

Environmental and Social Impact Assessment (ESIA) for the Proposed Construction of the Two Storey Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipal Council, Kigoma Region, Tanzania



PROPONENT:



THE OPEN UNIVERSITY OF TANZANIA

Kawawa Road, Kinondoni Municipality,
P.O. Box 23409,
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Tanzania

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EXECUTIVE SUMMARY

Introduction

The Open University of Tanzania (OUT) is a fully fledged, autonomous and accredited public University, established by an Act of Parliament Number 17 of 1992. The Act became operational on 1st March 1993 by the publication of Government Notice No. 55 in the Official Gazette. The first Chancellor was officially installed in a full ceremony on 19th January 1994 and the first batch of students was admitted in January 1994. In January 2007, following enactment of the Universities Act No. 7 of 2005, OUT started using the OUT Charter and Rules (2007) for its operations. The Open University of Tanzania offers its certificate, diploma, degree and postgraduate courses through the open and distance learning system which includes various means of communication such as face-to-face, broadcasting, telecasting, correspondence, seminars, e-learning as well as a blended mode which is a combination of two or more means of communication. The OUT's academic programmes are quality-assured and centrally regulated by the Tanzania Commission for Universities (TCU).

OUT Headquarters are temporarily located off-Kawawa Road in Kinondoni Municipality, Dar es Salaam. The permanent headquarters are under constructions at Bungo in Kibaha District, off-Soga Road, about 4.0 Km from the main Morogoro highway in Coast Region. OUT operates through a network of about 30 Regional Centres; 10 Coordinating Centres, of which one is in Zanzibar and one in Pemba; two are in Kenya (Egerton and Njoro), one is in Rwanda (Kibungo), one in Namibia and one in Uganda. Other OUT Internal Coordination Centres are the African Council for Distance Education – Technical Collaboration Committee (ACDE TCC), the Centre for Economics and Community Economic Development (CECED) and the SADC Centre of Specialization in Teacher Education (SADC ODL CoS TE). OUT has also 69 Study Centres spread throughout the United Republic of Tanzania. The Open University of Tanzania offers its certificates, ordinary diplomas, degrees, postgraduate diplomas and PhDs through its five Faculties and two Institutes - Faculty of Arts and Social Sciences, Faculty of Business Management, Faculty of Education, Faculty of Law, Faculty of Science, Technology and Environmental Studies, Institute of Educational and Management Technologies and Institute of Continuing Education.

The OUT as public learning institution has received financial support from the World Bank (WB) through the Tanzania Higher Education for Economic Transformation (HEET) project in which part of it will be used for construction of multipurpose science laboratories in seven regions of Tanzania. The 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 labour market relevance, by investing in requisite infrastructure for modern and effective teaching and research.

The OUT is intending to use part of HEET project fund to construct a Laboratory Building at Kigoma Regional Centre for the Open University of Tanzania, Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipal Council, Kigoma Region, Tanzania. The plot area which is the proposed project site, measures One Hundred Seventy-Eight Thousand, Seven Hundred and Twenty-Seven (178,727) square meters and the proposed Two Storey (Ground + 1) laboratory building will use only 1300-1500 m². The laboratory will be used as zonal science laboratory for science students, researchers, secondary schools and community in the project's area. The project components will cover; - Botany laboratory, Zoology Laboratory, Food science laboratory and Preparation rooms and technical offices for each laboratory on the ground floor. The building also will have 38 total parking bays for the users and visitors. Other associated facilities to support the project are retaining wall, concrete paving blocks, security guard post, changing room, water storage tank with a pumping system, toilets, solid waste collection area, waste water drainage system, fire system and utilities network. The project total investment cost is estimated at Tanzania Shillings One Billion Two Hundred Ninety-Eight Million Seven

Hundred Thirty-Six Thousand Four Hundred only (TZS. 1,298,736,400.00) which is equivalent to USD. 520,000.00.

