was followed by prediction or estimation of the magnitude, extent and duration of the impact in comparison with the situation without the project. The matrix method was used (Table 6.1). To be able to predict whether impacts are likely to occur as well as their scale, the initial reference or baseline data prior to the project was determined, and the future changes forecasted with or without the proposed project. The impact evaluation was based on experts' knowledge as well as checklists.

The significance of impacts was tested using the following criteria:

i. The magnitude and likelihood of the impact and its spatial and temporal extent;
ii. The likely degree of recovery of the affected environment;
iii. The value of the affected environment;
iv. The level of public concern; and
v. Extensiveness over space and time (magnitude);
vi. Intensiveness in concentration or in proportion to assimilative capacity;
vii. Exceedance of environmental standards or thresholds ;
viii. Level of compliance with environmental policies, land use plans, sustainability strategy;
ix. Level of adversity and seriousness in affecting ecologically sensitive areas;
x. Level of adversity and seriousness in affecting heritage resources, other land uses; communities and/or indigenous peoples, traditions and values.

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

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

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

6.4 Impact assessment Criteria

Eight criteria were used to assess the significance of the impacts of the project, these include

- **Direct impacts-** Refer to the immediate and observable effects that the project has on the environment. These impacts are often straightforward and can be directly linked to the cause. Direct impacts occur in the short term and are typically immediate or near-immediate results of the project. These impacts can affect various components of the environment, including air, water, soil, climate, and ecosystems.

- **Indirect impacts –** Refer to the secondary or unintended effects that result from project. The effects are not immediately observable. The causes of the impacts are often more complex and may emerge over a longer time scale than direct impacts. The impacts may be the result of a series of interconnected events.

- **Induced impacts-** These are indirect and cascading effects that project activities can have on the environment and society. These effects are often the result of a chain reaction initiated by specific actions. The impacts have more direct link between a project and the subsequent effects and the effects can be more immediate.

- **Cumulative Impacts-** These are impacts that cause changes to the environment that are caused by an action in combination with other past, present and future human actions.

- **Residual Impacts-** These are long term impacts which go beyond the lifetime of the project.

- **Spatial Scale-**The spatial dimension encompasses the geographical spread of the impacts regardless of whether they are short term or long term. Table 16 describes the ratings used in the Simple Matrix as far as spatial scale is concerned.

Table 16: Spatial Rating

International (I)	Trans-boundary
National (N)	Within country
Regional (R)	Within Region
Local (L)	On and adjacent to site

- **Temporal Scale-**Temporal boundaries refer to the lifespan of impacts. Table 17 describes the ratings used in the Simple Matrix.

Table 17: Temporal Rating

Short-Term (ST)	during construction
Medium-Term (MT)	Life of project
Long –Term (LT)	Residual impacts beyond life of project

- **Reversibility of the impact-** Every impact was checked if its effect can be reversed or not. Letter R was used to denote reversible impacts while IR was used to denote Irreversible impacts.

Table 6.3: Impact Correlation Matrix for the proposed construction of ARU buildings at Mwanza Campus

S/n	Impact	Project activities, phase and Impact Significance																						Impact Rating							
		Construction/Mobilization/Demobilization phase									Operation Phase										Decommissioning phase											
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
Impacts on the physical environment																															
1.	Risk to generate emergency/disaster events	-3	0	0	-1	0	-1	-1	-3	0	-3	-1	-3	-2	-2	-2	-2	-1	-1	-3	0	0	N	LT	R			✓		
2.	Loss of arable land	0	0	-3	-1	-1	-1	-1	-3	-1	0	0	0	-1	-1	0	-1	0	-1	-1	0	0	L	MT	R	✓	✓	✓		
3.	Loss of biodiversity			-1	-1	-1	-1	-1	-1	-1	0	0	-1	+1	+1	+1	-1	-1	-1	-1	-1	0	I	LT	IR		✓	✓		
4.	Change of habitat			-2	-1	-2	-2	-1	-2	-1	0	0	-1	+1	+1	+1	-1	-1	-1	-1	-1	0	I	LT	IR		✓	✓		✓
5.	Loss of ecosystems services			-3	-1	-2	0	-1	-2	-1	0	0	0	+1	+1	+1	-1	-1	-1	-1	-1	-1	I	MT	R	✓		✓		

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating								
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase										
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
6.	Acceleration of soil erosion	0	0	-3	-1	-3	-1	-1	0	-1	0	0	0	-1	-1	-1	0	-1	0	0	-1	0	L	ST	R	✓				✓
7.	Generation of liquid waste	0	0	-1	-3	-1	0	-1	-3	0	-2	-2	-3	+3	0	+3	0	-1	-1	-3	0	0	L	MT	R	✓		✓		
8.	Generation of solid waste	0	0	-3	-3	-2	-1	-1	-2	-1	-3	-2	-3	0	+3	+3	0	-1	-1	-3	-3	0	L	MT	R	✓		✓		
9.	Generation of Hazardous waste	0	0	0	-3	-1	0	0	-2	0	-2	-3	0	0	0	+3	+3	-1	-1	-1	-2	0	R	LT	IR	✓	✓	✓	✓	✓
10.	Increased runoff/storm water	0	0	-1	-1	-1	0	0	-2	-2	0	0	0	+1	0	0	0	0	-1	-2	-1	0	R	MT	R	✓		✓		
11.	Land pollution	0	0	-1	-3	-1	-1	-1	-3	-1	-1	-1	-1	+3	+3	+3	0	-1	-1	-2	-3	0	R	MT	R	✓		✓		

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating							
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase								
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
12.	Surface and ground Water Pollution	0	0	-1	-2	-2	-2	-1	-3	-1	-1	-1	-1	+3	+3	+3	0	-1	-1	-2	-3	0	R	MT	R	✓			✓	
13	Air pollution	0	0	-1	-1	-2	-2	-1	-3	-1	-1	-1	-1	0	-1	0	0	-1	-1	-1	-1	0	I	LT	IR	✓	✓	✓		
14	Contribution to Climate change	0	0	-2	-2	-2	-2	-1	-3	+2	-1	-1	-2	+2	+2	+2	-2	-1	-1	-2	-1	0	I	LT	IR	✓	✓	✓	✓	
15	Noise pollution	0	0	-2	-2	-2	-2	-1	-3	-1	-1	-1	-1	0	0	0	0	-1	-1	-2	-2	0	L	MT	R	✓		✓		
16	Generation of vibrations	0	0	-2	-2	-2	-2	-1	-3	-1	-1	-1	-1	0	0	0	0	-1	-1	-2	-2	0	L	MT	R	✓		✓		
17	Visual impact	+3	0	-1	-1	-1	-1	-1	-2	-2	0	0	0	0	0	0	0	0	0	0	-2	0	L	LT	IR	✓	✓	✓		

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating								
		Construction/Mobilization/Demobilization phase									Operation Phase										Decommissioning phase								
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
18	Increase pressure on natural resources	0	0	-2	-1	-2	-1	-1	-2	-1	0	0	-1	+3	+3	+3	-1	-1	-1	-2	-2	0				✓			✓	
Impacts on Social Environment																														
1.	Employment opportunities	0	0	+2	+2	+2	+2	+2	+2	+2	+3	+3	+2	+1	+1	+1	+1	+1	+1	+2	+1	-3	I	LT	IR	✓	✓	✓	✓	✓
2.	Increase in income generation opportunities	0	0	+2	+1	+1	+1	+1	+2	+1	+3	+3	+2	+1	+1	+1	+1	+1	+1	+2	+1	-3	L	LT	IR	✓	✓	✓	✓	✓
3.	Changes in lifestyle and quality of life	0	0	+2	+1	+1	+1	+1	+2	+1	+3	+3	+2	+1	+1	+1	+1	+1	+1	+2	+1	-3	L	LT	IR	✓	✓	✓	✓	

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating							
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase								
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
4.	Increased skills and impart knowledge to local communities	0	0	+1	+1	+1	+1	+1	+3	+1	+2	+1	+2	+1	+1	+1	+1	+1	+1	+1	+1	-3	N	LT	IR	✓	✓	✓	✓	
5.	Increase of academic facilities in Mwanza	0	0	0	0	0	0	0	0	0	+3	+2	+2	0	01	0	0	0	0	0	0	-3	N	LT	IR	✓	✓	✓		
6.	Loss of cultural assets and displacement of ritual sites	0	-2	-2	-1	0	0	0	+1	0	0	+2	0	0	0	0	0	0	0	0	0	0	L	LT	R		✓	✓		
7.	Change of habitant	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	0	0	0	0	0	L	LT	R	✓	✓	✓	✓	

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating								
		Construction/Mobilization/Demobilization phase									Operation Phase										Decommissioning phase									
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
8.	Population increase	0	0	-1	-1	-1	-1	-1	-2	-1	-3	-2	-2	0	0	0	0	-1	-1	-2	-1	0	R	LT	IR	✓	✓	✓		
9.	Increased pressure on social services	0	0	-1	-1	-1	-1	-1	-2	-1	-3	-2	-2	0	0	0	0	-1	-1	-2	-1	0	R	LT	IR	✓	✓	✓		✓
10.	Increased traffic flow	0	0	-1	-1	-1	-1	-1	-1	-1	-3	-1	-1	0	0	0	0	-1	-1	-1	-1	0	L	LT	IR	✓	✓	✓	✓	
11.	Increased risks of road/ ferry accidents	0	0	-1	-1	-1	-1	-1	-1	-1	-3	-1	-1	0	0	0	0	-1	-1	-1	-1	0	R	LT	IR	✓	✓	✓	✓	
12.	Increase in level of crimes	0	0	-1	-1	-1	-1	-1	-2	-1	-3	-1	-1	0	0	0	0	-1	-2	-2	-2	-2	L	LT	R	✓				✓
13.	Increased risks of communicable diseases	0	0	-1	-1	-1	-1	-1	-2	-1	-3	+2	-1	+2	+2	+2	+2	-1	-2	-2	-2	-2	I	LT	R	✓				✓

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating								
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase									
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
14	Change in social values and ethics	0	0	-1	-1	-1	-1	-1	-2	-1	-3	-1	-2	-1	-1	-1	-1	-1	-2	-1	-1	-1	L	I	IR	✓	✓	✓		✓
16	Increase in conflicts	0	0	-1	-1	-1	-1	-1	-2	-1	-3	-1	-2	0	0	0	0	0	-1	-2	-1	-1	L	LT	R					✓
17	Food insecurity	0	0	-1	-1	-1	-1	-1	-2	-1	-3	0	-2	0	0	0	0	0	-1	-2	-1	-1	R	LT	R	✓			✓	
18	Price inflation of goods and services	0	0	-1	-1	-1	-1	-1	-2	-1	-3	0	-2	0	0	0	0	0	-1	-2	-1	-1	R	MT	R					✓
19	Occupation health, safety and security risks	0	0	-1	-1	-1	-1	-1	-2	-1	-3	0	-2	0	0	0	0	0	-1	-2	-1	-1	L	MT	R			✓		
21	Community health and safety risks	0	0	-1	-1	-1	-2	-1	-2	-1	-3	+2	-2	+2	+2	+2	0	0	-1	-2	-1	-1	L	MT	R			✓		

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating							
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase								
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
22	Child labour	0	0	-1	-1	-1	-1	-1	-2	-1	0	-1	-2	-1	-1	-1	0	-1	-1	-1	-1	-1	L	MT	R			✓		
23	Increased incidence of GBV/SEA/SH	0	0	-1	-1	-1	-1	-1	-2	-1	-3	+2	-2	0	0	0	0	-1	-1	-1	-1	-1	L	MT	R			✓		
24	Increased transmission of STDs, COVID etc	0	0	-1	-1	-1	-1	-1	-2	-1	-3	+2	-2	0	0	0	0	-1	-1	-1	-1	-1	I	LT	R	✓		✓		
25	Loss of livelihood	0	0	-2	-1	-1	-1	-1	-2	-1	+3	+2	+2	0	0	0	0	+1	+1	-1	+1	-2	L	MT	R	✓		✓		
26	Restrictions on use of access road to Karumo village	0	0	-1	-1	-1	-1	-1	-2	-1	-3	0	0	0	0	0	0	0	0	-1	-1	0	L	LT	R			✓		

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating								
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase									
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
27	Loss of employment	0	0	+1	+1	+1	+1	+1	+3	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	-3	I	MT	IR			✓		
1.	Increased Revenues to local authorities	0	0	+2	+2	+2	+2	+2	+2	+2	+3	+3	+2	+1	+1	+1	+1	+1	+2	+2	+1	-3	N	LT	R	✓	✓	✓	✓	
2.	Increased commercial and social activities around project locations	0	0	+2	+2	+2	+2	+2	+2	+2	+3	+3	+2	+1	+1	+1	+1	+1	+2	+2	+1	-3	L	LT	R	✓	✓	✓	✓	
3.	Increased Income to local suppliers and service providers	0	0	+2	+2	+2	+2	+2	+2	+2	+3	+3	+2	+1	+1	+1	+1	+1	+2	+2	+1	-3	I	LT	IR	✓				✓

S/n	Impact	Project activities, phase and Impact Significance																			Impact Rating							
		Construction/Mobilization/Demobilization phase									Operation Phase									Decommissioning phase								
		Design and Risk Hazard Assessment(RHA)	Land acquisition	Site clearance and demolition	Establishment and operation of campsite	Exploitation of quarries/natural resources	Transportation of materials	Trench excavations and casting of	Construction, installations & finishing works	Landscape activities	Teaching /imparting knowledge	Health care provision	Operation of cafeteria and hostels	Liquid waste management	Solid waste management	Hazardous waste Management	Provision of utilities	Maintenance works	Operation of Associated facilities	Occupancy/Tenancy	Demolition of structures	Termination of employment	Spatial Scale	Temporal Scale	Reversibility	Cumulative Effects	Residual Impact	Direct Impacts	Indirect Impacts	Induced Impacts
4.	Increased land values	0	0	+1	+1	+1	+1	+1	+3	+1	+3	+2	+2	+1	+1	+1	+1	+1	+1	+1	+1	-2	L	LT	IR	✓	✓	✓		
5.	Loss of revenue to the government and University	0	0	+2	+2	+2	+2	+2	+2	+2	+3	+3	+2	+1	+1	+1	+1	+1	+2	+2	+1	-3	N	ST	R			✓		

Source: Consultant analysis, 2023

6.5 Potential Environmental and Social Impacts during the Pre-Construction Phase

Positive social impacts

6.5.1 Job Creation and employment opportunities

During this phase, about 30 people shall be employed by the contractor to do mobilization works such as construction of campsites, quarrying and material extraction and transportation activities etc. In additional to that, there will be an increase of self-employment (indirect employment) due to the higher demands and supply of various goods and services for people working in the project. For example, an increase in restaurants, *mama Ntilie* will be obvious to meet the increased number of the people working at this phase. The people surrounding the project area (Nyamatongo and Karumo) are farmers and fishermen, through the presence of the project the likelihood of the increased price of their price is high due to population influx and increased demands of foods and services. The increased income to the community will enhance their economic status, even though for short while. This impact is perceived to be of direct, medium in significance, felt at regional scale within Mwanza Region, and will have residual impacts on the community.

6.5.2 Increase in income generation opportunities

This influx of people and particularly skilled and unskilled labourers in the area will provide an opportunity for local people to engage in some sort of business activities that will enable them to get more income compared to the previous time in which most of them depended on agriculture and farming as their only source of income. The project will create a new source of income for both the people within Karumo and Kamanga communities as well as the surrounding communities of Nyamatongo ward and Sengerema district in general. This impact will be moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a direct long-term impact in the sense that even at the end of the phase the created income generation opportunities will leave the lives of the beneficiaries improved in one way or another. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.5.3 Changes in lifestyle and quality of life

It is expected that, the increase in employment opportunities both formal and informal will result to the rise of high wages among the population in the areas as well as the surrounding communities. This is likelihood to increase their expenditure and consequently alter their living standard. This will also have a multiplier effect in the communities that the workers come from, as they will for example be able to pay for school fees as well as buy assets such as bicycles and radios. Apart from that, the influx of people in the area will result to an increased number of people with mixed culture hence easy to alter or influence the same to undergo some changes that may be positive or negative. The people in the project areas are traditional in nature, mostly Sukuma and Zinza. Their lifestyle is greatly influenced by Sukuma and Zinza culture in terms of wearing style, food, behaviour and how they see and interpret issues. The increased number of people from different areas of the country with different cultural

background will influence the adoption of new lifestyle that may arise from interaction or intermarriages.

This is an induced impact that will be moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the new lifestyle developed and improved quality of life will persist. After the end of this phase the impacts will never be reversible (irreversible).

6.5.4 Increased Revenues to local and national Authorities

The proposed project development can benefit local communities in terms of income generating employment. This will allow opportunities within the local business community, such as the provision of services and supply of goods such as food, hotel and building materials. The local business community as such would therefore also have more money circulating within it creating additional spin off effects for improvement of the local economy. It is also expected that the increased business and investments in the area will give an opportunity for local government authorities to collect tax and consequently improve the availability of social services in the area. Overall, as users pay specific taxes and fees for services, the local and national revenue will increase even before the commencement of the operational phase.

This impact will be moderate and will affect entire nation in the sense that revenue collected from the project area will not be used in the local area but rather will contribute to the nation budget and will likely to have a long-term impact in the sense that even at the end of the phase the source of incomes developed prior will persist and grow in terms of size and services. This is a indirect impact which will be reversible in the sense that the government may propose and or develop strategies to retain the revenues or even multiplies as the project will be more growing in the stage to follow.

6.5.5 Increased commercial and social activities around project locations

It is envisaged that the pre-construction stages of the buildings at Karumo village; Sengerema District which includes but not limited to; site clearance, establishment of campsites, and transportation of materials will attract a number of investors from within and outside surrounding communities to invest in meeting the needs of the increased population as well as people seeking for employment in the area. This is likely to enhance the development of the centers at surrounding areas. It is also expected that service providers such as food venders and general viosks (dukas) may be established and increase during construction phase to provide services to both skilled and unskilled laborers working in the project site.

This impact will be moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the new commercial activities at the project site will persist and grow in terms of size and magnitude of the services to be provided. After the end of this phase there will be an induced impacts will be reversible in the sense that the owners of this

social and commercial activities may develop new strategies to re-construct and re-develop.

6.5.6 Increased income to local suppliers and service providers

The Population of Karumo village is expected to triple in the next few years as a result of the ARU-Mwanza campus construction. During construction, the project is expecting to employ more than two hundred (200) people from outside Karumo village. Therefore the village will be having more people than before. The change in population level due to influx of workers and laborers will contribute to the new market opportunities for small, middle and big business persons. This will increase money circulation at the area leading to high income to the local suppliers and service providers.

This is an induced impact, moderate in nature and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the life f the local suppliers and service providers will remain improved. It is noted that, after the end of this phase the impacts will never be reversible (irreversible).

Negative social Impacts

6.5.7 Loss of cultural assets and displacement of ritual sites

Land acquisition, site clearance, establishment of campsite, and trench excavation and casting of foundations will involve the destruction of some cultural assets and displacement of ritual sites which are currently available in the proposed area for the construction of the ARU-Mwanza campus. Currently, three ritual sites were identified and the local people have agreed to remove those ritual sites out of the proposed project site. At the time of conducting the ESIA study all the ritual sites styled in the name of ***Msambwa*** were already removed by the local people owning those sites with financial support from ARU. The ritual sites were shifted to another areas suggested by the local people (actually the clans owning those ***Misambwa.***

This will bring about moderate negative impact and will directly affect the project area of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and will be a long-term impact in the sense that even at the end of this phase the life the situation will not be restored to its original status. One of the thing to note is that, after the end of this phase the impacts will be reversible in the sense that the community and clans affected has found another suitable areas for the cultural assets and ritual sites, hence status quo well maintained.

6.5.8 Community health and safety risks

During the site clearance and demolition, establishment of campsite, and trench excavation and casting of foundations will involve some activities that may rise in endangering the lives of the community members living close to those activities. This in turn will likely to endanger the lives of the local communities in form of accidents if appropriate measures are not taken. In the areas where raw materials will be taken like sand, stones and water accidents are likely to happen if appropriate measures are not taken on board. On the transportation of raw materials to the site, drivers may fail

to observe safety measures along the road something that may result to accidents to other road users like pedestrian, motorcyclist, and bodaboda drivers.
This impact will be moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a short-term impact in the sense that at the end of this phase all the risks will die natural death. Furthermore, the impact will not be pilling up and no cumulative effects may be witnessed at the end of this phase. That, the impacts arising out of this are direct, reversible in the sense that the same can be controlled upon strict use of road safety measures and occupational safety measures.

6.5.9 Loss of livelihood

The proposed project areas are partially used by people for cultivation and livestock keeping, to mention few. Land acquisition, site clearance and demolition, establishment of campsite, and trench excavation and casting of foundations in the proposed will force people who depended on that particular area for their livelihood to seek for alternative remedy. In short, the use of land for the above activities will reduce availability of land for the locals or clan and families that used the area for agriculture and livestock activities.