The Environmental Management Act, cap 191 and the Environmental Management (EIA and Audit) (Amendment) Regulations, 2018, requires that EIA be undertaken for all new projects that may cause adverse environmental and social impacts. The First Schedule of the Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018, categorize major urban projects including multistorey buildings as type B1 project (borderline project), which may or may not require ESIA study. Also, the World Bank Environmental and Social Frameworks (ESF) and Standards (ESSs) require project developers to carry out an Environmental and Social Impact Assessment (ESIA) prior to project implementation. In view of the above, OUT commissioned TRES Consult (T) Limited of Dar es Salaam (Registered Environmental Consultancy Firm) to carry out the ESIA, for the proposed project.

Thus, the consultants as a first step of the environmental and social impact assessment process prepared EIA application documents. The documents included the project Registration Form, Scoping Report and Terms of Reference (TOR) which were submitted to the National Environment Management Council (NEMC). The scoping report and ToRs were approved by the NEMC through the letter dated 19th December 2023 with Reference Number HG.145/88/29/02 (Appendix 5). The ToR was also approved by World bank and used to provide guidance under which this Environmental Impact Assessments were done. Therefore, 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.

Project description

The project components will cover the Botany laboratory, Zoology Laboratory, Food science laboratory and Preparation rooms and technical offices for each laboratory on the ground floor. The first floor will comprise the ICT Multimedia state of the art laboratory, DRC and staff offices, Min library and Modern conference facilities. The building also will have 38 total parking bays for the users and visitors. Other associated facilities to support the project are retaining wall, concrete paving blocks, security guard post, changing room, water storage tank with a pumping system, toilets, solid waste collection area, waste water drainage system, fire system and utilities network. The building shall be built to the highest acceptable standards using the best available environmentally friendly materials and offering a comfortable and high-quality laboratory and teaching space.

The project site is already connected to TANESCO power supply and thus upgrading of the same shall be considered for the project. There is existing public water supply pipeline at the project site that shall be considered for connection. Currently, there is no centralised sewer system within the project site as such the septic tank and soak away system will be used. The solid waste will be collected in waste bins from the laboratory and thereafter to the centralized transfer station (waste collection area) from where Authorized agent will be collecting the wastes to the to the designated Municipal Council's dumping site.

Project location

The project area is accessed by an earth road which branch of from Lumumba tarmacked road which connects to the CBD of Kigoma. The Kigoma CBD can be reached from outside by three trunk roads traversing the region namely Mwandiga - Mwanjovu to Burundi border; Kanyani (Kasulu) - Katavi region border; and Kigoma - Kasulu - Kibondo – Nyakanazi to Kahama. Other routes include Tabora – Urambo– Uvinza – Kigoma road; Tabora - Kigoma branch of the central railway line; over Lake Tanganyika from Katavi, Mbeya, Burundi, Zambia, and Congo or by air. The project site is about 1,250 km distance from Dar es Salaam by rail and 1,080 km by air.

Policy, legal and institutional framework

There are several policies, laws and regulations that require the project proponent to undertake an ESIA. The proposed project should comply with these policies, laws and regulations. The most relevant national policies and strategies include: the National Environmental Policy, 2021; the Land Policy (1995); the Water Policy (2002); the National Construction Policy (2003); the National Employment Policy (2008); the National Human Settlements Development Policy (2000); the Energy Policy of Tanzania (2015); the National Investment Promotion Policy (1996); the National Health Policy (2017); the National Policy on HIV/AIDS (2001); the National Women and Gender Development Policy (2000); the Tanzania Education and Training Policy, (2014); the Urban Planning and Space Standards Policy (2012). 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: the Tanzania Development Vision 2025; the Third National Five-Year Development Plan (FYDP III; 2021/22 – 2025/26) and the National Plan of Action to End Violence Against Women and Children (NPA-VAWC) 2017/18-2021/22.

The main legislation with a bearing to this project include the Environmental Management Act, Cap 191; the Open University of Tanzania Act, [Cap. 268 R.E 2019]; the Land Act, [Cap. 113 R.E 2019]; the Occupation Health and Safety Act, 2003 (Act No. 5/2003); the Local Government (Urban Authorities) Acts, [Cap. 288 R.E 2019]; the Water Resource Management Act, 2009 (Act No. 12/2009); the Workers Compensation Act, 2015; the Land Use Planning Act No.6 of 2007; the Urban Planning Act No. 8 of 2007; the Contractors Registration (Amendments) Act No. 15 of 2008; the Engineers Registration Act No. 15 of 1997 and its Amendments of 2007; the Public Health Act, 2008; the HIV and AIDS (Prevention and Control) Act, 2008; the Fire and Rescue Service Act No. 14 of 2007; the Water Supply and Sanitation Act of 2009; the Persons with Disability Act, 2010; the Child Act of 2009; the Antiquities Principal Act, 1964 and (Amendment 1979) and the Architects and Quantity Surveyors Act No. 16 of 1997 R.E. 2019.

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; World Bank relevant Environmental and Social Standards. This ESIA study has applied 6 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; Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS5); and ESS10 - Stakeholder Engagement and Information Disclosure.

Baseline conditions

The proposed project will be situated within the larger part of the OUT plot located at the Busomero Mtaa. At the project site there is one building which is used as OUT Kigoma centre staff offices, examination hall and teaching facilities. As such some teaching activities are currently being carried out on site. Partly clearance of the project site was done in the course of construction of the existing building and agricultural practised on site. Part of the general area had already been cleared up and currently there are only sprouting grasses and shrubs grown due to seasonal rains. The site was also levelled and thus the current terrain is almost flat however the nearby areas show the general overland flow towards the west side.

The nearby water body is the Lake Tanganyika which is located about 550 meters from the actual proposed project site. However, the larger part of the OUT plot bound the Lake Tanganyika on the Western side. The soils of the project area are typical of the Lake Tanganyika shore areas. Soils are predominantly deep and well drained comprising the reddish to yellowish fine sandy loams, and sandy loams partly stony and severely eroded. The soil in the area could generally well be expressed as deep to moderately deep, well drained loams which is suitable for proposed project. Based on the state of the site during assessment and at the present there is no pristine environment that can promote thriving and existence of the species of conservation concern as per IUCN and CITES standards. Further, there were

no cultural or archaeological objects that were reported and likewise during assessment none of the objects were observed or found at site.

Stakeholder Engagement

Stakeholder consultations were carried out, including interviews and meetings with officials from national and local government departments and local communities in the project area. One-to-one interviews with individuals, based upon a list of general topics or questions and partly based on an open discussion, were conducted based on a list of general topics or questions and partly based on an open discussion. Focused group discussions were also used to gather information. In establishing the public's views concerning the proposed project, the consultants were provided with an introduction letter addressed to each stakeholder identifying the project, the need for an ESIA and asking the stakeholder to raise their concerns to the Consultant freely.

Notices were posted at strategic places requesting stakeholders to raise their concerns through written or verbal communications. Consultation with stakeholders indicated that they generally view the proposed project as a positive venture that will enhance communication within and beyond the national boundaries and stimulate socioeconomic activities and economic development in the area. Concerns and questions raised by stakeholders have been documented and addressed in the ESIA report.

Environmental and Social Impact Assessment and impacts considered

The ESIA assessed the potential environmental and social impacts of the proposed Construction of the Two Storey Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre. The study was conducted to comply with the Environmental Management Act (2004) and in accordance with the EIA and Audit (Amendment) Regulations (2018). Further World Bank Environment and Social Framework (ESF) and the project's Environmental and Social Management Framework (ESMF) were observed in the study. A standard methodology for impact identification was used to define the scope for the analysis, including a checklist/matrix approach, stakeholder input and professional judgement. Both qualitative and quantitative methodologies were employed to collect and analyse the gathered ESIA data.