In the right of the above explanation, this impact will be moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a medium-term impact in the sense that Sengerema district council which acquired land from the locals before the same being sold to ARU as already compensated the locals in terms of monetary compensation and they have used the same to engage either in the same kind of livelihood activities or different from the previous ones. Furthermore, the impact will not be pilling up and no cumulative effects may be witnessed at the end of this phase. That, the impacts arising out of this are direct, reversible in the sense that the affected persons were compensated to find for alternative livelihood activities or areas

6.5.10 Loss of revenue to the government

During pre-construction of the project, the local government will be collecting revenues from the workers and suppliers of materials to the project. This will end up when the phase is over. This is because workers will stop being paid and supplier will no longer sell the materials to the project in this case there will be loss of revenue to the government.

This impact will be moderate and will affect entire nation in the sense that revenue collected from the project area not only benefited the local area but also to the entire nation and will likely to have a short-term impact in the sense that even at the end of the phase the source of revenues are expected grow in terms of size and services in the phase next to this, the construction phase. Furthermore, the impact will not be pilling and no cumulative effects as explained in the previous sentence. One of the important thing to note is that, after the end of this phase the impacts will be direct, reversible in the sense that the government may propose and or develop strategies to retain the revenues or even multiplies as the project will be more growing in the stage to follow.

Negative Environmental Impacts

6.5.11 Risk of buildings/structural designs to have potential to generate emergency/disaster events

The design of buildings or structural elements which do not consider the emergencies due to technical and financial reasons may be prone to structural failure, fire incidences, flooding, and attraction disease causing agents at the proposed ARU Mwanza campus. These may ruin the proposed ARU Mwanza campus investment plans as well as the health and safety of the students, staffs, service providers, community and physical environment at large. Also, the buildings and structures may not become user friendly due to failure to consider climate, safety and security issues. The incompatibility of the buildings design with ARU Mwanza campus masterplan and failure to meet the design capacity may also affect the intended use of the buildings hence becoming a white elephant buildings. This risk is projected to be moderate during construction and high during operation phase (impacts shall be fully realized during operation phase than the construction phase). The scale of the impact will be National and Medium term.

6.5.12 Change of habitat

Change in habitat is expected to occur due to change in land use, removal of vegetation cover and top soils, pollution emanated during construction and operational phase, and infrastructure development. Plants offer a critical medium to protect the wide variety of species.

Cleaning of land during the construction phase will remove important vegetation/plants which serve for different purposes including soil erosion control, air quality regulation, provide habitats and feeds to some animals including birds, cow, goat and others. The vegetation cover accounts for about 1,630,508 square meters (including proposed road reserve areas) of the total ARU-Mwanza Campus area of which almost 67% will be cleared to provide adequate space for physical facilities for the University operation, including construction of buildings, wastewater treatment plant, roads and others.

The university has planned to use 200,000 m^2 and 152,974 m^2 for botanical gardens and open space respectively. These areas might serve as the habitats for various plant and animal species, however introduction of new species in botanical garden might alter ecological functions within the area due to changes in the soil structure and deterioration of its quality as a result of erosion and compaction. Further, the proposed physical features to be constructed will result into the fragmentation of the existing land as indicated in the baseline and subsequent fragmentation of the habitat. Habitat fragmentation reduces biodiversity and impairs key ecosystem functions by decreasing biomass, reducing species persistence, species richness, nutrient retention, trophic dynamics and altering nutrient cycles. Several animals and plant species across the world preferring to live in their natural habitat. Change in habitat will affect their survival and sometime they do shift from their native environment and adapt to new habitats.

The extent of change of habitat is moderate, local and long term during the life of the project. The project has a direct negative impact on provision of ecosystem services to community. The results of the impacts are irreversible, and has some residual impacts even after the life of the project.

6.5.13 Loss of biodiversity

It was observed that ARU-Mwanza Campus site contains different species of plants which provide habitats and grazing avenues for animals. Presence of the proposed project will lead to the following.

- Cleaning of land during the construction phase will cause the loss of animal and plant species due to the loss of habitat. Trees provide shelter for some species also provide the canopy that regulates the temperature, which could affect biotic component of the ecosystem.
- Plant root systems provide habitats for microorganisms. Destroying of the same will affect microbial community responsible for the water treatment, the removal of pollutants through phytodegradation and the recycling of nutrients.
- Poor disposal of hazardous waste which will be generated during operational e.g. from laboratories, workshops and others phase may kill some of plant species and reduce their richness.

The extent of loss of biodiversity is local and long term during the life of the project. The impact significance is rated minor the local biodiversity of the site. The results of the impacts are indirect, irreversible, and has some residual impacts even after the life of the project.

6.5.14 Loss/reduction of ecosystem services

The ARU-Mwanza campus site contains blue, green and grey spaces which are crucial for ecosystem services. It harbors different plant species which provide ecosystem services to local communities include supporting, regulating, provisioning and cultural services'.

- Vegetation especially trees are lungs of our planet which help to help to mitigate carbon dioxide and other toxic greenhouse gas emissions. Cleaning of the vegetation for development of physical facilities reduce vegetation cover which is currently sequesters carbon dioxide through photosynthesis process. Lack of plant species especially trees allows a greater amount of greenhouse gases to be released into the atmosphere since vegetation are good carbon sinks or reservoirs. Increasing carbon dioxide levels contributes to greenhouse gases subsequently global warming.
- Presence of pollutants such as dust emanated from construction phase and transportation during both phases might affect the ability of vegetation to survive and maintain effective evapotranspiration, which is very important component in the hydrologic cycle. Trees keep on returning water vapor to the atmosphere.
- Potential soil contamination also might occur during the construction and operational phases due to poor materials and waste handling practices, spillage and leaks from construction equipment. This will affect plant growth and limit their ecological functions.
- Trees help in controlling soil erosion by assisting the land to retain water and topsoil, which also provide the rich nutrients to sustain growth of plants. Plants bind soil together with their root systems makes it harder to be washed away by agents of erosion including water, wind and others. Cleaning of the same will subject the land to soil erosion and floods. Erosion sweeps the soil from one place to another such as streams and rivers, and if the soil was exposed to contaminants when leach into the water supply systems will affect the quality water.

Extent of spread is the impact is local and medium term; with a negative impact on provision of ecosystem services to community. The impact significance is rated as moderate without mitigation measures, however with implementation of proper mitigation measures the impact could be significantly reversed.

6.5.15 Loss of arable land

The community in Karumo ward engage if farming and animal keeping activities. The proposed establishment of the ARU Mwanza Campus at Karumo Village will lead to direct loss of about 378Acres of land, (equivalent to 12.1% of the total Karumo village land), previously used for residences and agricultural activities. The previous occupiers used the land for small scale cultivation of food crops such as maize, cassava, sweet potatoes and vegetables; and for animal grazing. Further, the presence of the Campus at Karumo Village is likely to attract other investors in the area, thus causing further loss of arable land in the form of land take for other activities such as recreation, housing and accommodation and business centres.

The loss of arable land may affect farmer's livelihood, cause a reduction in agricultural output, and a decrease in farmer's income, and even contribute to land conflicts. *This is direct negative impact, local, of long term and perceived as of high sign significance. The impact if further rated irreversible, with cumulative and residual impacts.*

6.5.16 Acceleration of Soil Erosion

Human activities, including land clearing and excavation leave soil vulnerable to erosion. Soil erosion happens when construction equipment destroy/remove vegetation, which provides root systems that hold dirt in place and prevent erosion. Once the soil is loose, the top soils be displaced by both wind and water erosion. The existence of abandoned sandpits at the proposed site increases the risks of water caused soil erosion. *This is an induced impact, localized and will be short term, only during the construction phase. The significance of the impact is high, however the situation is reversible with application of mitigation measures.*

6.5.17 Loss of Landscape and scenic view

Like any development, there is a 'zone of visual intrusion' from which it can be seen. These refer to the impacts of landscape change on people: on the views that people have from their homes, offices, footpaths, cars as they drive past, etc. Construction activities shall affect the landscape by removing existing landscape features in place such as trees and replacing them by concrete and gravel surface. If operated at night, the lights will lead to the increase of light pollution. The following components of the landscape can be affected by development:

- Physical factors: geology, landform, microclimate, drainage, soil, ecology; and
- Aesthetic factors: proportion, scale, enclosure, texture, colour views as well as sounds

However, the proposed project components can also change the overall character of an area to make it look more urban. *This is direct impact, localized at the site, long term during the life of the project and has both cumulative and residual impacts.*

6.5.18 Land pollution

Construction activities will generate large quantities of waste materials, both liquid and solid (including hazardous waste), with varying nature, including scrap metal, plastic, wood, concrete, bricks etc (as described in Chapter two of this report). When these materials are not properly disposed of, it will contribute to the land pollution area. Land could also be polluted by oil spills, from machines an equipment, placement of construction materials on bare land and others.
This is direct impact assessed to be of local scale and short term during construction. The significance of the impact is high and reversible.

6.5.19 Impacts on surface and ground water quality

The main sources of pollution during preconstruction and construction phases of the project could be:

- Oil spills from construction equipment and vehicle (hydrocarbons (for example grease, oils and lubricants);
- Release of wastewater from domestic and construction activities;
- On land disposal of construction wastes and other mixed wastes during the operation phase;
- Runoff on piled construction materials (could potentially contain heavy metals, leaching from the materials);
- Sediments and solids eroded from the surface

The hydrological study of the site indicated that the site is within the Lake Victoria basin. The Chamihigwa seasonal stream collects surface runoff from the site to the Lake. It was indicated that site is water lodged during the rainy season. Therefore, release of any contaminants (solids or liquid) on the land can potentially contaminate surface runoff, and eventually impair the quality of the water by altering its physical-chemical parameters of Lake Victoria water, which is the main source of water supply to the Lake Zone communities. Further, infiltration of contaminated runoff could potential contaminated groundwater.

Contaminated water could directly affect domestic water quality, render it useless for irrigation, contaminate food chain and also affect living organisms in water. *This is indirect impact is assessed to be of regional scale (due to the size of Lake Victoria) and short term during construction. The significance of the impact is high and irreversible.*

6.6 Potential environmental and social impacts during construction phase

Positive social impacts

6.6.1 Jobs creation/Employment opportunities

Due the scope of the proposed construction activities, this phase will be labour intensive. The selected Contractor is expected to employ about 200 people (professionals and non-professionals), to be sources both locally and countrywide. There will also be other indirect employment opportunities/self-employment for transported of construction materials, suppliers of various goods and services etc. For example, an increase in restaurants, *mama Ntilie* will be obvious to meet the increased

number of the people working at this phase. The increased income to the community will enhance their economic status. This impact is perceived direct, high significance, felt at regional scale within Mwanza Region, and will have residual impacts on the community.

6.6.2 Increase in income generation opportunities

This influx of people and particularly skilled and unskilled laborers in the area will provide an opportunity for local people to engage in some sort of business activities that will enable them to get more income compared to the previous time in which most of them depended on agriculture and farming as their only source of income. The project will create a new source of income for both the people within Karumo and Kamanga communities as well as the surrounding communities of Nyamatongo ward and Sengerema district in general.

This is direct impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the created income generation opportunities will leave the lives of the beneficiaries improved in one way or another. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.6.3 Changes in lifestyle and quality of life

It is expected that, the increase in employment opportunities both formal and informal will result to the rise of high wages among the population in the areas as well as the surrounding communities. This is likelihood to increase their expenditure and consequently alter their living standard. This will also have a multiplier effect in the communities that the workers come from and/or reside, as they will for example be able to pay for school fees as well as buy assets. Apart from that, the influx of people in the area will result to an increased number of people with mixed culture hence easy to alter or influence the same to undergo some changes that may be positive or negative.

This is an induced impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the new lifestyle developed and improved quality of life will persist. . Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.6.4 Increased skills and impart knowledge to local communities

As noted in the previous paragraph, the construction phase of the proposed buildings will provide a number of opportunities for both skilled and non-skilled laborers. There will potentially be training opportunities or practical learning for local people and

people from different part of the country that will secure employment or casual labour in the construction of the new ARU Mwanza campus. It is obvious that different people from the local area and others from different part of the country will be employed in the project particularly technicians and machine operators during this phase and consequently acquire necessary skills that will be of paramount important in their lives, communities and nation in general. This will enable them to improve their economic activities which will lead to higher income and hence improvement of their living standards or may use the skills in improving their lives and life of their fellow community members in the local areas of Karumo, Kamanga and the entire nation.

This is an induced positive impact, high and are likely to affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and the nation in general in the sense that even at the end of the phase the new skills acquired will benefit the entire nation in different areas. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them and the nation at large. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.6.5 Increased Revenues to local and national Authorities

The proposed project development can benefit local communities in terms of income generating employment that will be generated during the construction phase. This will allow opportunities within the local business community, such as the provision of services and supply of goods such as food, hotel and building materials. The local business community as such would therefore also have more money circulating within it creating additional spin off effects for improvement of the local economy. It is also expected that the increased business and investments in the area will give an opportunity for local government authorities to collect tax and consequently improve the availability of social services in the area. Overall, as users pay specific taxes and fees for services, the local and national revenue will increase even before the commencement of the operational phase.

This is indirect impact, moderate and will affect entire nation in the sense that revenue collected from the project area will not be used in the local area but rather will contribute to the nation budget and will likely to have a long-term impact in the sense that even at the end of the phase the source of incomes developed prior will persist and grow in terms of size and services. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the entire nation that will benefit from the increased government revenues in terms of improved social services and other government support to the citizen. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that the government may propose and or develop strategies to retain the revenues or even multiplies as the project will be more growing in the stage to follow, an operation phase.

6.6.6 Increased commercial and social activities around project locations

It is envisaged that the pre-construction stages of the buildings at Karumo village; Sengerema district which includes but not limited to; site clearance, establishment of campsites, and transportation of materials will attract a number of investors from within and outside surrounding communities to invest in meeting the needs of the increased population as well as people seeking for employment in the area. This is likely to enhance the development of the centers at surrounding areas. It is also expected that service providers such as food venders and general viosks (dukas) may be established and increase during construction phase to provide services to both skilled and unskilled laborers working in the project site.

This is direct impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the new commercial activities at the project site will persist and grow in terms of size and magnitude of the services to be provided. . Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them including local authorities in the area and people they serve. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that the owners of this social and commercial activities may develop new strategies to re-construct and re- develop or even multiplies the interventions as the project will be more growing in the next stages to follow in the project cycle.

6.6.7 Increased income to local suppliers and service providers

The Population of Karumo village is expected to triple in the next few years as a result of the ARU-Mwanza campus construction. During construction, the project is expecting to employ more than two hundred (200) people from outside Karumo village. Therefore the village will be having more people than before. The change in population level due to influx of workers and laborers will contribute to the new market opportunities for small, middle and big business persons. This will increase money circulation at the area leading to high income to the local suppliers and service providers.

This direct impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the life f the local suppliers and service providers will remain improved. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.6.8 Increased land values

Upon commencement of the construction activities for Ardhi University at Mwanza will change the land status at Karumo area; Sengerema district, as well as the land at surrounding villages (Kamanga and the entire Nyamatongo ward). Land owners have the understanding that the introduction of the campus will cause their land to add

value and therefore they have to plan for it and obtain title deeds. The title deeds will help them to obtain loans from financial institutions which will be used for different purposes like; improving their houses, paying for health services, education services etc. adding value to the land and the same will have a sustainable effect to the people in the local area.
This direct positive impact, high and are likely to affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them in the local area. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

Potential negative social impacts

6.6.9 Population Increase and increased pressure on social services

Residences in the project area and surrounding communities do not have sufficient social and infrastructural services provided to them such as in the areas of health, education and water. In view of this, the influx of people in the project area will increase pressure on the already limited social infrastructure and may without the taking of steps to alleviate this place a heavy additional burden on the existing service delivery system. During the construction phase I is expected that more than 200 people will resides within these communities causing burden and pressure on the available limited social services.
This direct negative impacts, moderate and are likely to affect the entire region surrounding the project area for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them in the region. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

6.6.10 Increased in level of crimes

It is expected that the selection and design stage will recruit a considerable number of workers both skilled and non-skilled from the communities around and other from the nearby communities. In addition, the project will attract people from various areas to come and invest the provisions of good and services. The increase in Population increase will stimulate the growth of the trading centres around the project site. Experience and sociological point of view show that where there is a big concentration of people from various backgrounds and behaviour, levels of crimes and changes in norms and behaviour are common. This is also is likely to be the case of the trading centers around the project sites like Kamanga village, Karumo village and other nearby areas.

This direct impacts, negative in nature at a moderate level and will cover the local areas surrounding the project like Karumo, Kamanga and the entire area of Nyamatongo ward. The impacts arising from this will be moderate and are likely to affect the entire region surrounding the project area for a long-term. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that ARU in cooperation with local authorities and police force may set up strategies to reduce and combat crimes.

6.6.11 Food Insecurity

The stakeholders that were involved in this study have raised their concerns about shortage of food that may arise at the project site due to influx of workers during construction phase causing pressure on available areas for sources of food. In our focus group discussion with village council members, they argued that the development of this project would likely to attract many people to come and settle in their villages increasing demand of foods and services. This is likely to cause a lot of chaos and inflation of prices on goods and services including food services.

This is indirect negative impacts, moderate and are likely to affect the entire region surrounding the project area for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them in the region. One of the important thing to note is that, after the end of this phase the impacts will be reversible as relevant strategies may be employed to reduce the state of food insecurity.

6.6.12 Community health and safety risks

During the construction phase, some activities that may rise in endangering the lives of the community members living close to those activities. This in turn will likely to endanger the lives of the local communities in form of accidents if appropriate measures are not taken. In the areas where raw materials will be taken like sand, stones and water accidents are likely to happen if appropriate measures are not taken on board. On the transportation of raw materials to the site, drivers may fail to observe safety measures along the road something that may result to accidents to other road users like pedestrian, motorcyclist, and bodaboda drivers.

This direct impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a short-term impact in the sense that at the end of this phase all the risks will die natural death. Furthermore, the impact will not be pilling up and no cumulative effects may be witnessed at the end of this phase. That, the impacts arising out of this are reversible in the sense that the same can be controlled upon strict use of OSHA safety measures.

6.6.13 Prevalence of Communicable diseases

Influx of job speculators from other parts of Tanzania and neighboring regions will increase interaction, consequently increasing the risk of getting HIV/AIDS infections and other communicable diseases. That, the growth of trading centers in the area will attract different businesses and different people to the extent that the level of prostitution will also increase in the area provided that there will be employees from other areas of the country. Increased prevalence of communicable diseases like HIV/AIDS will likely to happen and consequently result to the increased number of orphans and single parenting in the project area.

6.6.14 Loss of livelihood

The proposed project areas are partially used by people for cultivation and livestock keeping, to mention few. Land acquisition, site clearance and demolition, establishment of campsite, and trench excavation and casting of foundations in the proposed will force people who depended on that particular area for their livelihood to seek for alternative remedy. In short, the use of land for the above activities will reduce availability of land for the locals or clan and families that used the area for agriculture and livestock activities.

In the right of the above explanation, this is direct impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a medium-term impact in the sense that Sengerema district council which acquired land from the locals before the same being sold to ARU as already compensated the locals in terms of monetary compensation and they have used the same to engage either in the same kind of livelihood activities or different from the previous ones. Furthermore, the impact will not be pilling up and no cumulative effects may be witnessed at the end of this phase. That, the impacts arising out of this are reversible in the sense that the affected persons were compensated to find for alternative livelihood activities or areas

Impacts on physical environment

The ESS3 'Resource Efficiency and Pollution Prevention and Management' recognizes that development projects often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment. Impacts caused by pollution are described hereunder:

Negative Environmental Impacts

6.6.15 Air Pollution

As per the IFC guidelines on Air Emissions and Ambient Air Quality Guidelines, construction and pre construction phases will be associated with emissions from construction equipment and vehicles, fugitive emissions from the workshops (hydrocarbons), emissions from small combustion processes used to deliver electrical or mechanical power, regardless of the fuel type, with a total, rated heat input capacity of between three Megawatt thermal (MWth) and 50 MWth.

Further, there will also be an increase in levels of fugitive dust from the construction activities mainly due to vegetation clearance, foundation excavation, movements of heavy machinery and windblown dust from bare land and piled construction materials. This may cause localized temporary disturbance to workers at construction sites and areas where sand and aggregates will be sources. Air pollutants have a range of health and environmental impacts. Exposure to hydrocarbons has impacts varying from mild to chronic effects. Respirable particulates are a public health hazard and may otherwise create considerable nuisances to the public and fauna. Deposition of dust on the site vegetation will interfere with plants photosynthesis process.
The level of air pollution will be judged in comparison with ambient air quality standards (see Chapter 9). This is direct impact of medium significance, international

concern, long term and irreversible. Further, the impact has both cumulative (since there are also other existing sources) and residual impacts.

6.6.16 Increased Greenhouse gas generation

According to the ESS1, the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the welfare of current and future generations. The construction of the proposed ARU Mwanza Campus is associated with GHGN emissions from cars, equipment, plants etc. Various internal combustion engines will release GHGs notably carbon-dioxide (CO_2), methane (CH_4) and ssmall quantities of noxious gases such as Nitrogen Oxides (NOx), Sulphur Oxides (SOx) and hydrocarbons. The generation and emission rate will depend on equipment type, road condition, speed of vehicles, quantities of equipment, duration, and prevailing atmospheric conditions, particularly wind and moisture of the air. The main source of emission of atmospheric pollutants will emanate from mobile sources-the exhaust engines (trucks/tipper, wheel loaders). Table 6.4 shows the emission factors of the various construction equipment and vehicles, and approximated emissions.