The impacts considered were those identified by most of the stakeholders. Impacts, both physical and socio-economic were firstly highlighted depending on the stage of the project (e.g., mobilization, construction, operation, decommissioning). These impacts were then considered in terms of how they would positively or negatively impact society, and how long they would last, whether they are residual, short term, long term, or cumulative. All the impacts that were identified by stakeholders were addressed, and it was decided not to leave any of these out as they were all considered as impacts; that needed to be assessed further to determine their significance levels and durations.

Description of the major significant impacts

Major Significant Impacts for the purposes of this report are mainly considered as the impacts types which are of high positive and negative significance over a long period of time in terms of their duration. Those which are of high significance as well as cumulative also fall into this category. The impacts identified as significant and their mitigation for this project are listed as follows:

NEGATIVE ENVIRONMENTAL IMPACTS DURING PREPARATION / MOBILIZATION

Damage / loss of valuable vegetation cover

The OUT and Contractor shall ensure that clearance of the site for construction purposes shall be kept to a minimum and areas that the project will not impact shall not be disturbed. The Contractor shall mark out the extent of clearing within the approved worksite and instruct all construction workers to restrict clearing to the marked areas and not outside defined work areas. In the same vein, there will be strict

control of construction vehicles to ensure that they operate only within the area to be disturbed by construction works.

Deterioration/impairment of local air quality from equipment's/vehicular emissions

Reducing air emissions from exhausts shall be achieved by contracting new equipment or well serviced and maintained equipment. No vehicles or equipment's to be used that generate excessive black smoke. Where practical, the contractor will inspect machines and vehicles on delivery. Also, contractor will enforce vehicle load restrictions to avoid excess emissions from engine overloading.

Deterioration/impairment of local air quality from dust pollution

Dust generating activities (excavation, handling and transport of soils) shall not be carried out during times of strong winds. The Contractor shall suspend earthworks operations wherever visible dust is affecting properties adjoining the project site. Water shall be applied whenever dust emissions (from vehicle movements or wind) are visible at the site in the opinion of the Supervisor.

Disturbance/ nuisance to receptors from increased noise levels

Best practice procedures will be implemented to reduce mobilization noise. Such measures will include hydraulic construction in preference to percussive techniques where practical. Also, all plant and equipment will be maintained appropriately, silenced where appropriate and operated to prevent excessive noise and switched off when not in use. Loading and unloading of vehicles dismantling of equipment such as scaffolding or moving equipment or materials around the site will be conducted as practicable during daytime hours, and noise complaints will be immediately investigated.

Increased soil erosion of exposed surfaces

The OUT and contractor will, if possible, ensure that civil or earth work is done during dry season when there is no run off to reduce the impact severity. Deliberately re-cover exposed soils with grass and other appropriate species as soon as possible during dry season to enable vegetation growth before wet season. Also, temporarily shall bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses.

NEGATIVE ENVIRONMENTAL IMPACT DURING CONSTRUCTION PHASE

Impacts on air quality from construction emissions

All personnel working on the project will be trained before starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained to minimise emissions during construction. Specific training will minimise dust and exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idling of engines.

Nuisance and disturbance on/offsite receptors from increased noise level

The noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site. These include installation of portable barriers to shield compressors and other small stationery equipment where necessary, use of quiet equipment (i.e., equipment designed with noise control elements) and the proponent will ensure all vehicles have properly functioning mufflers. The noise level will be within acceptable limits and construction activities shall, where possible, be confined to regular working hours.

Deteriorated/impaired air quality from dust pollution

Dust generating activities (excavation, handling and transport of soils) shall not be carried out during times of strong winds. The Contractor shall suspend earthworks operations wherever visible dust affects properties adjoining the project site. Water shall be applied whenever dust emissions (from vehicle

movements or wind) are visible at the site in the opinion of the Supervisor. Vehicles delivering soil materials will be covered to reduce spills and windblown dust.