Table 6.4: Emission of construction equipment and vehicles

S/N	Type	Quantity	Emission factors (Giunta *et al.*, 2019)		Total Emission	
			CO - g/hp-hr	NOx - g/hp-hr	CO g/day	NOx g /day
1	Excavator	1	0.75	4.31	0.34	1.90
2	Bulldozer	1	0.94	4.67	0.42	2.09
3	Trucks	5	11.24	15.27	25.12	34.13
4	Motor grader	1	0.75	4.31	0.34	1.90
5	Compactor	1	0.94	4.67	0.42	2.09
6	Crane	2	170	260	340	520

Analysis of baseline air quality indicated that the quality of air is good. Based on these findings, the level of the emissions of the precursory pollutants and the atmospheric pollutants from mobile sources will vary from day to day, according to the type of activity done during construction. However, even if the impact is very limited in time, it does not remain the same depending on the weather conditions. Of this fact the intensity of the impact of the construction of the project on air pollution was evaluated to be direct negative impact, cumulative, global, short term and moderate significance.

6.6.17 Contribution to Climate Changes

The IFC identifies the energy, transport and waste management sectors among other to be the major sources of GHGs. Transportation of construction materials and the labour force, use of fossil fuels for energy (combustion engines) and waste management activities have high potential for emission of greenhouse gases such SO_2, CH_4 and CO_2. The project will contribute to climate change in two ways. Firstly, it will be through generation of Greenhouse Gas emissions. Secondly, the project is

expected to reduce CO_2 sequestration due to reduction of vegetated area of the campus.

The production of greenhouse gases has long-term consequences on a planetary level. This is indirect impact considered high significance, long term and of international concern. Further the impact is irreversible, has cumulative impacts (baseline indicated that waste burning is common practices, thus potential for GHG emissions) and has residual impacts.

6.6.18 Reduction of CO_2 Sequestration Potential

The ESS1 recognised CO_2 sequestration potential as one category of the Ecosystem Services (i.e. regulating services). Vegetation clearance during construction activities will reduce the CO_2 sequestration process. About 67% of the total Campus area (i.e. 153Ha or 1.53Km^2) will be cleared (equivalent to 1.025 km^2). Destruction of 1,025,000m^2 will potentially reduce Carbon dioxide sequestration and hence reduction of global efforts towards climate change mitigation. It is estimated that, a forest can absorb 162 g C/m^2 to 168 g C/m^2 annually (Getter et al. 2009). Therefore the potential reduction of about (166,066,200 – 172,216,800) g C/m^2 is expected.

6.6.19 Increased Noise level during Construction

The baseline noise monitoring indicated that noise level at the site ranged from 40-47 dBA, which is below national and IFC standards for daytime exposure. The Tanzania Standard limits (TZS) guidelines require noise emission levels to be less than 55 dBA during the day within residential/institution areas. The proposed project activities will inevitably increase noise level. Noises from vehicles, equipment, construction crew, etc may rather be significant. Noise beyond some level (70dBA) is itself a nuisance and need to be avoided. This impact is local (at the proposed site) of moderate significance moderate and short term during the construction phase. The impact is direct, reversible , and is cumulative (adding to the existing noise level).

6.6.20 Increased vibration

Construction activity can result in varying degrees of ground vibration, depending on equipment and methods employed. Vibration will be produced by construction vehicles, plant and machinery during delivery of materials, processing of materials, and actual construction work. The Construction activities that typically generate the most severe vibrations are blasting and impact pile driving for foundation. Due to an increase in activities and number of operational vehicles, the impacts of vibration include causing disturbance to neighbours and physical damage to properties near the construction site. *This is direct impact, moderate, localized and will be medium term.*

6.6.21 Generation of Waste and Hazardous during Construction

The construction industry produce a significant amount of wastes. Studies have indicated that construction waste can be as high as 10 to 15% of the materials utilized

for the construction works. Thus, the amount of construction waste generated could be as high and the total amount of various materials use in the construction of the ARU Mwanza Campus. Examples of waste generated could include various building materials such as nails, electrical wiring, shingle, concrete, damaged bricks, insulations, dredging materials, rubble, etc. Some of the adverse impacts of the construction wastes include the following:

- Some of the construction wastes are difficult to dispose of and have no residual value (cannot be re used or recycled. This has impacts on waste management costs in terms of transportation, land required for disposal, and costs for establishing suitable disposal sites.
- Some of the construction wastes when exposed to moist environment, can release *hazardous components* such as lead, and other metal ions (i.e. Cu. Fe, Zn etc), than can contaminate land, and water resources. Such contamination can potentially enter the food chain and cause health effects to humans and other organisms.

Further impacts could also arise from improper disposal of food waste & packaging materials and human wastes generated onsite by the construction workers. Haphazard disposal of food waste will attract scavenged birds, insects and rodents, which are diseases vectors. Human wastes carry infectious pathogens. Improper discharge or open defecation on the environment will contaminate soils, and pathogens can be carried by runoff to receiving water bodies, where they will contaminated water resources. Contamination of water resources and foods by pathogen can result in eruption of diseases such as cholera, typhoid, dysentery and diarrhoea. *The significance of this impact is high. The spread of the impact is local, and short term during construction. The impact is direct, revisable, but has cumulative impacts.*

6.6.22 Wastewater Management problems

The types of wastewater generated during construction activities include sewage, grey water and process water. Sewage effluent will be produced in the sanitary facilities provided and collected on site. Septic waste produced if not well disposed will also pose a problem to human health. This will be particularly severe if the waste is not collected directly and / or is released directly into the environment without any treatment. Grey sewage will pose less of a direct problem to human health but will be produced in large quantities in the camps. Further, process water generated from batching plants, equipment maintenance centres and ordinary sites will contain chemicals with deleterious effects. Wastewater if discharge in the natural environment can pollute environment and causing unhygienic sanitary conditions and nuisances to the human perceptions. *The significance of the impact is moderate as the impact is direct, localised, short term and reversible.*

6.7 POTENTIAL IMPACTS DURING THE OPERATION PHASE

Potential Positive Social Impacts

6.7.1 Diversification of Ardhi University

The proposed new campus will definitely make ARU a bigger university, with more learning facilities. More student's enrolment and an *increase diversity of courses* offered. This will bring both social and economic benefits to the nation. Also the proposed project components shall provide adequate and conducive space for training, seminars, workshops etc. This is direct impact, high significance, and could be felt

national level. The project will leave its mark, even after decommissioning, (those who gained knowledge will continue to benefit the nation).

6.7.2 Job Creation and employment opportunities

During this phase, people shall be employed by the University to conducts a number of activities at the campus including both academic and administrative activities. During this phase it is expected that more than 10,090 students will be registered at the University calling for higher demand of both staff and non-staff amounting to 502. In additional to that, there will be an increase of self-employment due to the higher demands and supply of various goods and services for people working at the campus as well as students studying at the campus. For example, an increase in restaurants, bars, hotels, *mama Ntilie* will be obvious to meet the increased number of the people working in the site.

This direct positive impact, high and are likely to affect large area as the project will pileup from the local area to International level (it is expected that some of the students and teachers may come out of the country) and will be a long-term impact in the sense that even at the end of the phase the created employment and business opportunity will leave the lives of those employed improved in one way or another. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.7.3 Increase in income generation opportunities

This influx of people and particularly students amounting to 10,090 at the University calling for higher demand of both staff and non-staff amounting to 502 in the area will provide an opportunity for local people to engage in some sort of business activities that will enable them to get more income compared to the previous time in which most of them depended on agriculture and farming as their only source of income. The project will create a new source of income for both the people within Karumo and Kamanga communities as well as the surrounding communities of Nyamatongo ward and Sengerema district in general.

This is direct impact, high and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the created income generation opportunities will leave the lives of the beneficiaries improved in one way or another. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.7.4 Changes in lifestyle and quality of life

It is expected that, the increase in employment opportunities both formal and informal will result to the rise of high wages among the population in the areas as well as the surrounding communities. This is likelihood to increase their expenditure and consequently alter their living standard. This will also have a multiplier effect in the

communities that the workers come from, as they will for example be able to pay for school fees as well as buy assets such as bicycles and radios. Apart from that, the influx of people in the area will result to an increased number of people with mixed culture hence easy to alter or influence the same to undergo some changes that may be positive or negative.

This induced impact, high and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the new lifestyle developed and improved quality of life will persist. . Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.7.5 Increased skills and impart knowledge to local communities

As noted above, the operation phase of the University will register and train up to 10,090 students in different phase till its full capacity of the campus. In addition to that, there will potentially be training opportunities or practical learning for local people who will be employed in the project particularly staff and non-staff during this phase and consequently acquire necessary skills that will be of paramount important in their lives. During operation, the university will offer some short courses to help people to acquire necessary skills used to perform their daily activities. This will enable them to improve their economic activities which will lead to higher income and hence improvement of their living standards.

This indirect impact, high and will affect the entire nation as well as education system and will be a long-term impact in the sense that even at the end of the phase the new skills and knowledge acquired will be necessary in improving their own life as well as contributing t the development of the nation. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have residual impacts.

6.7.6 Increase of academic facilities in Mwanza Region

The ARU-Mwanza campus is expecting to work in cooperation with other related academic institutions in Mwanza. The nearby institutions will benefit from the campus through outreach services, short courses or using university resources like laboratories, machines. This will reduce cost to the institutions which had to travel a long distance to seek for the similar services. The long term relationships for the institutions will improve the quality of education in Mwanza and country at large.

This direct impact, high and will affect the entire nation as well as education system in Tanzania and will be a long-term impact in the sense that even at the end of the phase the new skills and knowledge acquired will be necessary in improving their own life as well as contributing to the development of the nation. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved

but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have residual impacts.

6.7.7 Increased Revenues to local and national Authorities

The proposed project development can benefit local communities in terms of income generating employment. This will allow opportunities within the local business community, such as the provision of services and supply of goods such as food, hotel and building materials. The local business community as such would therefore also have more money circulating within it creating additional spin off effects for improvement of the local economy. It is also expected that the increased business and investments in the area will give an opportunity for local government authorities to collect tax and consequently improve the availability of social services in the area. Overall, as users pay specific taxes and fees for services, the local and national revenue will increase even before the commencement of the operational phase.

This indirect impact, high and will affect entire nation in the sense that revenue collected from the project area will not be used in the local area but rather will contribute to the nation budget and will likely to have a long-term impact in the sense that even at the end of the phase the source of incomes developed prior will persist and grow in terms of size and services. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the entire nation that will benefit from the increased government revenues in terms of improved social services and other government support to the citizen. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that the government may propose and or develop strategies to retain the revenues or even multiplies it.

6.7.8 Increased commercial and social activities around project locations

It is envisaged that the pre-construction stages of the buildings at Karumo village; Sengerema district which includes but not limited to; site clearance, establishment of campsites, and transportation of materials will attract a number of investors from within and outside surrounding communities to invest in meeting the needs of the increased population as well as people seeking for employment in the area. This is likely to enhance the development of the centers at surrounding areas. It is also expected that service providers such as food venders and general viosks (dukas) may be established and increase during construction phase to provide services to both skilled and unskilled laborers working in the project site.

This direct impact, high and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the new commercial activities at the project site will persist and grow in terms of size and magnitude of the services to be provided. . Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them including local authorities in the area and people they serve. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that the owners of this social and commercial activities

may develop new strategies to re-construct and re- develop or even multiplies the interventions.

6.7.9 Increased income to local suppliers and service providers

The Population of Karumo village is expected to triple in the next few years as a result of the ARU-Mwanza campus construction. During construction, the project is expecting to employ more than 502 staffs and 10,090 students from different part of the country. Therefore the village will be having more people than before. The change in population level due to influx of workers and laborers will contribute to the new market opportunities for small, middle and big business persons. This will increase money circulation at the area leading to high income to the local suppliers and service providers.

This is direct impact, moderate and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that even at the end of the phase the life f the local suppliers and service providers will remain improved. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible.

6.7.10 Increased land values

Upon commencement of the operation activities for Ardhi University at Mwanza will change the land status at Karumo area; Sengerema district, as well as the land at surrounding villages (Kamanga and the entire Nyamatongo ward). Land owners have the understanding that the introduction of the campus will cause their land to add value and therefore they have to plan for it and obtain title deeds. The title deeds will help them to obtain loans from financial institutions which will be used for different purposes like; improving their houses, paying for health services, education services etc. adding value to the land and the same will have a sustainable effect to the people in the local area.

This is direct positive impact, high and are likely to affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them in the local area. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

Negative Social Impacts

6.7.11 Population Increase and increased pressure on social services

Residences in the project area and surrounding communities do not have sufficient social and infrastructural services provided to them such as in the areas of health, education and water. In view of this, the influx of people in the project area will increase pressure on the already limited social infrastructure and may without the taking of steps to alleviate this place a heavy additional burden on the existing service

delivery system. During the operation phase it is expected that more than 10,090 students and 502 employees of ARU will resides within these communities causing burden and pressure on the available limited social services.
This is direct negative impacts, high and are likely to affect the entire region surrounding the project area for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them in the region. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

6.7.12 Increased in level of crimes

It is expected that the operation phase will recruit more than 502 staffs and 10,090 students from the communities around and other from within and outside the country. In addition, the project will attract people from various areas to come and invest the provisions of good and services. The increase in Population increase will stimulate the growth of the trading centres around the project site. Experience and sociological point of view show that where there is a big concentration of people from various backgrounds and behaviour, levels of crimes and changes in norms and behaviour are common. This is also is likely to be the case of the trading centers around the project sites like Kamanga village, Karumo village and other nearby areas.

This is direct impacts, negative in nature at a high level and will cover the local areas surrounding the project like Karumo, Kamanga and the entire area of Nyamatongo ward. The impacts arising from this will be moderate and are likely to affect the entire region surrounding the project area for a long-term. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that ARU in cooperation with local authorities and police force may set up strategies to reduce and combat crimes.

6.7.13 Food Insecurity

The stakeholders that were involved in this study have raised their concerns about shortage of food that may arise at the project site due to influx of employees, students and investors causing pressure on available areas for sources of food. In our focus group discussion with village council members, they argued that the development of this project would likely to attract many people to come and settle in their villages increasing demand of foods and services. This is likely to cause a lot of chaos and inflation of prices on goods and services including food services.

This indirect negative impacts, high and are likely to affect the entire region surrounding the project area for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated with them in the region. One of the important thing to note is that, after the end of this phase the impacts will be reversible as relevant strategies may be employed to reduce the state of food insecurity.

6.7.14 Increased traffic flow and increased risks of road/ferry accidents

During the operation, some activities that may rise in endangering the lives of the community members living close to those activities. This in turn will likely to

endanger the lives of the local communities in form of accidents if appropriate measures are not taken. In the areas. On the transportation of raw materials and students as well as different individuals to the site, drivers may fail to observe safety measures along the road something that may result to accidents to other road users like pedestrian, motorcyclist, and bodaboda drivers. The increased congestion of people and vehicles at the project site as stated above will cause multiple routes on the roads and sea. The multiple routes of vehicles will increase the chances of roads and ferry accidents. This may cause loss of people lives which can lead to misunderstanding between local people and their government.

This indirect impact, high and will affect the project communities of Karumo and Kamanga as well as other local communities surrounding Nyamatongo ward and Sengerema district and will be a long-term impact in the sense that at the end of this phase all the risks will die natural death. Furthermore, the impact will not be pilling up and no cumulative effects may be witnessed at the end of this phase. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

6.7.15 Prevalence of Communicable diseases

Influx of students and employees from different part of the country (more than 502 staffs and 10,090 students from other parts of Tanzania and neighboring regions) will increase interaction, consequently increasing the risk of getting HIV/AIDS infections and other communicable diseases. That, the growth of trading centers in the area will attract different businesses and different people to the extent that the level of prostitution will also increase in the area provided that there will be employees from other areas of the country. Increased prevalence of communicable diseases like HIV/AIDS will likely to happen and consequently result to the increased number of orphans and single parenting in the project area as well as increased level of communicable diseases.

This is an induced impact, high and its effect will go internationally due to the fact that currently the world is like a village and that the Campus will attract both local and International students and will be a long-term impact. Furthermore, the impact will not be pilling up and no cumulative effects may be witnessed at the end of this phase. One of the important thing to note is that, after the end of this phase the impacts will be reversible in the sense that some strategies may be employed to reduce or control the transmission of communicable diseases.

6.7.16 Price inflation of goods and services

Residences in the project area and surrounding communities do not have sufficient social and infrastructural services provided to them such as in the areas of health, education and water. In view of this, the influx of people in the project area will increase pressure on the already limited social infrastructure and may without the taking of steps to alleviate this place a heavy additional burden on the existing service delivery system. The high demand on goods and services by the increased number of people at the project site will lead to the price inflation of goods and services which will result to failure of some members of the community to buy or access the social services.

During the operation phase it is expected that more than 10,090 students and 502 employees of ARU will resides within these communities causing inflation of goods and services. This negative impacts arising from this will be high and are likely to affect the local communities for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated within the area. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

6.7.17 Increased incidence of GBV/SEA/SH

ARU-Mwanza campus will be one of the major University projects in Sengerema district. Normally, projects like this can be a high-risk environment for GBV affecting community members, workers and service users. GBV risks can intensify within local communities when there are large influxes of male workers from outside the area. Such workers often come without their families and have large disposable incomes relative to the local community, and can pose a risk in terms of sexual harassment, violence and exploitative transactional relationships. These risks are higher where workers come into close contact with the local community, for example on access routes or when living together in remote areas. Addressing gender based violence in construction projects improves workers' physical and emotional wellbeing and strengthens occupational health and safety also builds relationships and social license to operate in communities.

This is direct negative impacts, high and are likely to affect the local communities for a mid-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated within the area. One of the important thing to note is that, after the end of this phase the impacts will be reversible hence hence no residual impacts.

6.7.18 Restrictions on use of access road to Karumo village

There is a community road used by pedestrians and cyclists passing through the project site from Kamanga-Geita main road to Karumo village. Currently people are free to use the road all the time but when the project takes off, there will be some restrictions especially through the night durations for security purposes. This may cause chaos to the community members who have used the road freely throughout their life time. In order to reduce disturbance to community members, an alternative road must be constructed or improving the existing alternative roads

This is direct negative impacts, high and are likely to affect the local communities for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated within the area. One of the important thing to note is that, after the end of this phase the impacts will be reversible hence no residual impacts.

6.7.19 Change in social values and ethics

During operation phase of the project new people from different places of the country and outside the country will be employed and live at the project site. People with different values and ethics will have to live together with the local communities. In this case it is expected that the local community will have a lot to learn from the people. If the introduced values and ethics will not be good according to the local, national and international standards then the local community will be impacted negatively. Once the community is affected at the project site, the effects will soon be felt at the local and national levels.

During the operation phase it is expected that more than 10,090 students and 502 employees of ARU will resides within these communities causing change in social values and ethics. This is indirect negative impacts, high and are likely to affect the local communities for a long-term. Furthermore, the impact will be pilling up with cumulative effects not only to those directly involved but also the one associated within the area. One of the important thing to note is that, after the end of this phase the impacts will never be reversible hence irreversible and will have a residual impacts.

Impacts on physical environment

6.7.20 Impacts on surface and ground water quality

The main sources of pollution during the operation phase include:

- Contaminated runoff from parking lots (containing hydrocarbons grease, oils and lubricants);
- Discharge of untreated wastewater from wastewater treatment facilities;
- Improper solid waste disposal;
- Release of wastewater from domestic and construction activities;

Contaminated runoff could potentially contaminated Chamihigwa seasonal stream, and eventually impair the quality of Lake Victoria water, by altering its physical-chemical nature. Since the Lake is the main source of water supply to the Lake Zone communities, its contamination could directly affect domestic water supply quality, render it useless for irrigation, contaminate food chain and also affect living organisms in water. *This impact is assessed to be regional scale (due to the size of Lake Victoria) and medium. The significance of the impact is high and irreversible.*

6.7.21 Increased runoff/storm water

Development of the propose site, including construction of structures and paved areas will significantly reduce surface area for storm water infiltration and uptake by plants. The vegetation cover of the site is about 1,630,508 square meters, of which 67% will be cleared to provide adequate space for physical facilities. The amount of storm water generated is estimated in chapter II. The increased surface runoff could potentially accelerate soil erosion and increase sediment transfer and pollution load to Lake Victoria. *This is direct impact, moderate significance, local scale and of long term. The impact is reversible with proper mitigation, however, it is cumulative in nature.*

6.7.22 Health and safety risks due to fire hazards

Buildings are very prone to fire hazards because of different types of combustible materials and machines, which are used and installed, respectively. Electrical fault is by large the main culprit in fire accidents in buildings in Tanzania. The components of a fire are fuel (combustible substance), heat and oxygen. Some chemicals used in laboratories and training workshops may also cause fire eruption if not handled appropriately. Unless all three are present fire will not occur. Fire can cause the following effects:

i. Loss of lives;
ii. Serious Injuries;
iii. Loss of properties etc.

This is direct impact, moderate, local and will be long term.

6.7.23 Contribution to Climate Changes during the operation phase

The operation of the Mwanza ARU Campus will contribute to Climate change in terms of emissions from energy (use electric appliances, utilisation of biomass/ electricity in cooking); transportation (emissions from diesel and petrol vehicles) and waste management (i.e. CH_4 emission from waste decomposition, CO_2 from waste burners) sectors. There will also be minor emission of hydrocarbons from printing devices. The IFS guidelines on GHGs emissions recognises these sector as major contributors to climate change. Emissions from these sector, by the project have been quantified in chapter II. *The production of greenhouse gases has long-term consequences on a planetary level. This is indirect impacts, high significance, long term and of international concern. Further the impact is irreversible, has cumulative impacts (baseline indicated that waste burning is common practices, thus potential for GHG emissions) and has residual impacts.*

6.7.24 Impacts/risks associated with generation of solid waste during operation phase

Operation of the Campus will result in generation of solid wastes, including paper wastes, plastics, rubbish yard wastes, floor sweepings etc. there will also be food wastes from operation in the kitchens and dining areas, food packaging materials and containers.

- Food waste is highly putrescible, and will decompose within few hours, producing foul smells that will attract scavenger organisms, flies and other disease vectors.
- Haphazard disposal of solid waste will be a threat to public health. Scavenger animals can spread the waste to the nearby community areas, and result in eruption of diseases, especially those transmitted by flies and rodents.
- Solid wastes, if they end up in water ways, will block water flow, and interfere the local hydrology.
- The Sengerema DC has no sanitary landfill, thus collected waste material will be disposed in the designated waste dump. This has high potential for land contamination by the wastes and leachate (during the rain seasons).

Another impact is on air quality and Climate Change in case waste is burned. Burning of solid waste (which is a common practice in the project areas, due to lack of coordinated waste management services) will result in emission pf greenhouse gases, hence have impacts on local air quality and contribute to the global climate change.

The significance of this impact is high, the scale of impact is local, and medium term. The impact is direct, irreversible, and hascumulative effects.

6.7.25 Impacts/Risks of liquid waste generation during operation phase

Significant amount of wastewater will be generated from toilets bathrooms, kitchen, and laundry areas. At peak, the university will have about 10,000 people. High volumes of wastes water will be generated and treated onsite before disposal (se chapter II). Improper management of wastewater has a number of impacts/risks as listed hereunder;

- Human wastes (faeces and urine) is rich in pathogens, bacteria and nutrients. If not properly disposed can contaminate food (via flies). When deposited in open land, it can contaminate soils and surface runoff, which will eventually contaminate surface water and ground water. Exposure to contaminated food or water can result into many health problems, including disease outbreaks (i.e. diarrhoea, typhoid and cholera).
- Domestic wastewater is rich in nutrients, hence can cause eutrophication of receiving water bodies (Lake Victoria);
- Oils and grease in sullage, if not separated, removed and treated can cause toxicity in aquatic environment;
- Chemicals in soap detergents can cause toxicity in soil and aquatic organisms;
- Contamination of land and water resources could potentially contaminated the food chain

This impact will be felt locally, but in case of Lake Water contamination, the impact is rated at regional level and of medium term. *The significance of the impact is high. The impact is direct, reversible and has cumulative impacts.*

6.7.26 Generation of Hazardous waste during the operation phase

During the operation phase of the project, hazardous wastes will be generated from laboratory activities, involving the use of chemicals; oils, lubricants and containers, and contaminated rugs from the training workshop; cut materials (plastics, metals and similar) etc. Hazardous wastes will be generated from the health care facility (i.e. infection wastes, sharp objects, and chemicals). Table 6.5 provides a summary of impacts from various waste types and their associated risks/impacts is presented hereunder

Table 6.5: Waste types and associated risks

HAZARDOUS WASTE TYPE	**IMPACTS/RISKS**
Medical Waste generated in the health care facilities	Health-care waste contains potentially harmful microorganisms that can ready infect any exposed person. Some wastes may include drug-resistant microorganisms which may spread from the campus into the environment. Risks and adverse health impacts associated with exposure may include: ▪ Infectious medical waste can cause disease in humans either through direct contact or indirectly by contamination of soil, ground or surface water and air. ▪ Accidents: sharps-inflicted injuries; ▪ Health impacts associated with toxic exposure to pharmaceutical products, in particular, antibiotics and cytotoxic drugs; Further, haphazard burning of medical waste may cause air pollution and health problem associated with inhalation of toxic substances such as mercury gas or dioxins.
Waste Batteries (Single batteries, reachable batteries and automotive batteries)	Most rechargeable batteries contain toxic metals such as ***cadmium, cobalt, lead, nickel, lithium etc***. Improper disposal of batteries may contribute to water and air pollution. When depleted batteries are thrown into the environment, they decay and leak the toxic metals. As batteries corrode, their chemicals soak into soil and contaminate soils, groundwater and surface water. ▪ Leached toxic materials released into the environment may poison food chain and pose serious threats to human health and the environment. ▪ If burned haphazardly, toxic fumes are produced. Long term exposures to the toxic fumes may result to chronic illness, including damage to the respiratory system. ▪ Most heavy metals in the batteries are known ***carcinogens*** i.e. exposure may lead to cancer development.
E-waste (Used/old/ damaged electronic devices including printer, photocopies. Lab equipment, workshop electronic equipment, gadgets etc	E-waste contains a list of chemicals that are harmful to people and the environment, like: mercury, lead, beryllium, brominated flame retardants, and cadmium. When electronics are mishandled during disposal, these chemicals may leach out and end up in soil oils, where it can washed away with runoff, and contaminate soils, water, and air. • The open-air burning releases toxic fumes, while acid baths leaches toxic materials leaching into the environment. • The most dangerous property of heavy metals is their toxicity and tendency to accumulate in the environment. Highly toxic substances such as mercury, lead, beryllium, and cadmium can accumulate in bio water, in plants and animal tissues and pose a significant threat to the environment even in minute quantities

	Heavy metals. **Impacts on Climate Change:** Failing to recycle e-waste means more primary raw materials need to be extracted and refined, which might lead to an increase in greenhouse gas emissions.
Plastics	Plastics are non-biodegradable. When haphazardly dumped in the environment, it may take up to 1,000 years to decompose, leaching potentially toxic substances into the soil and water. Further, haphazard disposal of plastics on land and open air burning can lead to the release of toxic chemicals into the air causing public health hazards. ▪ Contamination of water resources: Chlorinated plastic can release harmful chemicals into soils & water resources, and eventually contaminate food chain (micro plastics have been found in soils, water and aquatic organisms) and cause toxic effects.

The scale of this impact is regional. The duration of the impact is long term during the operation phase of the campus. The significance of the impact is high, requiring sophiscated mitigation measures, as provided in local and international guidelines i.e. the IFC. However, with application of the mitigation measures the impact revised. The impact will be direct, cumulative, and will have residual impacts.

6.8 IMPACTS DURING DECOMMISSIONING PHASE

Social impacts

6.8.1 Loss of employment and business opportunities

People employed by the project will lose their jobs. This will have significant impact on these people and their families. Other dependents of the project, such as suppliers of various services (e.g. security and cleaning companies) and goods (such as food stuff and stationaries) will lose the business opportunities. This impact is considered negative, long term and of moderate significance. This impact is direct, high, local and will be moderate term.

Environmental Impacts

6.8.2 Land pollution and loss of aesthetic

In the event that decommission of the Campus involve demolition of structures, there is a risk that improper waste management could contaminate land (soils and water resources). In case demolition waste is left scattered, it will destroy the aesthetic values of the area, and its neighbouring environment. Abandoned waste management facilities (septic tanks, wetland could potentially become a breeding area for diesel causing vector, that could transmit infectious disease to the neighbouring community.

The significance of the impact is high. The spatial scale of the impact regional and its duration will be short term.

6.8.3 Generation Demolition waste materials

The Decommissioning of ARU Mwanza campus will generate demolition wastes that are heterogeneous mixtures of building materials such as aggregate, concrete, wood, paper, metal, insulation, and glass that are usually contaminated with paints, fasteners, adhesives, wall coverings, insulation, and dirt. Due to the complex composition of demolition waste, its haphazard disposal on the environment could have deleterious effects. For example, metals, paints when exposed to wet environment can potential release toxic ions (through leaching), thus altering the soils chemistry, and contaminating water resources and the food chain. Other components such plastics and glass are non-decomposable, thus can remain in the environment for years. The waste if improper placed will become a safety hazard.

The significance of this impact is high. The scale of impact is local, and short term. The impact is direct, reversible, and will have cumulative and residual impacts.

6.8.4 Air pollution resulting from demolition works

Demolition activities will potentially generate dusts and other air pollutants. Dust will emanate from gridding, drilling on concrete works, from moving, loading and off-loading of construction materials. Dust will have impacts on the aesthetic value of the area, impair plants photosynthesis and possibly impair visibility. Inhalation of fine particulates (PM) may cause health hazards to receptors (demolition workers). *The significance of this impact is low, of local scale and short term.*

6.8.5 Noise pollution from demolishing works

Demolition activities are typically associated with noise levels above the standards. The main noise receptors will be the demolition force and neighbouring community. Noise is nowadays considered a public health concern. Impacts of noise could be physical (such as hearing loss) and psychological (such as frustration and nuisance). *The impacts of noise is direct, local, of medium significance, short term but could be irreversible.*

6.8.6 Loss of revenue to institutions and the government

As discussed above both town and Central government will be receiving revenue from the project. In case of the decommissioning of the project, the revenue generated will cease and hence the revenue base of local and central governments will shrink. This impact is direct, high, local and will be long term.

6.9 Cumulative impacts

Cumulative impacts are incremental changes caused by the project together with other presently ongoing, or reasonably foreseeable future planned actions/projects within the Project Area. Cumulative impacts act with others in such a way that the sum is greater than the parts. The project will have both positive and negative cumulative impacts during its implementation. The nature of cumulative impacts can be both short term in nature (restricted to the construction phase) and medium term (occurring in both the construction and operation phases).This subsection presents cumulative

impacts of the proposed projects at ARU campus. The mitigation measures to either prevent or minimise risks related to potential cumulative impacts have been provided in chapter seven.

6.9.1 Cumulative Socio-Economic Impacts

Positive Cumulative Socio-Economic Impacts

The proposed construction of classrooms, cafeteria, workshops, laboratories, hostels, dispensary, etc are likely to have positive impacts during project implementation. The proposed ARU Mwanza campus shall modify the existing Kamanga and Karumo settlement due to introduction of the state of the art buildings. The project shall enhance the available social services by introducing the health services and education facilities hence contributing to government efforts in providing health and education services to the people. Further, the presence of the proposed campus shall increase employment opportunities, increase of income generation activities, changes in life style, and the increase in skills to local community more that the present status.

Negative Cumulative Socio-Economic Impacts

The establishment of the proposed ARU Mwanza Campus shall attract are students, vendors, and staff from different social backgrounds. The increased number of people will cumulatively increase the impacts of social interactions between students/ staff/vendors and visitors at the campus with local community. Such impacts may include cumulative increase in communicable diseases (HIV, AIDS and other STDs as well as COVID 19 outbreak) and cumulative increase in theft, conflicts, traffic flow, crimes and other security issues.

6.9.2 Cumulative Impacts on Bio-physical Environmental

6.9.2.1 Incremental noise and air pollution

The main sources of noise and air emissions at Karumo are traffic and standby power generators. The proposed project shall definitely contribute to increase traffic flow within the campus, both during construction and operation. The proposed infrastructure shall be provided with standby power generators. These shall cumulatively increase noise levels and exhaust gasses emissions within the University Campus.

6.9.2.2 Greenhouse Gas Emissions and Climate Change

Greenhouse gas emissions has a major influence on climate. Naturally occurring greenhouse gases such as Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O) and Ozone (O3) play a key role in trapping the sun's heat, thereby maintaining the earth's temperature range necessary for life. Project implementation activities contribute to greenhouse gas emissions through the use of equipment, plants and vehicles during the construction phase. Also, the electricity use is associated with greenhouse gas emissions; since the electricity generation is met by hydropower and thermal generation plant. On the other hand, the increasing vegetation clearance during construction and operation phase reduce Carbon sequestration potential, hence reducing efforts towards climate change mitigation.

6.9.2.3 Acceleration of soil erosion and loss of biodiversity

The proposed project area and the surrounding community have land parcels having affected by erosion due to sand mining, transportation, agricultural and livestock keeping activities. On the other hand, the biodiversity at the proposed site is already disturbed. The proposed ARU Mwanza campus shall increase the effect of soil erosion through storm water generation and disturbance of soil material. Thus, the introduction of the new buildings and infrastructure shall lead to more soil erosion, more loss of biodiversity and associated ecosystem services. In addition, the presence of ARU Mwanza Campus shall attract land developments which will further intensify the soil erosion and biodiversity loss as well. Theses shall cause cumulative siltation to nearby waterbodies and ecosystem services loss.

6.9.2.4 Cumulative impacts of liquid and solid waste generation

The implementation of ARU Mwanza Campus shall generate solid and liquid wastes (both hazardous and non-hazardous). The future developments around the proposed site inclined by the presence of the campus shall attract people resulting to cumulative increase in liquid and solid waste generation within and around the campus. If not well controlled, they will lead to land and water pollution, and consequently impacting the public health.

6.10 Analysis of Project Alternatives

Consideration of project implementation alternatives is crucial in ensuring that the developer and decision-makers have a wider base from which they can choose the most appropriate option. The planning stage of this project considered the No project alternative site, alternative energy sources, alternative waste management technologies, alternative construction materials and alternative roofing materials. These are explained hereunder;

6.10.1 No project alternative

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

Based on the enormous benefit of the proposed project at national level, the No project alternative was abandoned. It is clear that identified impacts associated with project implementation are mostly temporary, and shorter, and are manageable at the campus level.

6.10.2 Alternative Site

As presented in Chapter 2 of this report, the proposed structures will be located within the University Campus. The option of utilising an alternative site out of the campus

was considered but over-weighted by the existing land at the university due to the following advantages over other;

- The site is owned by Ardhi University (No need to buy a new piece of land);
- The selected area is compatible with the land use
- The site is located on a favourable piece of land; large area with a clear view
- The site is well served with road network and it is easily accessible to public transport; and
- Availability of water and electricity mains supply.

6.10.3 Alternative Energy Sources

The main source of energy for ARU Mwanza campus is Electricity, supplied by the national grid. For the proposed infrastructure, the University considered four alternative sources of energy namely; electricity, diesel power generators, compressed natural gas (CNG) and solar energy.

- ***Alternative one - Electricity:*** As it is the case in most of developing countries, supply of electricity from national grids is not reliable as it mostly originates from hydroelectric power generators, which depend on rainfall frequency, intensity and pattern.
- ***Alternative two - Diesel generators:*** These utilise fossil fuels, which tend to emit greenhouse gases especially when operated for a long time. As such, diesel generators are used as standby power supply during power outages.
- ***Alternative three - Compressed Natural Gas (CNG):*** The University considered the used of CNG, especially in the laboratories. CNG is the cleanest gas, thus its utilisation would reduce environmental pollution. However, the University is currently not connected to such service.
- ***Alternative four - Solar energy****:* the last alternative considered was the installation of solar panels to harvest solar energy. It is intended that the solar energy be used for lighting within the buildings. It is also intended to install solar lights in various locations along the streets.

Conclusions: an evaluation of the four alternatives based on capital costs, availability of adequate supply, reliability, and environmental protection revealed that at least three options could be used together. Therefore, it is planned to connect the proposed infrastructure to electricity from the National grid as a basic power supply. Provisions will be made for installing solar panels and connections to CNG in the future. However, since some machines and laboratory equipment requires high voltage, which could not be supplied by solar energy, standby generators will also be provided, especially for the laboratories.

6.10.4 Water supply Alternative

Alternative one: Water Supply (surface water) from the operating water utility Authority

The Sengerema Rural Water Supply Authority (RUWASA) is the leading water supplier in the Sengerema District from Lake Victoria. This is the option considered to be appropriate as the water supply network is near the proposed site, and therefore can guarantee reliable, clean and safe water supply to the proposed ARU Mwanza Campus.

Alternative two: Groundwater Extraction

Presence of ponds and wetland at the proposed project area suggest that ground water is another alternative option for water supply and can supplement the water supply at the project site at such times of water shortage and scarcity. It has to be noted that before establishing the groundwater as sources of water supply, an investigation in terms of groundwater quantity and quality has to be thoroughly carried out and ascertained. Ground water investigation and well drilling have cost implications on the project. Further, utilization of ground water will necessitate investing on water treatment plant/equipment.

Alternative three: Rainwater Harvesting

The project considered rainwater-harvesting potential as alternative source of water. It is proposed to harvest rainwater from both roof and land catchment. It will entail the design of rainwater harvesting system and underground water storage tanks. Although this may demand more investment (capital), its operation costs are relatively low. Rainwater harvesting is one of the best ways to reducing surface runoff and soil erosion.

Conclusion: *The University opted to use a combination of two water sources namely piped water supply from RUWASA and rain water harvesting.*
RUWASA water although relatively expensive, it is of most reliable quality. Therefore, RUWASA water will be used for domestic purposes and in the running of laboratory. Rainwater will be used for cleaning and gardens maintenance but shall be complemented by RUWASA water.

6.10.5 Liquid waste Management Alternatives

Five alternatives were considered for liquid waste management, namely stabilization ponds/lagoons; use of up-flow anaerobic sludge blanket (UASB); constructed treatment wetland; septic tank - soakaway system; and direct discharge to the sewer system.

Alternative one: Use of stabilization ponds/lagoons

This refers to the use of a series of ponds/lagoons, which allow biological processes to treat the wastewater to meet effluent quality standards. This method requires a large surface area on the ground, to facilitate natural treatment (degradation). This option has two major fallbacks:

i) It requires large space and is incompatible with the ARU masterplan
ii) The open ponds will attract scavenger birds and animals to feed into the wastewater. The scavengers will create unaesthetically conditions at the site.
iii) Generation of foul smells from the degradation of wastewater in the lagoons/ponds.

Alternative two: Connection existing wastewater treatment plants

Another alternative considered is to use Up-flow Anaerobic Sludge Blanket (UASB).The system allow recovery of energy from the waste, in terms of sludge, biogas and nutrients rich water effluents. Further, the plant has many other advantages. It will be used for research and experiments; and it generates energy (biogas, manure, and nutrient rich effluent water) that could be used at the staff

houses at the campus, and save energy costs. While UASB systems are effective in removing organic pollutants, they may not achieve the same level of nutrient and Phosphorus removal as some aerobic treatment processes. Thus, if the treated effluent is intended for discharge into sensitive aquatic ecosystems, additional aerobic treatment processes for nutrient removal may be needed after the UASB process.

Alternative three: Constructed treatment wetland
The University shall consider adoption of constructed wetlands, which are engineered system designed and constructed to copy natural processes taking place in the natural wetlands. Constructed wetlands remove pollutants in wastewater through the combination of physical, biological and chemical processes. They are either subsurface flow where the flow is below the surface of soil or surface flow where the flow of wastewater is above the soil. This alternative is feasible compared to waste stabilization ponds /lagoons given the space available but needs more land compared to UASB for the proposed project. The system has Long Start-up Period, Maintenance Challenges and Odor Issues.

Alternative four: Use of septic tank and soak pits systems
This involves the construction of underground tanks for treatment of sludge and is connected to soak pits for disposal of effluent. It is less expensive to construct though regular emptying in large discharge points is required. Septic tanks and soak pits demand little space compared to other options.

Alternative five: Discharge direct to the sewer system
There are no sewerage system in vicinity of the site. This is not feasible and it will cost a lot to make it available.

Alternative six: Natural wetland
The project area has a wetland which may play a crucial role in wastewater treatment, providing a cost-effective and environmentally friendly method for improving water quality. Wetland vegetation and soils act as natural filters, trapping suspended solids and sediments from the wastewater as it passes through. The wetland sediments can adsorb and bind heavy metals. Microbial communities in wetland soils and on plant roots play a significant role in the degradation of organic matter and the breakdown of pollutants. Wetlands typically have a longer hydraulic retention time compared to traditional treatment systems. Wetland plants absorb nutrients like nitrogen and phosphorus through their roots, thereby reducing nutrient loads in the water.

Conclusion: analysis of the six alternative showed that alternatives two (Up-flow Anaerobic Sludge Blanket (UASB)) and four (Use of septic tank and soak pits systems) are the most favourable. Since, it is intended for discharge to Lake Victoria, alternative six (Natural wetland) can be used in conjunction with UASB and Septic tank-soak away pits for removing nutrients and so as to polish the effluents from UASB. Thus, the construction of the infrastructure will include construction of onsite septic soak away pit systems for interim use and when the population is at full capacity, the septic tank and soak ways systems will later be connected to sewer line to convey wastewater to treatment facilities (UASBs). The effluent from the UASB shall pass through the existing natural wetland and finally to the lake. The system is envisioned to ensure effective treatment so that the final discharge shall have no harmful effects to Lake Victoria.

6.10.6 Solid Waste Management Alternatives

The proposed project will generate a considerable large amount of solid waste (estimated at 3.7tones/day) from hostels, stationeries, workshops, laboratories, restaurants and offices. The University has considered two alternatives namely;

i) Landfilling- It involves collection and transportation to dumpsite for disposal. This shall be considered a last resort due to loss of resources and the potential environmental impacts at disposal site.
ii) Source Reduction: This approach focuses on reducing the amount of waste generated at the source followed by disposal at dumpsite.
iii) Reuse: Encouraging the reuse of products and materials to the extent possible to extend their lifespan. However, not all materials can be reused.
iv) Recycling: This will involve the collection and processing of materials to create new products and the rest shall be disposed of. Common recyclable materials include paper, glass, plastic, and metal.
v) Composting: This will involve transforming organic waste, such as food scraps and yard trimmings, into nutrient-rich compost as valuable soil amendment.
vi) Waste-to-Energy. It involves converting solid waste to energy source like briquettes and biogas production
vii) Waste Sorting and Segregation at the source: This approach enhances the efficiency of downstream waste management processes. Implementing waste sorting at the source or through centralized facilities helps separate different types of waste for recycling, re-use, composting, or proper disposal.

Conclusion: Alternative one will involve transportation of huge amounts of waste to the dumpsite. Since solid waste management is a service and doesn't generate any revenue, such practice will become a burden to the University. The generated amount will require at least one trip per day to the dumpsite. Therefore, alternative one is not feasible. The university shall use an integrated solid waste management approach that involves a combination of alternative (ii) to (vii). The approach will holistically reduce waste generation. The generated waste shall be segregated and sorted into degradable and non-degradable; and recyclables and non-recyclables. All recyclables wastes will be collected and sold to recycles (includes papers and plastic containers). The degradable wastes will be collected for animal food and the rest shall be utilized in research activities such as composting, biogas generation and maggot production. The remaining non-decomposable and no recyclables will be stored on site in constructed chambers for final disposal.

6.10.7 Alternatives building materials

It is estimated that building materials account for more than 60% of the total building cost, therefore, the selection of affordable building materials cannot be overemphasized.

The University looked into a variety of building materials for different aspects of the proposed infrastructures. Architects consulted with structural engineers on the load-bearing capabilities of available materials. Five common materials namely *concrete, steel, wood, masonry and stone* were considered as briefly described hereunder:

Concrete: Concrete is a composite material made from fine and coarse aggregates, bonded together with cement. Its versatility, cost and strength makes it the ideal

material for building foundations. It is most prefer since it can carry heavy load and withstand harsh environmental conditions its

Steel: Steel is a metal alloy of iron and carbon and often-other alloying material in its composition to make it stronger and more fracture-resistant than iron. Because it is so strong compared to its weight and size, structural engineers use it for the structural framework of tall modern buildings and large industrial facilities

Wood: Among the oldest, or perhaps *the* oldest, of building materials, wood has been used for thousands of years and has properties that make it an ideal building material—even in the days of engineered and synthetic materials.

Stones: The longest lasting building material available is the one that's been here for thousands of years: stone. In fact, the most ancient of buildings still in existence in the world are made of stone.

Brick/masonry: Masonry construction uses individual units (such as bricks) to build structures that are usually bound together by some kind of mortar. The strongest and most commonly used masonry unit is a concrete block, which may be reinforced with steel. Glass, brick, and stone can all be used in a masonry structure

Conclusion: A team of Architects and Engineers evaluates these based on criteria such as *strength, weight and durability*, which would make it right for various uses; compatibility with National standards and testing methods that govern the use of building materials in the construction industry; consideration for structural integrity and cost and aesthetics.The University shall opt to use a combination of materials except brick/masonry..

6.10.7 Alternatives roofing materials

Roofing is a crucial part of the building construction. Every construction requires a stable and strong roof and should have the ability to protect the structure from natural conditions. The University considered various options in terms of roofing materials, among these coated *aluminum roofing sheets* and *clay roofing tiles*. The two materials were evaluated based on costs, availability, whether resistance, longevity, flexibility and corrosion resistance.

Conclusion: Although roofing tiles scored, more points in terms of whether resistance, longevity and resistance to corrosion, they were found to be more expensive that aluminum roofing (i.e. per square meter). Aluminum roofing sheets scored more point on capital costs, flexibility and less labor intensive during installation. Therefore, the University opted to use corrugates aluminum sheets for roofing.

CHAPTER SEVEN

7.0 IMPACTS MITIGATION AND ENHANCEMENT MEASURES

This chapter is devoted to describing measures or interventions that shall be implemented to minimize the potential negative impacts and enhance the potential positive impacts identified in the preceding chapter. Many of the proposed mitigation measures are essentially good practice that shall be adhered to during all the project phases.

7.1 MITIGATION MEASURES DURING PREPARATORY PHASE

Negative Social Impacts

7.1.1 Loss of cultural assets and displacement of ritual sites

i. Work with local authorities and relevant clans for alternative area for cultural and ritual sites
ii. Agree with the local authorities and clans owning those cultural and ritual sites on smooth on the best modality to remove them from the project area
iii. Lease with the relevant local authorities and clans owning those ritual sites for smooth re-allocation of the sites
iv. Financing the smooth re-allocation of the for cultural and ritual sites
v. When necessary, avoiding to interfere the areas rich in cultural and ritual assets

7.1.2 Community health and safety risks

i. Institute good site practices including prevent public access to the construction site by securing equipment and demarcate excavate, using warning signs with appropriate text (local language) and graphic displays;
ii. Institute traffic management and safety programme including, training and testing of heavy vehicles operators and drivers, enforcement of speed limits, maximum loading restrictions and compliance with all Tanzania transportation law and standards;
iii. Awareness campaigns /Education on HIV and STDs shall be provided to workers;
iv. Appropriate working gear (such as nose, ear and mouth mask and clothing) and good construction site management shall be provided;
v. During construction, the contractor shall ensure that the construction site is fenced and hygienically kept with adequate provision of facilities including waste disposal receptacles, sewage, firefighting and clean and safe water supply;
vi. A well-stocked First Aid kit (administered by medical personnel) shall be maintained at construction site. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing health education to the workforce;

vii. Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health and safety due to the construction operation should be put in place;
viii. Emergency contact details in the event of an accident shall be provided;
ix. Develop and implement an emergency plan including spill response;
x. Training all contractor staff in emergency planning and spill response; and
xi. Developing a detailed health and safety plan and training all contractor staff on the plan.

7.1.3 Loss of livelihood

i. Seminars shall be conducted on alternative means of livelihood after acquisition of the land from local people
ii. Local people that previously owned the land in question for the campus constriction should be well compensated as per the local laws and World Bank requirements/standards

7.1.4 Loss of revenue to the government

i. The government must find alternative source of revenues
ii. Strengthening revenue collection mechanisms
iii. Awareness creation for the people in the area on the importance of paying revenues even after the end of this phase and subsequent entering of new phase
iv. Enhanced cooperation between the project and local authorities

Environmental mitigation measures

7.1.5 Risk of buildings/structural designs to have potential to generate emergency/disaster events

Technical studies

- Geotechnical studies, Environmental and social impact assessment studies, master plans and feasibility studies shall be done by competent professionals to ascertain the project risks hazard profile of the site

Infrastructure and equipment design and safety

i. Structural elements of a project will be designed and constructed by competent professionals, and certified or approved by competent authorities or professionals. The Structural design will take into account climate change considerations, as appropriate.
ii. Where the project includes new buildings and structures that will be accessed by members of the public, the ARU will consider the incremental risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events. Where technically and financially feasible, ARU will also apply the concept of universal access to the design and construction of such new buildings and structures

Safety of services

- Where the project involves provision of services to communities, ARU will establish and implement appropriate quality management systems to anticipate

and minimize risks and impacts that such services may have on community health and safety. In such circumstances, ARU will also apply the concept of universal access, where technically and financially feasible

Emergency Preparedness and Response

- ARU will conduct a risk hazard assessment (RHA) to projects having potential to generate emergency events), as part of the environmental and social assessment. Based on the results of the RHA, ARU will prepare an Emergency Response Plan (ERP) in coordination with the relevant local authorities and the affected community, and will take into account the emergency prevention, preparedness and response arrangements put into place with project workers under ESS2. ERP will include, as appropriate: (a) engineering controls (such as containment, automatic alarms, and shutoff systems) proportionate to the nature and scale of the hazard; (b) identification of and secure access to emergency equipment available on-site and nearby; (c) notification procedures for designated emergency responders; (d) diverse media channels for notification of the affected community and other stakeholders; (e) a training program for emergency responders including drills at regular intervals; (f) public evacuation procedures; (g) designated coordinator for ERP implementation; and (h) measures for restoration and cleanup of the environment following any major accident

7.1.6 Increase in pressure on natural resources

i. Exploitation of construction materials will take place from authorized and reliable sources only;
ii. Restoration of the borrow pits/quarries after use-constituting of levelling the area and seeding or planting of trees and/or grasses will be done in association with local government (department responsible for natural resources) and local environmental NGOs. If appropriate, the levelled area will be left for natural re-vegetation
iii. When the project is a potentially significant user of energy, the ARU will adopt measures specified in the EHSGs to optimize energy usage, to the extent technically and financially feasible
iv. When the project is a potentially significant user of water or will have potentially significant risks and impacts on water quality, in addition to applying the resource efficiency requirements, ARU shall use additional technically feasible water conservation measures, the use of alternative water supplies, water consumption offsets to maintain total demand for water resources within the available supply, and evaluation of alternative project locations.

7.1.7 Solid waste generation due to demolition

i. All materials which can be reused shall be reused
ii. Materials that cannot be reused shall be sent to Sengerema/Mwanza dumpsite

7.2. POTENTIAL MITIGATION MEASURES DURING CONSTRUCTION PHASE

Negative Social Impacts

7.2.1 Community health, safety risks and security from the handling, transport, and disposal of construction wastes

i. Institute good site practices including prevent public access to the construction site by securing equipment and demarcate excavate, using warning signs with appropriate text (local language) and graphic displays;
ii. Institute traffic management and safety programme including, training and testing of heavy vehicles operators and drivers, enforcement of speed limits, maximum loading restrictions and compliance with all Tanzania transportation law and standards;
iii. Appropriate working gear (such as nose, ear and mouth mask and clothing) and good construction site management shall be provided;
iv. During construction, the contractor shall ensure that the construction site is fenced and hygienically kept with adequate provision of facilities including waste disposal receptacles, sewage, firefighting and clean and safe water supply;
v. A well-stocked First Aid kit (administered by medical personnel) shall be maintained at construction site. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing health education to the workforce;
vi. Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health and safety due to the construction operation should be put in place;
vii. Emergency contact details in the event of an accident shall be provided;
viii. Develop and implement an emergency plan including spill response;
ix. Training all contractor staff in emergency planning and spill response; and
x. Developing a detailed health and safety plan and training all contractor staff on the plan.

7.2.2 Gender based violence

- The project will prepare a GBV Action Plan that ensures project awareness raising strategy (for workers and community members), a list of GBV service Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.

7.2.3 Gender discrimination

- This project will ensure that there is involvement of women in project activities.

7.2.4 Child labour

i. ARU will conduct regular monitoring of project workers in relation to health, working conditions, hours of work, minimum age, and the other requirement of national law.
ii. Work with local authorities and schools in the area to control school drop out

iii. Cooperate with relevant authorities like Ministry of Labour to control child labour
iv. Create awareness raising to the communities on the importance of education to the children
v. The local authorities should develop bylaws to control the engagement of children in petty business or work in project related activities

7.2.5 Food Insecurity and inflation of prices on other social services

. The following measures are very vital in minimizing the problem of food insecurity;

i. Encourage traders to supply food and other products to the project area.
ii. Sensitization of the surrounding communities in order to make them aware of the employment and hence income generating opportunities with the proposed project.
iii. Provide more avenues for service providers e.g. cafeteria and restaurants
iv. Encourage and sensitize local communities to highly concentrate on the cultivation of food crops

7.2.6 Increased level of crimes

The following measures are very vital in minimizing the problem of crime;

i. Constructions of police stations at Ardhi University- Mwanza Campus and the surrounding communities like Kamanga and Karumo in order to strengthen security services
i. Establish community based security in collaboration with village/ward leaders.
ii. The contractor shall establish his own security to protect his properties and should establish community policing to support insufficient police force.
iii. The community should be encouraged to participate in security matters by providing information on suspects
iv. The cooperation of local people together will help to lessen criminal incidents and maintain security of people and their properties.

7.2.7 Increased pressure on social services

The project surrounding communities already do not have sufficient social and infrastructural services. In view of this, the influx of people in the project area will increase pressure on the already limited social infrastructure. In order to minimize this problem the following measures are very important;Limit the number of unskilled workers recruited from outside the direct vicinity as far as possible.

i. Explore alternative sources of domestic water, such as rainwater harvesting.
ii. Link to mandated structures to support improvement of social and infrastructural services at the project site and communities surrounding project area.
iii. Duty to the community requirement may be applied to justify the construction of new social services infrastructures or cooperate with local structures to strengthen the existing social services infrastructures
iv. Use of water conservatively by instituting technologies (e.g. self-lock water taps) and awareness raising notices to users, etc.;
v. Construction of underground water reserve tank and introducing rainwater harvest system;

vi. Link to mandated structures to support improvement of social and infrastructural services at the campus and communities adjacent to the project area.
vii. Duty to the community requirement may be applied to justify the construction of new social services infrastructures or cooperate with local structures to strengthen the existing social services infrastructures

7.2.8 Restrictions on using community road passing through project site

There is a community road used by pedestrians and cyclists passing through the project site from Kamanga-Geita main road to Karumo village. Currently people are free to use the road all the time but when the project takes off, there will be some restrictions especially through the night durations for security purposes. This may cause chaos to the community members who have used the road freely throughout their life time. In order to reduce disturbance to community members the following measures should be applied:

i. New Alternative roads shall be constructed
ii. Improving the existing alternative roads
iii. Allow people to pass through project site during day time

7.2.9 Prevalence of Communicable diseases

Influx of job speculators from other parts of Tanzania and neighboring regions will increase interaction, consequently increasing the risk of the spread of communicable diseases. The following measures are recommended to mitigate this impact.

- Provide awareness to public on pathways of communicable diseases.
- Provide Voluntary Counselling and Testing (VCT) centres for HIV/AIDS.
- Provide more health facilities
- Work close to government and private institutions that deal with the spread of communicable diseases
- A safety, health and environment induction course shall be conducted to all students and workers, putting more emphasis on HIV/AIDS, which has become a national disaster as well as other emerging pandemics such as COVID 19 and dengue fever;
- The project shall include information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS, and means to suppress its incidence;
- Environmental sanitation systems shall be improved; and,
- Adequate medical services shall be made available at the University dispensary for meeting the population demand.

Environmental Impacts

7.2.10 Occupational Health and Safety

Slips and fall

i. Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
ii. Cleaning up excessive waste debris and liquid spills regularly
iii. Locating electrical cords and ropes in common areas and marked corridors

iv. Use of slip retardant footwear

Work in Heights

v. Training and use of temporary fall prevention devices, such as rails or other barriers able to support a heavy loads, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface
vi. Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support heavy loads (also described in this section in Working at Heights above), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested.
vii. The tie in point of the fall arresting system should also be able to support heavy loads
viii. Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces

Struck By Objects

ix. Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels
x. Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable
xi. Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap
xii. Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged

viii. Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes
ix. Institute good site practices including prevent public access to the construction site by securing equipment and demarcate excavate, using warning signs with appropriate text (local language) and graphic displays;

Moving Machinery

xiii. Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic
xiv. Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
xv. Ensuring moving equipment is outfitted with audible back-up alarms
xvi. Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

Disease prevention

x. Awareness campaigns /Education on HIV and STDs shall be provided to workers;
xi. A well-stocked First Aid kit (administered by medical personnel) shall be maintained at construction site. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing health education to the workforce;
xii. Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health Emergency contact details in the event of an accident shall be provided;
xiii. Training all contractor staff in emergency planning and management; and
xiv. Developing a detailed health and safety plan and training all contractor staff on the plan.

Over-exertion, and ergonomic injuries and illnesses

xv. Training of workers in lifting and materials handling techniques in construction projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary
xvi. Planning work site layout to minimize the need for manual transfer of heavy loads
xvii. Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations
xviii. Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks

7.2.11 Loss of biodiversity (flora and fauna)

i. Clearance of patches of native forest remaining in the neighborhood of the proposed project components shall be avoided;
ii. Close supervision of earthworks shall be observed in order to confine land clearance within the project site;
iii. Appropriate landscaping programme to help in re-vegetation of part of the project area after construction shall be designed and implemented,
iv. Minimize the cutting or clearing of vegetation to extent possible

7.2.12 Loss of habitat

i. Appropriate landscaping programme to help in re-vegetation of part of the project area after construction shall be designed and implemented.

7.2.13 Loss of ecosystem services

i. Appropriate landscaping programme to help in re-vegetation of part of the project area after construction shall be designed and implemented.

7.2.14 Acceleration of soil erosion

i. Construction will be done as per engineering design and procedure of which a maximum requirement of compaction strength is achieved during the

construction. That is maximum dry density (MDD) specified in the design manual by consultant;

ii. Maintain gravel fill and/or re-vegetate around the structures;
iii. Unnecessary ground clearance and sensitive re-alignments shall be avoided;
iv. Directing flow to properly designated channels;
v. All excavation works shall be properly backfilled and compacted
vi. Most of construction activities will be done during dry weather;
vii. Mulching to stabilize exposed areas;
viii. Designing channels and ditches for post-construction flows
ix. Lining steep channel and slopes (e.g. use jute matting) and
x. Reducing or preventing off-site sediment transport through use of settlement ponds, silt fences, and water treatment, and modifying or suspending activities during extreme rainfall and high winds to the extent practical.

7.2.15 Generation of liquid waste

i. Contractor shall be instructed to put in place acceptable procedure for handling hazardous waste such as oils, lubricants and non-combustible waste;
ii. Construction workers shall be provided portable/temporary toilets (portapoty) by contractor; and
iii. Training on waste management shall be done for all personnel, operators and service providers.

7.2.16 Generation of solid waste

i. The contractor shall have adequate facilities for handling the construction waste; and
iv. Topsoil shall be stock piled and used for reclamation or re-vegetation at the site during landscaping.
v. Training on waste management shall be done to all personnel, operators and service providers.
vi. All materials which can be reused shall be reused.
vii. Materials that cannot be reused shall be sent to an authorised dumpsite.
viii. The contractor shall have adequate facilities for segregating, handling and storing the construction waste.
ix. Topsoil shall be stockpiled and used for reclamation or re-vegetation at the site during landscaping.

7.2.17 Air pollution

Impairment of air quality due to emissions

- Equipment shall be maintained in good running condition and equipment, which generate excessive black smoke shall not be used;
- Enforce vehicle road restrictions to avoid excessive emissions from engine overloading, where practical switching off engines will be done when machines are not in use;
- There will be routine inspection of equipment;
- Turn off engines to reduce idling.

Impairment of Air Quality Due to Dust

i. Protect stockpiles of friable material subject to wind through wetting;
ii. Cover loads with friable material during transportation;

iii. Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone);
iv. Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content
v. Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements
vi. Avoiding open burning of solid
vii. Restrict speed on loose surface roads to 30 km/hr during dry or dusty conditions; and,
viii. Douse with water work sites with loose open soil to reduce dust generation when necessary.

7.2.18 Contribution to climate change

i. Equipment shall be maintained in good running condition and equipment, which generate excessive black smoke shall not be used;
ii. Enforce vehicle road restrictions to avoid excessive emissions from engine overloading, where practical switching off engines will be done when machines are not in use;
iii. There will be routine inspection of equipment;
iv. Turn off engines to reduce idling; and
v. Green spaces shall be maximized in project areas

7.2.19 Noise pollution

i. Avoiding or minimizing project transportation through community areas
ii. Vehicles carrying construction materials shall be restricted to work during day time only;
iii. Machine operators in various sections with significant noise levels shall be provided with noise protective gear; and,
iv. Construction equipment shall be selected, operated and maintained to minimize noise.
v. ARU shall include in tenders, employment contracts, subcontractor agreements and work method statements clauses that assure the minimization of noise and compliance with directions from management to minimize noise;
vi. The Contractor shall be required to give preference to the use quieter technology or other mitigation measures rather than lengthening construction;
vii. Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways that minimize noise;
viii. Ensure that site managers periodically check the site, nearby residences and other sensitive receptors for noise problems so that solutions can be quickly applied;
ix. Avoid shouting, and minimize talking loudly and slamming vehicle doors;

x. Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours and other relevant practices (e.g. minimizing the use of engine brakes and periods of engine idling).

7.2.20 Generation of vibrations

i. Impact pile driving shall be avoided where possible in vibration sensitive areas; and,
ii. Vibratory rollers and packers shall be avoided.

7.2.21 Visual impacts

i. Locating parts of the development further away from the general public.
ii. Avoid light pollution through choice of light fixtures when construction is done during the night

7.2.22Generation of hazardous waste

i. Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids,
ii. Using impervious surfaces for refueling areas and other fluid transfer areas
iii. Training workers on the correct transfer and handling of fuels and chemicals and the response to spills
iv. Providing portable spill containment and cleanup equipment on site and training in the equipment deployment
v. Assessing the contents of hazardous materials and petroleum-based products in building systems (e.g. PCB containing electrical equipment, asbestos-containing building materials) and process equipment and removing them prior to initiation of decommissioning activities, and managing their treatment and disposal
vi. Assessing the presence of hazardous substances in or on building materials (e.g., polychlorinated biphenyls, asbestos containing flooring or insulation) and decontaminating or properly managing contaminated building materials
vii. All hazardous materials shall be handled by registered personnel/company

7.2.23 Land pollution

i. There should proper separation of materials and wastes,-selection (eg more environmental friendly, etc.), less use, proper storage, etc.
ii. An efficient collection and disposal system based on the principles of reduction, re-use and recycling of materials, shall be instituted at project areas.
iii. Ensure proper waste segregation and introduction of waste disposal bins, and warning notices, posted at strategic points;
iv. No, on-site burial or open burning of solid waste shall be permitted.
v. There should be proper procedure for handling hazardous waste such as oils, lubricants and non-combustible waste.

7.3 POTENTIAL MITIGATION MEASURES DURING THE OPERATION PHASE

Negative Social Impacts

7.3.1 Increased incidences of diseases and ill health

- A safety, health and environment induction course shall be conducted to all students and workers, putting more emphasis on HIV/AIDS, which has become a national disaster as well as other emerging pandemics such as COVID 19 and dengue fever;
- The project shall include information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS, and means to suppress its incidence;
- Environmental sanitation systems shall be regularly improved; and,
- Adequate medical services shall be made available at the University dispensary for meeting the population demand.

7.3.2 Increased pressure on social services/facilities and utilities

i. Limit the number of unskilled workers recruited from outside the direct vicinity as far as possible.
ii. Explore alternative sources of domestic water, such as rainwater harvesting.
iii. Link to mandated structures to support improvement of social and infrastructural services at the project site and communities surrounding project area.
iv. Duty to the community requirement may be applied to justify the construction of new social services infrastructures or cooperate with local structures to strengthen the existing social services infrastructures
v. Use of water conservatively by instituting technologies (e.g. self-lock water taps) and awareness raising notices to users, etc.;
vi. Construction of underground water reserve tank and introducing rainwater harvest system;
vii. Link to mandated structures to support improvement of social and infrastructural services at the campus and communities adjacent to the project area.
viii. Duty to the community requirement may be applied to justify the construction of new social services infrastructures or cooperate with local structures to strengthen the existing social services infrastructures
ix. Alternative measures like use of solar power, drilling a borehole at site, water recycling shall be explored and implemented if found feasible. For instance, use of energy savers bulbs shall be given high priority; and
x. Use of air conditioning shall be kept to a minimum and maintenance of the cool indoor environment using natural ventilation system shall be strongly explored during the design process.

7.3.3. Gender based violence

- The project will prepare a GBV Action Plan that ensures project awareness raising strategy (for workers and community members), a list of GBV service

Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.

7.3.4 Increased incidence of GBV/SEA/SH

The project will prepare a GBV Action Plan that ensures project awareness raising strategy (for workers and community members), a list of GBV service Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.

7.3.5 Child labour

i. ARU will conduct regular monitoring of project workers in relation to health, working conditions, hours of work, minimum age, and the other requirement of national law.
ii. Work with local authorities and schools in the area to control school drop out
iii. Cooperate with relevant authorities like Ministry of Labour to control child labour
iv. Create awareness raising to the communities on the importance of education to the children
v. The local authorities should develop bylaws to control the engagement of children in petty business or work in project related activities

7.3.6. Food Insecurity and inflation of prices on other social services

. The following measures are very vital in minimizing the problem of food insecurity;

i. Encourage traders to supply food and other products to the project area.
ii. Sensitization of the surrounding communities in order to make them aware of the employment and hence income generating opportunities with the proposed project.
iii. Provide more avenues for service providers e.g. cafeteria and restaurants

7.3.7 Increased level of crimes

The following measures are very vital in minimizing the problem of crime;

i. Constructions of police stations at Ardhi University- Mwanza Campus and the surrounding communities like Kamanga and Karumo in order to strengthen security services
ii. Establish community based security in collaboration with village/ward leaders.
iii. The contractor shall establish his own security to protect his properties and should establish community policing to support insufficient police force.
iv. The community should be encouraged to participate in security matters by providing information on suspects
v. The cooperation of local people together will help to lessen criminal incidents and maintain security of people and their properties.

7.3.8 Increased traffic flow and increased risks of road/ferry accidents

i. Institute traffic management and safety programme including, training and testing of heavy vehicles operators and drivers, enforcement of speed limits, maximum loading restrictions and compliance with all Tanzania transportation law and standards;
ii. A well-stocked First Aid kit (administered by medical personnel) shall be maintained at construction site. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing health education to the workforce;
iii. Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health and safety due to the construction operation should be put in place;
iv. Emergency contact details in the event of an accident shall be provided;
v. Develop and implement an emergency plan including spill response;
vi. Developing a detailed health and safety plan and training all contractor staff on the plan.
vii. Working with relevant authorities and private stakeholders to make sure that road safety/ferry safety measures are intact and implemented accordingly
viii. Develop and maintain an active rescue plan in collaboration with Fire and Rescues offices for both road and water accidents

7.3.9 Prevalence of Communicable diseases

Influx of job speculators from other parts of Tanzania and neighboring regions will increase interaction, consequently increasing the risk of the spread of communicable diseases. The following measures are recommended to mitigate this impact

i. Provide awareness to public on pathways of communicable diseases.
ii. Provide Voluntary Counselling and Testing (VCT) centres for HIV/AIDS.
iii. Provide more health facilities
iv. Work close to government and private institutions that deal with the spread of communicable diseases
v. A safety, health and environment induction course shall be conducted to all students and workers, putting more emphasis on HIV/AIDS, which has

become a national disaster as well as other emerging pandemics such as COVID 19 and dengue fever;

vi. The project shall include information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS, and means to suppress its incidence;

vii. Environmental sanitation systems shall be improved; and,

viii. Adequate medical services shall be made available at the campus and surrounding communities of Kamanga and Karumo for meeting the population demand.

7.3.10 Restrictions on use of access road to Karumo village

i. The University management will provide alternative route for the community

ii. The community will be allowed to use the University pathways during daytime

7.3.11 Change in social values and ethics

Ethical training and discussion will be conducted in collaboration with government and non-government stakeholders

Impacts on physical environment

7.3.12 Increased runoff/storm water

i. The design of storm water drainage will be given a high priority;

ii. Where feasible, rainwater harvesting will be used in proposed project sites to minimise generation of surface runoff; and,

iii. The design shall provide sufficient greenery area for facilitating soil infiltration.

7.3.13 Land pollution

vii. Septic tank and soak away pits shall be designed in such a way waste treatment is achieved by 100% before disposal to the authorised disposal sites(UASB); and

viii. No, on-site burial or open burning of solid waste shall be permitted.

ix. Wastes not suitable for incineration and general municipal waste dumping (e.g. plastics, rubbers, tires, etc.) shall be removed for recycling, treatment, and/or disposal by a licensed contractor as appropriate.

x. There should be proper procedure for handling hazardous waste such as oils, lubricants and non-combustible waste.

xi. Wastes not suitable for incineration and general municipal waste dumping (e.g. plastics, rubbers, tires, etc.) shall be removed for recycling, treatment, and/or disposal by a licensed contractor as appropriate.

7.3.14 Surface and ground water pollution

iv. The design of storm water drainage will be given a high priority;

v. Where feasible, rainwater harvesting will be used in proposed project sites to minimise generation of surface runoff; and,

vi. The design shall provide sufficient greenery area for facilitating soil infiltration.

7.3.15 Health and safety risks due to fire hazards

i. Adequate number of portable fire extinguishers shall be placed at strategic locations;
ii. Good housekeeping shall be maintained at all sites to reduce the fire risk;
iii. The design of buildings shall strictly adhere to the Fire Safety Standards;
iv. Regular fire and other disaster drills and awareness training shall be conducted;
v. Fire detectors and sprinkler system shall be installed in the buildings; and
vi. The proponent shall insure buildings against fire Hazards.
vii. Install water tanks

7.3.16 Contribution to Climate Change

ARU shall reduce direct and indirect greenhouse gas generation in the following ways;

i. To change the consumption behaviour in terms of energy and water
ii. Use of renewable energy technologies to minimize the carbon dioxide emission.
iii. Promote use of natural green space at the campus to increase energy saving
iv. The university shall transform to digital software operated work, in order to minimize paper consumption rates. This will greatly influence the educational standards. And will save a great deal to reduce the amount of forest resources consumed.

7.3.17 Increased solid waste generation

i. ARU management shall provide adequate waste handling facilities such as waste bins for temporarily holding waste before disposal.
ii. A private cleanliness firm with adequate number of staff shall be commissioned to ensure cleanliness.
iii. The skip buckets shall be emptied in authorized landfill twice a week.
iv. All hazardous waste shall be handled by registered authorized dealers recognized by NEMC

7.3.18 Increased liquid waste generation

i. The campus shall have liquid waste to collect the wastewater (sewage) to treatment facilities found at the campus
ii. The collected sewage shall be disposed in septic tank systems before final disposal

7.3.19 Visual impacts

i. Locating noise development further away from the general public.
ii. Light pollution can be reduced by keeping lighting (e.g. of parking lots) to the minimum levels needed for safety, and through the careful choice of light fixtures such as the use of flat-glass lanterns in car parks

7.4 MITIGATION MEASURES DURING DECOMMISSIONING PHASE

Social impacts

7.4.1 Loss of employment

Seminars shall be conducted on alternative means of livelihood after termination of job

Environmental Impacts

7.4.2 Loss of aesthetics due to haphazard disposal of demolished waste

iii. The debris resulting from the demolition will either be transported by a licensed waste transporter for dumping at an approved site or used as base material for new construction work;
iv. All the necessary health and safety measures will be implemented including provision of personal protective equipment such as, safety harnesses, helmets, gloves, respirators, safety shoes, coveralls, goggles and ear protectors; and
v. Restoration of the affected land will involve the filling in of any open pits and grading the land to its natural contours, then planting appropriate tree species and under cover vegetation to hold the soil in place and to prevent flooding.

7.4.3 Noise and Vibration

i. Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance ·
ii. Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines.
iii. Avoiding or minimizing project transportation through community areas

7.4.4 Occupational Health and Safety

i. Training of workers in lifting and materials handling techniques in decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary
ii. Planning work site layout to minimize the need for manual transfer of heavy loads
iii. Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations
iv. Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks
v. Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
vi. Cleaning up excessive waste debris and liquid spills regularly
vii. Locating electrical cords and ropes in common areas and marked corridors
viii. Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes
ix. Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels

7.5. ENHANCEMENT MEASURES FOR POSTIVE PROJECT IMPACTS

Enhancement measures for project positive impacts during preparatory and construction phases

7.5.1 New source of income for the people living around project area

In order for the project to maximize the benefits to the local communities in making it a new source of their income, the following enhancement measures are highly recommended

i. Skills trainings and recruitment of employees should be given priority to the local communities
ii. Employment should be gender sensitive
iii. Reasonable wages should be paid to both skilled and unskilled laborers to be employed by the project
iv. Qualified local vendors/ entrepreneurs should be given priorities to supply different goods and services to the project site

7.5.2 Increase in both formal and informal employment

The project is expected to provide employment to both skilled and unskilled laborers as well to both the people living around the project sites and those coming from far areas within and outside Tanzania. In order for the project to maximize this benefit to both local and outsider's employee, the following enhancement measures are highly recommended

i. Skills trainings and recruitment of employees should be given priority to the local communities
ii. Employment should be gender sensitive
iii. Employment opportunities to be offered based on merits and known interviewing procedures and grading systems.
iv. Reasonable wages should be paid to both skilled and unskilled laborers to be employed by the project

7.5.3 Improved quality of life and standard of living

It is expected that, the increase in employment and entrepreneurship opportunities for local people in the area have positive impacts on the quality of people living close to the project site. In order to enhance these benefits, the project is advised to do the followings;

i. Creating awareness to the workers on employment schemes
ii. Provision of training opportunities and entrepreneurial skills
iii. Provide awareness to the local communities to use the opportunities available to improve their lives
iv. Paying workers reasonable wages
v. Supporting the local communities to provide quality social services to the people in the area.
vi. Pay reasonable price to the sugar cane produced by out growers and other community members in the area

7.5.4 Increased Revenues to local authorities

The proposed project will increase the level of doing trade and investment in the area, which are main sources of revenues for the local communities. In order to enhance

revenue collection arising from direct from the project activities or indirect activities like trade and investment, the following enhancement measures are very vital

i. Local authorities should identify the new sources of revenue in the area
ii. Strengthening revenue collection mechanisms
iii. Awareness creation for the people in the area on the importance of paying revenues
iv. Accountability in revenue collection among local authority employees
v. Enhanced cooperation between the project and local authorities

7.5.5 Increased skills to local communities

In order to maximize the infusion of skills to the community members surrounding the project, the followings actions should be done;

i. Conduct training needs assessments
ii. Initiate capacity building session base on the training needs assessments
iii. Initiate short courses to help community members improve their activities
iv. Cooperate with other social institutions in the area to identify challenges associated with skills development

7.5.6 Growth of trading activities around project site

In order to speed up business growth and maximize its benefits thereafter, the following are recommended as enhancement measures;

i. Improve the infrastructure like roads in the project site
ii. Improve the availability of services in the project site
iii. Create favorable environment for traders to work with the projects
iv. Pay reasonable wages to both formal and informal employees
v. Create favorable environment for investors and contractors to work with the project

7.5.7 The growth of banking activities in the project area

The growth of population, investment and trading activities in the projects area will attract some banks to open their offices. In order to maximize this benefit, the project has to do the following;

i. To connect workers, students with interested banks
ii. To make all the payment whether formal or informal through the banking system
iii. To invite different banks to come and talk to both employees, students and other community members
iv. If possible and under certain agreements, to provide a space for the banks to open their branches

Enhancement measures for project positive impacts during operation phase

7.5.8 Increase of students enrolment to ARU

i. Gender and disadvantaged groups will be considered during the students selection process
ii. ARU shall increase advertisement to attract more students to study the priority programmes for the Nation

7.5.9 Increase of revenue to ARU

i. ARU shall innovate business activities linked with academic activities for enhancing income of the University

7.5.10 Job creation

i. Employment shall be on equal opportunities for all genders.

7.5.11 Increased commercial and social activities at ARU

i. Provide good security within the project area and area of influence.
ii. Create conducive business opportunities for attracting investments

7.5.12 Growth of Trade and Increased Investment around ARU

i. Sensitize the community to invest to accommodate business opportunities inclined by the increasing students' enrolment

7.5.13 Production of skilled labour force for nation development

ii. Production of skilled labour force for implementing various development policies, plans and goals for sustainable social and economic growth of the Nation

7.5.14 The growth of banking activities in the project area

i. Provide good security within the project area and area of influence.
ii. Create conducive business environment for investment

7.5.15 Increased Revenues to local authorities

ii. Local authorities should identify the new sources of revenue in the area
iii. Strengthening revenue collection mechanisms
iv. Awareness creation for the people in the area on the importance of paying revenues
v. Accountability in revenue collection among local authority employees
vi. Enhanced cooperation between the project and local authorities

CHAPTER EIGHT

8.0 ENVIRONMENTAL AND SOCIAL IMPACT MANAGEMENT PLAN

8.1 Impact Management plan

Plans for the implementation of mitigation measures for the proposed project are provided in this Chapter. The Plans indicate institutional responsibilities, time to take the action, monitoring frequency and estimated costs (Table 7.1). The proposed costs are only indicative, should the proposed development proceed with the suggested changes, the developer will estimate actual costs and include them in the overall cost of the project.

The design of the mitigation measures for the identified Environmental and Social impacts applied the mitigation hierarchy suggested in the ESF (i.e. ESS1) which are:

a) Anticipate and avoid risks and impacts;
b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
c) Once risks and impacts have been minimized or reduced, mitigate; and
d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.

8.2 Implementation of the Management Plan

The environmental and social mitigation measures incorporated in the detailed engineering design shall be handed over to the contractor during construction period. The Contractor shall take stock of the contents of the Environmental and Social Management Plan of the Project. The contractor shall implement the ESMP during the construction period under close supervision of ARU Management.

During implementation, the ARU Estate department shall be responsible for:

- Ensuring that ARU staff and student are aware of the project implementation
- Ensuring that the implementation of the ESMP is part of the Contractor's contractual obligations. ARU procurement entity will supervise the tendering process for all service providers;
- Ensuring that the ESMP is implemented and approval conditions are observed during the mobilization, construction and operation of the project.

During the Operation Phase, ARU Management will manage the building and implement the ESMP. When the project reaches a stage of decommissioning, the ARU shall prepare a decommissioning plan that will include risks and impacts not limited to environmental and social issues highlighted in the ESMP.

8.3 Environmental and Social Cost

The principal environmental and social cost includes the cost for implementing the mitigation measures proposed. These costs are indicated in Table 8.1. ARU shall cover all the costs proposed in the ESMP.

Table 8.1: Environmental and Social Impact Management Plan for the proposed establishment of ARU Mwanza Campus

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
Preparatory phase					
Local Conflicts arising from land use and land ownership	i. Involve local communities in the identification of the project boundaries; ii. To raise awareness to the communities on the available laws guiding land ownership and land use; and iii. To develop a clear demarcation of the land owned by both parties engaged in a conflict through a participatory approach.	ARU/Village Leaders	Preparatory phase	Weekly	500,000
Increased pressure on social services	i. Limit the number of unskilled workers recruited from outside the direct vicinity as far as possible. ii. Provide First Aid Facilities on site. iii. Explore alternative sources of domestic water, such as rainwater harvesting. iv. Link to mandated structures to support improvement of social and infrastructural services at the project site and communities surrounding project area.	ARU/Village Leaders	Preparatory phase	Daily	30,000,000
Risk of buildings/structural designs to have potential to generate emergency/disaster events	i. Geotechnical studies, Environmental and social impact assessment studies, master plans and feasibility studies shall be done by competent professionals to ascertain the project risks hazard profile of the site ii. Structural elements of a project will be designed and constructed by competent professionals, and certified or approved by competent authorities or professionals. The Structural design will take into account climate change considerations, as appropriate.	ARU/Village Leaders	Preparatory phase	Daily	200,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	iii. Where the project includes new buildings and structures that will be accessed by members of the public, the ARU will consider the incremental risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events. Where technically and financially feasible, ARU will also apply the concept of universal access to the design and construction of such new buildings and structures iv. Where the project involves provision of services to communities, ARU will establish and implement appropriate quality management systems to anticipate and minimize risks and impacts that such services may have on community health and safety. In such circumstances, ARU will also apply the concept of universal access, where technically and financially feasible v. ARU will conduct a risk hazard assessment (RHA) to projects having potential to generate emergency events), as part of the environmental and social assessment undertaken pursuant to ESS1. Based on the results of the RHA, ARU will prepare an Emergency Response Plan (ERP) in coordination with the relevant local authorities and the affected community, and will take into account the emergency prevention, preparedness and response arrangements put into place with project workers under ESS2. ERP will include, as appropriate: (a) engineering controls (such as				

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	containment, automatic alarms, and shutoff systems) proportionate to the nature and scale of the hazard; (b) identification of and secure access to emergency equipment available on-site and nearby; (c) notification procedures for designated emergency responders; (d) diverse media channels for notification of the affected community and other stakeholders; (e) a training program for emergency responders including drills at regular intervals; (f) public evacuation procedures; (g) designated coordinator for ERP implementation; and (h) measures for restoration and cleanup of the environment following any major accident				
Increase in pressure on natural resources	i. Exploitation of construction materials will take place from authorized and reliable sources only; ii. Restoration of the borrow pits/quarries after use-constituting of levelling the area and seeding or planting of trees and/or grasses will be done in association with local government (department responsible for natural resources) and local environmental NGOs. If appropriate, the levelled area will be left for natural re-vegetation iii. When the project is a potentially significant user of energy, the ARU will adopt measures specified in the EHSGs to optimize energy usage, to the extent technically and financially feasible iv. When the project is a potentially significant user of water or will have potentially significant risks and	ARU/Sengerema DC/Leaders	Preparatory phase	Daily	30,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	impacts on water quality, in addition to applying the resource efficiency requirements, ARU shall use additional technically feasible water conservation measures, the use of alternative water supplies, water consumption offsets to maintain total demand for water resources within the available supply, and evaluation of alternative project locations.				
Sub-total during preparatory phase					**271,500,000**
CONSTRUCTION PHASE					
Community health, safety risks and security from the handling, transport, and disposal of construction wastes	i. GBV, SEA and sexual harassment training before working on the Project which will be provided by the Community Social Officers from the LGA and on the Child and Gender desk of the police. This will include information on the GBV reporting mechanisms. ii. Institute good site practices including preventing public access to the construction site by securing equipment and demarcating project boundaries using warning signs with appropriate text (local language) and graphic displays. iii. Institute traffic management and safety programme including, training and testing of heavy vehicles operators and drivers, enforcement of speed limits, maximum loading restrictions and compliance with all Tanzania transportation law and standards. iv. Awareness campaigns/education on HIV and STDs shall be provided to workers and the community. v. Low-skilled workers will be hired around the project	Contractor/ ARU	Construction phase	Daily	2,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	jurisdiction if necessary, to reduce the population of foreigners. vi. Protect stockpiles of friable material subject to wind through wetting. vii. Cover loads with friable material during transportation. iii. Contractors will be provided with signage on issues such as HIV/AIDS, GBV etc which will be posted at worksites. ix. Contractors/workers will attend education sessions on disease transmission notably HIV/AIDS, and malaria and will implement the control measures needed to protect public health. x. Contractors/workers will ensure good housekeeping arrangements on-site to avoid creating breeding grounds for rodents and insects which can spread diseases. xi. Contractors will ensure access to potable water for all workers. xii. Contractors will be required to abide by national law about vehicle conditions and movements and behaviour of drivers. iii. Signage will be erected at construction sites to advise the community of the dangers of entering the site and appropriate barricades (fencing, tape etc) will be put in place, especially around quarries, trenches, etc. iv. Contractor shall develop and use the traffic management plan				
Gender based	The project will prepare a GBV Action Plan that ensures	Contractor/	Construction	Daily	5,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
violence	project awareness raising strategy (for workers and community members), a list of GBV service Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.	ARU	phase		
Gender discrimination	This project will ensure that there is involvement of women in project activities.	Contractor/ ARU	Construction phase	Daily	500,000
Child labour	i. ARU will conduct regular monitoring of project workers in relation to health, working conditions, hours of work, minimum age, and the other requirement of national law ii. Work with local authorities and schools in the area to control school drop out iii. Cooperate with relevant authorities like Ministry of Labour to control child labour iv. Create awareness raising to the communities on the importance of education to the children v. The local authorities should develop bylaws to control the engagement of children in petty business or work in project related activities	Contractor/ ARU	Construction phase	Daily	500,000
Food Insecurity and inflation of prices on other social services	i. Encourage traders to supply food and other products to the project area. ii. Sensitization of the surrounding communities in order to make them aware of the employment and hence income generating opportunities with the proposed project.	Contractor/ ARU	Construction phase	Daily	500,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	iii. Provide more avenues for service providers e.g. cafeteria and restaurants				
Increased level of crimes	i. Sengerema District to strengthen security services by provision of more police stations/posts. ii. Establish community based security in collaboration with village/ward leaders. iii. The contractor shall establish his own security to protect his properties and should establish community policing to support insufficient police force. iv. The community should be encouraged to participate in security matters by providing information on suspects v. The cooperation of local people together will help to lessen criminal incidents and maintain security of people and their properties.	Contractor/ ARU	Construction phase	Daily	1,000,000
Increased pressure on social services	i. Limit the number of unskilled workers recruited from outside project area ii. Provide First Aid Facilities on site. iii. Explore alternative sources of domestic water, such as rainwater harvesting. iv. Link to mandated structures to support improvement of social and infrastructural services in villages at the project area. v. Duty to the community requirement may be applied to justify the construction of new social services infrastructures or cooperate with local structures to strengthen the existing social services infrastructures	Contractor/ ARU	Construction phase	Monthly	30,000,000
Restrictions on	i. New Alternative roads shall be constructed	Contractor/	Construction	Daily	500,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
using community road passing through project site	ii. Improving the existing alternative roads iv. Allow people to pass through project site during day time v.	ARU	phase		
Occupational Health and Safety	i. Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths ii. Cleaning up excessive waste debris and liquid spills regularly iii. Locating electrical cords and ropes in common areas and marked corridors iv. Use of slip retardant footwear v. Training and use of temporary fall prevention devices, such as rails or other barriers able to support a heavy loads, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface vi. Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support heavy loads (also described in this section in Working at Heights above), as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. vii. The tie in point of the fall arresting system should also	Contractor/ ARU	Construction phase	Daily	

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	be able to support heavy loads viii. Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces ix. Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels x. Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable xi. Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap xi. Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged xii. Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes xiii. Institute good site practices including prevent public access to the construction site by securing equipment and demarcate excavate, using warning signs with appropriate text (local language) and graphic displays; xiv. Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-				

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	people wearing high-visibility vests or outer clothing covering to direct traffic xv. Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle xvi. Ensuring moving equipment is outfitted with audible back-up alarms xvii. Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations. xviii. Awareness campaigns /Education on HIV and STDs shall be provided to workers; xix. A well-stocked First Aid kit (administered by medical personnel) shall be maintained at construction site. The medical personnel shall also be responsible for primary treatment of ailments and other minor medical cases as well as providing health education to the workforce; xx. Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health Emergency contact details in the event of an accident shall be provided; xxi. Training all contractor staff in emergency planning and management; xxii. Developing a detailed health and safety management				

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	plan and training all contractor staff on the plan. xxiii. Training of workers in lifting and materials handling techniques in construction projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary xxiv. Planning work site layout to minimize the need for manual transfer of heavy loads xxv. Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations xxvi. Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks				
Loss of biodiversity (flora and fauna)	i. Clearance of patches of native forest remaining in the neighborhood of the proposed project components shall be avoided; ii. Close supervision of earthworks shall be observed in order to confine land clearance within the project site; iii. Appropriate landscaping programme to help in re-vegetation of part of the project area after construction shall be designed and implemented, iv. Minimize the cutting or clearing of vegetation to extent possible	Contractor/ ARU	Construction phase	Daily	6,000,000
Loss of habitat	Appropriate landscaping programme to help in re-vegetation of part of the project area after construction shall be designed and implemented	Contractor/ ARU	Construction phase	Monthly	1,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
Loss of ecosystem services	Appropriate landscaping programme to help in re-vegetation of part of the project area after construction shall be designed and implemented.	Contractor/ ARU	Construction phase	Daily	1,000,000
Acceleration of soil erosion	i. Construction will be done as per engineering design and procedure of which a maximum requirement of compaction strength is achieved during the construction. That is maximum dry density (MDD) specified in the design manual by consultant; ii. Maintain gravel fill and/or re-vegetate around the structures; iii. Unnecessary ground clearance and sensitive re-alignments shall be avoided; iv. Directing flow to properly designated channels; v. All excavation works shall be properly backfilled and compacted vi. Most of construction activities will be done during dry weather; vii. Mulching to stabilize exposed areas; viii. Designing channels and ditches for post-construction flows ix. Lining steep channel and slopes (e.g. use jute matting) and x. Reducing or preventing off-site sediment transport through use of settlement ponds, silt fences, and water treatment, and modifying or suspending activities during extreme rainfall and high winds to the extent practical.	Contractor/ ARU	Construction phase	Monthly	30,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
Generation of liquid waste	i. Contractor shall be instructed to put in place acceptable procedure for handling hazardous waste such as oils, lubricants and non-combustible waste; ii. Construction workers shall be provided portable/temporary toilets (portapoty) by contractor; and iii. Training on waste management shall be done for all personnel, operators and service providers.	Contractor/ ARU	Construction phase	Daily	1,500,000
Generation of solid waste	i. The contractor shall have adequate facilities for handling the construction waste; and ii. Topsoil shall be stock piled and used for reclamation or re-vegetation at the site during landscaping. iii. Training on waste management shall be done to all personnel, operators and service providers. iv. All materials which can be reused shall be reused. v. Materials that cannot be reused shall be sent to an authorised dumpsite. vi. The contractor shall have adequate facilities for segregating, handling and storing the construction waste. vii. Topsoil shall be stockpiled and used for reclamation or re-vegetation at the site during landscaping.	Contractor/ ARU	Construction phase	Daily	2,000,000
Air pollution	***Impairment of air quality due to emissions*** i. Equipment shall be maintained in good running condition and equipment, which generate excessive black smoke shall not be used;	Contractor/ ARU	Construction phase	Daily	6,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	ii. Enforce vehicle road restrictions to avoid excessive emissions from engine overloading, where practical switching off engines will be done when machines are not in use; iii. There will be routine inspection of equipment; iv. Turn off engines to reduce idling. ***Impairment of Air Quality Due to Dust*** **v.** Protect stockpiles of friable material subject to wind through wetting; **vi.** Cover loads with friable material during transportation; **vii.** Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone); **viii.** Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content **ix.** Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements **x.** Avoiding open burning of solid **xi.** Restrict speed on loose surface roads to 30 km/hr during dry or dusty conditions; and, **xii.** Douse with water work sites with loose open soil to reduce dust generation when necessary				

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
Contribution to climate change	i. Equipment shall be maintained in good running condition and equipment, which generate excessive black smoke shall not be used; ii. Enforce vehicle road restrictions to avoid excessive emissions from engine overloading, where practical switching off engines will be done when machines are not in use; iii. There will be routine inspection of equipment; iv. Turn off engines to reduce idling; and v. Green spaces shall be maximized in project areas	Contractor/ ARU	Construction phase	Daily	3,000,000
Noise pollution	i. Avoiding or minimizing project transportation through community areas ii. Vehicles carrying construction materials shall be restricted to work during day time only; iii. Machine operators in various sections with significant noise levels shall be provided with noise protective gear; and, iv. Construction equipment shall be selected, operated and maintained to minimize noise. v. ARU shall include in tenders, employment contracts, subcontractor agreements and work method statements clauses that assure the minimization of noise and compliance with directions from management to minimize noise; vi. The Contractor shall be required to give preference to the use quieter technology or other mitigation measures rather than lengthening construction;	Contractor/ ARU	Construction phase	Daily	10,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	vii. Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways that minimize noise; viii. Ensure that site managers periodically check the site, nearby residences and other sensitive receptors for noise problems so that solutions can be quickly applied; ix. Avoid shouting, and minimize talking loudly and slamming vehicle doors; x. Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours and other relevant practices (e.g. minimizing the use of engine brakes and periods of engine idling).				
Generation of vibrations	i. Impact pile driving shall be avoided where possible in vibration sensitive areas; and, ii. Vibratory rollers and packers shall be avoided.	Contractor/ ARU	Construction phase	Daily	N/A
Visual impacts	i. Locating parts of the development further away from the general public. ii. Avoid light pollution through choice of light fixtures when construction is done during the night	Contractor/ ARU	Construction phase	Daily	N/A
Generation of hazardous waste	i. Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids, ii. Using impervious surfaces for refueling areas and other fluid transfer areas iii. Training workers on the correct transfer and handling	Contractor/ ARU	Construction phase	Daily	2,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	of fuels and chemicals and the response to spills iv. Providing portable spill containment and cleanup equipment on site and training in the equipment deployment v. Assessing the contents of hazardous materials and petroleum-based products in building systems (e.g. PCB containing electrical equipment, asbestos-containing building materials) and process equipment and removing them prior to initiation of decommissioning activities, and managing their treatment and disposal vi. Assessing the presence of hazardous substances in or on building materials (e.g., polychlorinated biphenyls, asbestos containing flooring or insulation) and decontaminating or properly managing contaminated building materials vii. All hazardous materials shall be handled by registered personnel/company				
Land pollution	i. There should proper separation of materials and wastes,-selection (eg more environmental friendly, etc.), less use, proper storage, etc. ii. An efficient collection and disposal system based on the principles of reduction, re-use and recycling of materials, shall be instituted at project areas. iii. Ensure proper waste segregation and introduction of waste disposal bins, and warning notices, posted at	Contractor/ ARU	Construction phase	Daily	10,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	strategic points; iv. No, on-site burial or open burning of solid waste shall be permitted. v. There should be proper procedure for handling hazardous waste such as oils, lubricants and non-combustible waste.				
Sub-total during construction phase					**112,500,000**
OPERATION PHASE					
Increased incidences of diseases and ill health	i. A safety, health and environment induction course shall be conducted to all students and workers, putting more emphasis on HIV/AIDS, which has become a national disaster as well as other emerging pandemics such as COVID 19 and dengue fever; ii. The project shall include information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS, and means to suppress its incidence; iii. Environmental sanitation systems shall be regularly improved; and, iv. Adequate medical services shall be made available at the University dispensary for meeting the population demand.	ARU	Operation phase	Daily	200,000,000
Increased pressure on social services/facilities	i. Use of water conservatively by instituting technologies (e.g. self-lock water taps) and awareness raising notices to users, etc.;	ARU	Operation phase	Daily	20,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
and utilities	ii. Construction of underground water reserve tank and introducing rainwater harvest system; iii. Link to mandated structures to support improvement of social and infrastructural services at Ardhi University and communities adjacent to the project area. iv. Duty to the community requirement may be applied to justify the construction of new social services infrastructures or cooperate with local structures to strengthen the existing social services infrastructures v. Extraction of underground water resources; vi. Alternative measures like use of solar power, drilling a borehole at site, water recycling shall be explored and implemented if found feasible. For instance, use of energy savers bulbs shall be given high priority; and vii. Use of air conditioning shall be kept to a minimum and maintenance of the cool indoor environment using natural ventilation system shall be strongly explored during the design process.				
Gender based violence	The project will prepare a GBV Action Plan that ensures project awareness raising strategy (for workers and community members), a list of GBV service Providers to which GBV survivors will be referred, revisions to the GRM to ensure it can address GBV complaints, and information on GBV allegation procedures in the workplace.	ARU	Operation phase	Quarterly monitoring and Verification Report	5,000,000
Gender discrimination	This project will ensure that there is involvement of women in project activities.	ARU	Operation phase	Quarterly monitoring and	5,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
				Verification Report	
Child labour	i. ARU will conduct regular monitoring of project workers in relation to health, working conditions, hours of work, minimum age, and the other requirement of national law. ii. Work with local authorities and schools in the area to control school drop out iii. Cooperate with relevant authorities like Ministry of Labour to control child labour iv. Create awareness raising to the communities on the importance of education to the children v. The local authorities should develop bylaws to control the engagement of children in petty business or work in project related activities	ARU	Operation phase	Quarterly monitoring and Verification Report	7,000,000
Food Insecurity and inflation of prices on other social services	i. Encourage traders to supply food and other products to the project area. ii. Sensitization of the surrounding communities in order to make them aware of the employment and hence income generating opportunities with the proposed project. iii. Provide more avenues for service providers e.g. cafeteria and restaurants	ARU	Operation phase	Quarterly monitoring and Verification Report	5,000,000
Increased level of crimes	i. Establish community based security in collaboration with village/ward leaders. ii. The community should be encouraged to participate in security matters by providing information on suspects	ARU	Operation phase	Quarterly monitoring and Verification Report	6,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	iii. The cooperation of local people together will help to lessen criminal incidents and maintain security of people and their properties.				
Increased runoff/storm water	i. The design of storm water drainage will be given a high priority; ii. Where feasible, rainwater harvesting will be used in proposed project sites to minimise generation of surface runoff; and, iii. The design shall provide sufficient greenery area for facilitating soil infiltration	ARU	Operation phase	Quarterly monitoring and number of complaints on health issues	80,000,000
Land pollution	i. Septic tank and soak away pits shall be designed in such a way waste treatment is achieved by 100% before disposal to the authorised disposal sites(UASB); and ii. No, on-site burial or open burning of solid waste shall be permitted. iii. Wastes not suitable for incineration and general municipal waste dumping (e.g. plastics, rubbers, tires, etc.) shall be removed for recycling, treatment, and/or disposal by a licensed contractor as appropriate. iv. There should be proper procedure for handling hazardous waste such as oils, lubricants and non-combustible waste v. Wastes not suitable for incineration and general municipal waste dumping (e.g. plastics, rubbers, tires, etc.) shall be removed for recycling, treatment, and/or disposal by a licensed contractor as appropriate.		Operation phase	Quarterly monitoring and Verification Report	5,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
Surface and ground water pollution	i. The design of storm water drainage will be given a high priority; ii. Where feasible, rainwater harvesting will be used in proposed project sites to minimise generation of surface runoff; and, iii. The design shall provide sufficient greenery area for facilitating soil infiltration.	ARU	Operation phase	Quarterly monitoring and Verification Report	30,000,000
Health and safety risks due to fire hazards	i. Adequate number of portable fire extinguishers shall be placed at strategic locations; ii. Good housekeeping shall be maintained at all sites to reduce the fire risk; iii. The design of buildings shall strictly adhere to the Fire Safety Standards; iv. Regular fire and other disaster drills and awareness training shall be conducted; v. Fire detectors and sprinkler system shall be installed in the buildings; and vi. The proponent shall insure buildings against fire Hazards. vii. Install water tanks	ARU	Construction phase	Daily	50,000,000
Increased solid waste generation	i. ARU management shall provide adequate waste handling facilities such as waste bins for temporarily holding waste before disposal. ii. A private cleanliness firm with adequate number of staff shall be commissioned to ensure cleanliness. iii. The skip buckets shall be emptied in authorized landfill twice a week.	ARU	Operation phase	Quarterly monitoring and Verification Report	6,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	iv. All hazardous waste shall be handled by registered authorized dealers recognized by NEMC				
Increased liquid waste generation	i. The campus shall have liquid waste to collect the wastewater (sewage) to treatment facilities found at the campus ii. The collected sewage shall be disposed in septic tank systems before final disposal	ARU	Operation phase	Quarterly monitoring and Verification Report	150,000,000
Visual impacts	i. Locating noise development further away from the general public. ii. Light pollution can be reduced by keeping lighting (e.g. of parking lots) to the minimum levels needed for safety, and through the careful choice of light fixtures such as the use of flat-glass lanterns in car parks	ARU	Operation phase	Quarterly monitoring and Verification Report	3,000,000
Sub-total during Operation phase					**572,000,000**
DECOMMISSIONING PHASE					
Loss of employment	Seminars shall be conducted on alternative means of livelihood after termination of job	ARU	Decommissioning phase		10,000,000
Loss of aesthetics due to haphazard disposal of demolished waste	i. The debris resulting from the demolition will either be transported by a licensed waste transporter for dumping at an approved site or used as base material for new construction work; ii. All the necessary health and safety measures will be implemented including provision of personal	ARU	Decommissioning phase	Daily	50,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	protective equipment such as, safety harnesses, helmets, gloves, respirators, safety shoes, coveralls, goggles and ear protectors; and iii. Restoration of the affected land will involve the filling in of any open pits and grading the land to its natural contours, then planting appropriate tree species and under cover vegetation to hold the soil in place and to prevent flooding.				
Noise and Vibration	i. Planning activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance · ii. Using noise control devices, such as temporary noise barriers and deflectors for impact and blasting activities, and exhaust muffling devices for combustion engines. iii. Avoiding or minimizing project transportation through community areas iv. Water sprinkling shall be applied to open earth to reduce dust emission; v. Trucks transporting construction materials shall be covered if the load is dry and prone to dust emissions; vi. The demolition area shall be fenced with iron sheets; this shall prevent the dust at the ground to be picked up by the wind; vii. Public notifications shall be sent where appropriate especially in nearby residential areas likely to be	ARU	Decommissioning phase	Daily	50,000,000

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
	impacted by dust; iii. Construction equipment, with noise sinks, shall be used; ix. Machine operators in various sections with significant noise levels shall be provided with noise protective gear x. Construction equipment shall be selected, operated and maintained to minimize noise				

Identified Impact	Mitigation Measure	Responsible Institution	Time of mitigation	Monitoring frequency	Relative cost (TZS)
Occupational Health and Safety	i. Training of workers in lifting and materials handling techniques in decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary ii. Planning work site layout to minimize the need for manual transfer of heavy loads iii. Selecting tools and designing work stations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations iv. Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks v. Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths vi. Cleaning up excessive waste debris and liquid spills regularly vii. Locating electrical cords and ropes in common areas and marked corridors iii. Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes ix. Using a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels	ARU	Decommissioning phase	Daily	10,000,000
Sub-total during decommissioning phase					**120,000,000**

CHAPTER NINE
9.0 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

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

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

To ensure that mitigation measures are properly done, monitoring is essential. Table 8.1 provides details of the attributes to be monitored, frequency, and institutional responsibility and estimated costs. These costs are only approximations and therefore indicative. Costs that are to be covered by the developer are to be included in the project cost.

9.2 Health and Safety Monitoring
This shall involve careful observation of health and safety regulations and guidelines.
Construction phase:

- The safeguard personnel of the contractor shall monitor availability and use of safety gears including helmets, coats, shoes, gloves and dust masks to protect them from exposure to various products, etc;
- The contractor shall hire a health specialist to monitor measures in place for prevention of the transmission of communicative diseases between the local community and construction workers. Monitoring may include conduction of voluntary HIV/AIDS testing and checking availability of free condoms at the construction site.
- Monitor availability of adequate First Aid facilities and a trained first Aider on site.

- **During the operation phase;**
  - ARU shall monitor availability and adequacy of safety equipment such as fire alarms and fire extinguishers provision in all buildings;
  - Monitor functioning of constructed sanitation facilities, and waste management facilities; and

- Monitoring safety environment in the laboratories (safe use of chemicals, use of protective gears while in the lab, storage of chemicals and so forth).

9.3 Cumulative impact monitoring

This development over time will result in a variety of changes. The most evident of these changes may be:

- This development will see a significant change in the land cover and landscape of the area; and
- The general culture of the area would change. A more likely result is a formal urban setting with the associated physical infrastructure and amenities. ARU shall monitor landscape and cultural changes with time, in order to device management mechanism.

9.4 Monitoring of key environmental and social parameters

Monitoring of all key environmental and social parameters that could potentially lead to an impact will be required to analyse the impacts of construction and operation on the environment. Therefore, self-monitoring and reporting techniques will be adopted to carry out monitoring. ARU Management shall be responsible for monitoring of residual impacts. The EIA has proposed monitoring techniques, monitoring frequency and methodology of selected parameters. Monitoring costs have also been provided.

An outline of the monitoring programmes proposed for the construction and operation phases, is presented in Tables 9.1 to 9.3. Monitoring process will enable ARU to understand how environmental performance will change over time and facilitate improvements to the Environmental and social management system.

9.5 Monitoring Responsibility

The monitoring of environmental and social parameters during the construction phase shall be carried out by the Contractor's safeguard team (i.e. Environmental and social and safety experts), under the supervision of the Consultant's safeguard team. They will conduct mitigation monitoring as part of the regular works inspections. The Contractor's Environmental Manager and ARU safeguard team will undertake scheduled site inspection. A monthly Environmental and Social Compliance Report will be produced following each inspection and will incorporate any actions identified during inspections and site meetings. The inspection report will summarize the status of the site's compliance, and include photographic records if appropriate.

The independent firm to be hired by ARU shall have Environmental and Social Specialists to monitor and review on-site implementation of the E&S measures. The specialists shall have qualifications as stipulated in ESMF- Environmental specialist shall have a master degree in Environmental Management or related field with at least five years of experience in Environmental impact assessment of civil works and working as environmental supervision, inspection, monitoring and or coordinator of environmental management plan. He/she shall be registered by NEMC and knowledgeable with World Bank Safeguards Policies. The Social Specialist shall have a master degree in Sociology, Anthropology or related field with at least five years of experience in managing social impacts including Resettlement planning and implementation, stakeholder engagement, information and education campaigns etc. on civil works site. She/he will be knowledgeable in World Bank Safeguards Policies.

Notwithstanding, the responsibility for mitigation and monitoring during the operation phase will lie with the ARU Estate Department. ARU shall be responsible to produce reports on environmental and social compliance during operation, as part of their annual progress reports and annual EHS monitoring/Audit reports. Depending on the implementation status and sensitivity of any emerging issues, OSHA and /or NEMC will perform annual EHS reviews in which environmental concerns raised will be reviewed alongside project implementation.

Table 9.1: Monitoring programme during the construction phase

Receptor/ Impact	**Monitoring activities**	**Monitoring parameter**	**Timing**	**Responsibility**	**Cost (TZS) per year**
Noise level	Noise levels measurement (within 500 m)*	Day and night noise levels	Quarterly	Contractor	3,000,000
Air quality	Measurement of ambient gaseous pollutants and dust**	Temperature H_2S, SOx, NOx and Dust	Quarterly	Contractor	8,000,000
Health and safety	Inspection; Voluntary testing;	-Availability and functionability of H & S facilities; -Functionability of sanitation facilities	Quarterly	Contractor/ Fire/OSHA	16,000,000
	Analyse records of accidents and incidents	Number and types of accidents and incidents	Monthly	Contractor/ ARU	3,000,000
Grievance	-Analyse records of workers and community grievance	Number and types of grievance reported and solved	Monthly	Contractor/ OSHA/ARU	1,000,000
Total					**31,000,000**

Table 9.2: Monitoring programme during operation phase

Receptor	**Monitoring activities**	**Monitoring parameter**	**Timing**	**Responsibility**	**Cost**
Underground water	Measurement of ground water quality at direct interference (within 500 m)	Physicochemical and bacteriological parameters (i.e. pH, EC, pathogens, heavy metals)	Semi annual	ARU	5,000,000
Ground/soil	Quality of wastewater discharges***	Physicochemical and bacteriological	Physicochemical and	Physicochemical and	

Receptor	Monitoring activities	Monitoring parameter	Timing	Responsibility	Cost
		parameters (i.e. pH, EC, pathogens, heavy metals)	bacteriological parameters (i.e. pH, EC, pathogens, heavy metals)	bacteriological parameters (i.e. pH, EC, pathogens, heavy metals)	
Noise	Noise levels measurement (within 500 m)**	Day and night noise levels	Semi annual	ARU	3,000,000
Community Safety	-Inspection of the emergency and detection systems; -Verification of security system and access to the campus	-Number of accidents and incidents recorded -Functionability, number and location of safety facilities on campus; -Availability of security guards and lighting in proper areas.	Monthly	ARU	5,000,000
Safety in the laboratories	Inspection of lab facilities & equipment; -Verification of expertise of laboratory instructors; -Inspection of the Personal Protected Equipment (PPE) and the safety equipment	Visual inspection and records verifying the condition of the safety equipment (life rafts, life jackets, flares, smoke canisters)	As per the manufactures requirements	ARU	3,000,000
Community Health	Inspection of available health facility in the dispensary;	-Availability and functionability of Health facilities;	Monthly	ARU	4,000,000

Receptor	Monitoring activities	Monitoring parameter	Timing	Responsibility	Cost
	Inspection of sanitation facilities and waste management facilities; Inspection of hygiene conditions in the cafeteria and dormitories	-Function ability of sanitation facilities; -Availability of clean and safe water; -Availability of waste management facilities;			
		Presence of fire safety management system, Environmental free from Safety and ergonomic hazards	Monthly	ARU	
Monitoring of Health and Safety implementation by the workforce	Efficiency of treatment plant Waste generation rates	Physiochemical parameters, Number of dust bins,	Monthly	ARU	3,000,000
Increased solid waste and liquid waste generation during Operation phase					**23,000,000**

Table 8.3: Monitoring programme during decommissioning phase

Receptor	Monitoring activities	Monitoring parameter	Timing	Responsibility	Cost
Underground water	Monitoring of ground water quality	Turbidity / Suspended solids Oil and grease	Weekly One month after direct interference	ARU	5,000,000
	Identification and reporting of leakage events**	Number of leakage events caused during the construction	Continuous	ARU	2,000,000
Restoration of areas	Inspection of Landscape,	Borrow pits, disposal	As per the	ARU	2,000,000

Receptor	Monitoring activities	Monitoring parameter	Timing	Responsibility	Cost
impacted by the project	damaged infrastructure, and waste accumulation	areas, site facilities, workers' camps, stockpiles areas, working platforms	approved contractors decommissioning plan		
Noise	Noise monitoring at direct interference (within 500 m)**	Day and night noise levels	Weekly	ARU	2,000,000
Health and safety	Health and Safety (H&S) Monitoring and audits. -H&S Performance evaluation -Personal Protected Equipment monitoring	Total recordable incidents, lost time incidents and other H&S indicators. Records verifying the conditions of Personal Protected Equipment	Weekly	ARU	5,000,000
	-Inspection of grievance mechanism -Analysis of workers and community grievance trends -Maintaining training records	-Recorder Grievance, accidents and incidents -Training records	Monthly	ARU	5,000,000
Total					**22,000,000**

Note:

**** Reference should be made to TZS 845:2005 Air Quality – Specifications***

*****Reference is made to EMDC 6 (1733): Limits for Environmental Noise)***

****** Reference should be made to TZS 860:2005 Limits for municipal and industrial wastewaters***

All issues regarding to occupational health and safety should be monitored against the requirements of the OSHA Regulation, 2003

CHAPTER TEN

10. COST BENEFIT ANALYSIS OF THE PROJECT

10.1. Introduction

This chapter presents the cost benefit analysis (CBA) of the proposed new building structures (administration block, student hostel, laboratory blocks, studio, workshop and multipurpose classrooms, staff houses, dispensary, estate, Centre for Innovation and Technology Transfer and multipurpose hall) to be built at Ardhi University Mwanza Campus. The estimation of cost benefit analysis reflects 99 years of the project design period. The details are not disclosed since they are still confidential in accordance to the Tanzania Procurement Act that prevents a detailed cost benefits analysis to be undertaken before tendering process. For that case, presented costs in this section are indicative and elementary qualitative description of the costs and benefits. The total operation cost have considered the indicative costs for implementation of mitigation measures as well as the cost of monitoring. However, total cost of the project will be stated later as project tendering are still in process.

10.2. Benefits related to the project

Benefits from the proposed building structures at ARU Mwanza campus project can be classified as direct benefits and indirect benefits to university, neighbour and the government. Building construction projects may generate negative benefits though; they are usually minimal compared to the positive benefits. Some of those impacts are non- quantifiable thus cannot be used in the benefit-cost analysis estimations. Generally, the benefits of the project will be experienced in all phases from mobilization, construction, operation to decommissioning phase. To mention few, employment opportunities and public benefits will occur during both the construction and the operation phases. Several benefits are associated with the proposed development both at local and national level in terms of revenue generation and the multiplier effects associated with linkages with local and national economy.

Direct benefits: the proposed project will create many job opportunities, good aesthetic view around Karumo village premises, good environments for students in their studies, entrepreneurial opportunities to the surrounding community as well as increase the number of skilled labourers due to increase in the enrolment and presence of conducive environment for self-studies. Most of the non-quantifiable impacts are directly benefits to the project receptors.

Indirect Benefits: Indirect benefits from a proposed project mainly include increase in government revenue through different sectors like; TANESCO, RUWASA, SEUWASA, TRA etc. cultural interactions, infrastructural development, and economic growth. But since the construction project requires inputs from other sectors to produce this output, and the other sectors subsequently require inputs themselves, there will be multiple rounds of interaction among the sectors resulting in additional output from each sector of the economy.

10.2.1 Benefits to ARU

The proposed project have positive impacts to ARU Mwanza Campus since its benefit is a lifetime process throughout the project life span (99 years). The completion of these projects will be one of the pooling factor for increased number of students' enrolment thus in monetary

cost its value has potential to increase annually. The completion this project is anticipated to improve the university financial capacity and sustainability. Further, the improved financial standing is not only going to promote enrolment but also good governance and efficient running of the University. Other benefits includes suitable environment for; Teaching, Research and Public Service and its envisioned centre of excellence in knowledge and dissemination to a wide spectrum of beneficiaries at national and regional levels. The project will also have several intangible benefits to both ARU Mwanza campus and the surrounding community which include improving the university's image.

10.2. 2 Benefit to the Neighbourhood

The proposed construction of ARU Mwanza Campus will lead to the increase in staff requirement that is technical, administrators and academicians. During and after construction phase the project is going to provide additional employment opportunities for people surrounding ARU Mwanza campus related to operation and maintenance. However, non-skilled labourers will benefit from the daily wages. University will also create business opportunities in vicinity of the campus. Business opportunities will be supporting government initiatives to create employment opportunities for Tanzanians as advocated by the current Government. Notwithstanding that now salaries are yet to be specified, it is envisaged that from employment, workers will get incomes, which will improve quality of their lives and perhaps improve their lifestyles. However, employment opportunities and income from salaries provided will extend beyond the workers and benefits many other people including dependants.

Moreover, employment opportunities and the benefits therein will depend on whether suitably qualified local personnel that can take up positions are available. Capacity building therefore is a prerequisite for these benefits to be realized. Alongside capacity building, there shall be a need for putting in place deliberate policies that would compel developers in the real estate economic sector to employ local labour with the requisite skills and experience. In addition, the project will also have following economic and social benefits:

- Utilization of locally available resources;
- Revenue to the Government will increase through payment of the various taxes (indirect and direct).
- Boosting the infrastructure and economy of the country and Sengerema District Council in particular Nyamatongo ward, Karumo village in which the project is located.

10.2.3 Benefit to the Government

The project will benefits the government in different aspects. These includes budget saving due to the relatively decrease in ARU financial dependence on the government. It is anticipated that during the operation phase the project will improve ARU financial capacity and sustainability resulting from project earnings. For that case, the government will have the opportunity to use the share of the budget which was supposed to go to ARU for other government development plans. Further the ability of ARU in contributing towards the realization of National Policies such as Education Reforms through expansion of enrolment of students into various degree

programmes is going to increase. The increase in the number of enrolment means the increase in financial capacity of the institution.

However, the government will benefit from the increased number of experts in priority discipline with different disciplines that will be graduating from ARU. Mwanza Campus This will create the potential of the government to use internal resources (home country experts) in different future projects rather than contracting foreign experts.

10.3 Costs related to the project

The estimated costs for implementing enhancement measures, impact management as well as monitoring process as outlined in Chapters 8 and 9 is about 594,000,000 per annum. The estimated costs for mitigation do not include the environmental costs, which could not be accurately calculated. Since some of the impacts will only to be realized during construction phase, the costs for these will also be short term, especially if mitigation measures are fully implemented. The construction costs for all the projects are detailed in Bills of Quantities.

10.3.1 Costs to community

The resulting negative environmental and social impacts such as noise, impairment of air quality, and Safety and health risks due to project activities will be absorbed by the surrounding communities. However, the introduction of mitigation measures will reduce the anticipated impacts. Apart from the above, no any community activities will be disrupted. Ardhi University is committed to mitigate the negative social and environmental impacts.

10.3.2 Costs to Government

The Government of the United Republic of Tanzania through the Ministry of Education, Science and Technology (MoEST) has secured fund from World Bank to promote higher education as a catalytic force in the new Tanzanian economy. The project is designed to revitalize the key areas for innovation, economic development, and labour market relevance. Also as already mentioned the Government will directly and indirectly benefit from taxes generated during both phases of the project. Apart from tax generation, the investment will also enhance the economic growth, enhancement of industrialization and businesses.

10.3.3 Environmental Cost

Environmental cost benefit analysis is assessed in terms of the negative and positive impacts. Furthermore, the analysis is considering whether the impacts are mitigatable and the costs of mitigating the impacts are reasonable. The total cost per annum for environmental risks and impacts monitoring will be Tshs 31,000,000 during the construction phase and Tshs 22,000,000 during operation phase.

10.4 Project cost benefit analysis

As it has been mentioned in Chapters 6 – 8, the potential benefits of the project, in terms of financial and social benefit are substantial. The environmental impacts are reasonably mitigatable and the financial resources needed to mitigate negative impacts, when compared to the required investment are relatively small. However, the benefit cost ratio concluded the

project to have more benefits compared to the total cost of the project, this implies that the project is viable and ARU is encouraged to develop it.

CHAPTER ELEVEN

11.0 DECOMMISSIONING

11.1 Introduction

Since decommissioning will take place in later years, the specific conditions for mitigation are generally inherently uncertain. Due to this uncertainty, specific mitigation measures pertaining to environmental impacts of decommissioning works cannot be proposed at the moment with a reasonable degree of certainty.

A detailed decommissioning plan that takes environmental issues into consideration shall be prepared by the proponent prior to the decommissioning works. Should it occur, decommissioning may entail change of use (functional changes) or demolition triggered by change of land use. Therefore what is presented here is just a Preliminary Decommissioning Plan which merely highlights on what shall be done if the need for decommissioning arise.

11.2 Preliminary Decommissioning Plan

This Section describes a brief outline of the works required to demolish the proposed project components on the site incase it happens. This Plan shall be used as a reference document that provides the framework to ensure that demolition activities on the site do not adversely affect the health, safety, traffic or the environment of the public and neighbouring properties. The Contractor shall be required to prepare a detailed Demolition Plan and Construction Management Plan to the satisfaction of the proponent and relevant Authorities prior to the commencement of works on site.

11.2.1 Components to be Demolished

The project components to be demolished shall generally be constructed with load bearing masonry walls with steel or timber framed roofs and metal roofs.

11.2.2 Demolition Methods

The Contractor shall prepare a detailed Demolition Plan prior to the commencement of work on site, however, the indicative demolition methods shall be as follows:

- The strip out and removal of non-structural elements shall be undertaken utilising manual labour and small plant including – bobcats, 3-5t excavators and dingo type loaders.
- The materials shall be removed from site using small to medium sized trucks.
- The structures shall be demolished using larger plant and equipment including 15-40t hydraulic excavators. These machines shall be equipped with rock breakers, pulverisers and the like which would be used in a sequential manner.
- The engineer shall be engaged to provide further engineering advice in relation to temporary support or backpropping of the structure during demolition.
- During the demolition process erosion control measures shall be established. These shall include treatment of dust and potential discharge into stormwater systems.

11.2.3 **Materials Handling**

Materials handling shall be done by mechanical plant (including excavators and wheel loaders) loaded into trucks (bogie tippers and semi trailers). The debris shall be hauled offsite to an approved waste facility or recycling centre.

The contractor shall submit a Demolition Waste Management Plan to ARU, which outlines the objectives of:

- Maximisation, reuse and recycling of demolition materials/wastes
- Minimisation of waste disposal and maximization of waste treatment such as composting organic demolition wastes
- Evidence of implementation for specified arrangements of waste management

Reusable materials shall be stored at the site. Recycling and disposal containers shall also be accommodated at this location for collection vehicles. Hazardous materials shall be treated separately. A hazardous materials inspection shall be undertaken by an accredited consultant and a report issued. Hazardous materials shall be removed in accordance with EMA 2004. A final clearance report shall be provided by the hygienist which shall include the provision of tip dockets from waste centres.

11.2.4 Proposed Sequence

The Contractor shall be required to prepare the following documentation prior to the commencement of demolition and/or excavation works:

- Rapid assessment
- Construction Waste Management Plan
- Demolition Management Plan

In principle, the demolition process is undertaken in the reverse sequence as construction. Essentially, internal finishes shall be stripped out first. Service amenities shall then be removed including air conditioning, pipework and conduits. The facades shall be removed where necessary and the structure shall then be demolished using the larger plants and equipment. It is estimated that it shall take 3 months to demolish and clear the site.

11.2.5 Protection Measures

An A Class hoarding shall be erected around the perimeter of the construction site prior to the commencement of demolition works. Additionally, wherever the risk arises of material falling into public areas, overhead protection shall be provided in the form of a B Class hoarding. Scaffolding shall be erected to facades where materials could fall in excess of 4m. The scaffolding shall be clad with chainwire and shadecloth to enclose debris and dust onto the site. During the demolition, dust control measures shall be used to minimise the spread of dust from the site. The Contractor shall have a senior representative on site at all times to ensure compliance with the safety guidelines and agreed work methods.

11.2 Traffic Management

The management of construction traffic during the deccommissioning phase shall be subject to the provision of a detailed traffic management plan. This plan shall be prepared by the Contractor for the various stages of demolition. During demolition, all traffic shall be held within

the site boundaries. The site shall remain closed to pedestrian traffic and shall be generally manned by security.

11.2.1 Occupational Health and Safety

Detailed OH&S measures shall be provided by the Contractor prior to work commencement. A detailed Site Safety Plan shall be prepared for the specific project. The plan shall highlight important issues as stipulated in the IFC general EHS guidelines for project decommisioning

11.2.2 Environmental Management Plan

A detailed Environmental Management Plan pertaining to demolition works shall be provided by the Contractor prior to the commencement of the work.

11.3 Potential Impacts and Mitigation Measures

11.3.1 Dust, Noise and vibration Pollution

The demolition activities for the remained part (foundation structure) shall be accompanied with emission of a lot of dusts, noise and vibration since the demolition works are expected to be carried out by conventional method using mechanical breakers and jackhammers. However, alternative methods of demolition including explosive techniques can be used.

Mitigation Measures

i. Water sprinkling shall be applied to open earth to reduce dust emission;
ii. Trucks transporting construction materials shall be covered if the load is dry and prone to dust emissions;
iii. The demolition area shall be fenced with iron sheets; this shall prevent the dust at the ground to be picked up by the wind;
iv. Public notifications shall be sent where appropriate especially in nearby residential areas likely to be impacted by dust;
v. Construction equipment, with noise sinks, shall be used;
vi. Machine operators in various sections with significant noise levels shall be provided with noise protective gear
vii. Construction equipment shall be selected, operated and maintained to minimize noise.

Costs to Undertake Mitigation Measures: Approximately TShs. 50,000,000

11.3.2 Increased Waste

A lot of demolition waste is expected to be generated as a result of demolition of this project.. Non-hazardous solid waste will include excess fill materials from grading and excavation activities. Hazardous wastes during decommissioning include release of petroleum-based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. These shall include blocks, concrete, reinforcements, pipes, etc. Most of the building materials shall be salvaged and recycled.

Mitigation Measures

i. All materials that can be reused shall be reused;
ii. Materials that cannot be reused shall be sent to an authorised dumpsite.

Costs to Undertake Mitigation Measures: Approximately TShs. **50**,000,000

11.3.3 Loss of Employment

Many people shall suffer loss of employment if it happens that the buildings have to be decommissioned, including members of staff (academic and administrative Staff), security guards, cleaners, etc.

Mitigation Measures
i. Prior notice shall be given to all those who are going to be affected;
ii. Credit and Savings account shall be established; and,
iii. Proper compensation shall be given to those who deserve it.

Costs to Undertake Mitigation Measures: Approximately TShs. 10,000,000

CHAPTER TWELVE
12.0 SUMMARY AND CONCLUSION

The proposed project is suitably located in an institutional area and is located at a site that is adequately accessible such that all heavy equipment and trucks may reach the site easily. The proposed project will contribute to socio-economic benefits to both ARU and the nation at large. These socio-economic benefits include: Creation of employment opportunities; increase income to the ARU and the Country as whole. On the other hand, the proposed project will entail some adverse environmental impacts of which adequate mitigation measures have been proposed and incorporated in the project design. The environmental impacts identified from this project include but not limited to: Increased noise levels; increased dust levels; waste management problems, storm water generation and safety and health risks.

It is, therefore, concluded that the proposed ARU buildings project will entail no significant impacts provided that the recommended mitigation measures are adequately and timely implemented. The identified impacts will be managed through the proposed mitigation measures and implementation regime laid down in this ESIA. ARU will implement all the recommendations given in this ESIA and carry-out the environmental auditing and monitoring schedules.

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