Nuisances and health hazards due to increased vibrations

It is prudent for the proposed project to reduce the level of vibration exposure as much as practical to prevent its effects on buildings/structures. This will be done by well-planned engineering designed and controls, the use of protective equipment and safe working practices. Also, the design of vibration-damped equipment and engine mountings are the most effective engineering methods of controlling vibration exposure.

Visual effects during construction

To mitigate the impact of haphazard storage of construction materials safe storage areas will be identified and retaining structures put in place prior to the arrival and placement of material. Stockpiles of fine materials will be covered with tarp during windy conditions to prevent a dust nuisance. The stockpiling of construction materials will be properly managed and controlled.

Deteriorated/impaired water quality (surface and ground) due to accidental spills of hydrocarbons

The OUT and contractor shall ensure that re-fuelling and services for vehicles is done off the project site. Spill control measures such as storage and handling of chemicals and fuels on impervious areas (such as concrete surfaces) will be implemented to minimize impacts in case of spills. Equipment will be checked for lubricant leaks, and workers will be trained not to dispose of waste improperly in the area.

Loss of aesthetics due to improper disposal of construction waste

An efficient collection and disposal system based on the principles of reduction, re-use and recycling of materials, shall be instituted at the project site and will include instructions to the contractor to put on his/her methodologies for handling hazardous waste such as oils, lubricants and non-combustible waste during the bidding process; and introduction of waste disposal bins, warning notices, "DOs & Don'ts" etc posted at strategic points, through the project area.

NEGATIVE SOCIAL IMPACT DURING MOBILISATION/CONSTRUCTION PHASE

Traffic accident impacts

Traffic accidents will be avoided by ensuring good driver awareness and maintaining speed limits for main roads and material access roads. Also, by providing both road and safety signs to the public and drivers at the core activity project site(s). All large or over-size transport vehicles will be accompanied by escort cars equipped with flashing yellow warning lights while in transit on public roads. Delivery of construction plant, equipment, and goods will be planned to minimize the total number of required trips and be scheduled outside of peak hour traffic times.

Occupational health and safety impacts during construction

OUT and contractor shall comply with relevant Tanzania (OSHA, 2003) and International Finance Cooperation's Performance Standards and regulations on health and safety requirements, including the provision of PPE, reasonable working hours and good working conditions and facilities. Also, health and safety on-site shall include standard best practice provisions in the construction contract, together with (i) appropriate BoQ items so that at least some elements of H&S are a pay item (financial incentive), (ii) a mechanism for withholding payments if the contractor is not compliant with the H&S provisions.

Increased incidence of diseases transmission including HIV/AIDS and STDs

The OUT and Contactor will devote time in raising awareness of the dangers of the HIV/AIDS within the project premises. Although basic knowledge of HIV/AIDS is high among Tanzanians, knowledge of self-

protection measures and behaviour change will be provided and a preference will be given to those who are vulnerable and to empower women for they compose one of the most vulnerable groups.

Potential risks and hazards associated with child labour

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

Increased local population due to labour influx

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

Potential GBV/SEA/SH related incidences

The OUT will emphasize to all contractor to provide equal employment opportunities between men and women depending on required qualifications at all level. During construction local employment shall be optimized by allocating jobs fairly (consider gender, marginalized groups), involve community leaders/committees to identify suitable/able people for the jobs, review to avoid bias or favouritism observe national/and international labour standards.

Gender inequity in employment

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

NEGATIVE ENVIRONMENTAL IMPACT DURING OPERATION PHASE

Health and safety hazards from chemical handling in the laboratories

Only small amounts of chemicals necessary for daily use would be stored in the laboratory. Bulk stocks would be kept in specially designated rooms away from the laboratory. The proponent will replacement of the hazardous substance with a less hazardous substitute and will implement engineering and administrative control measures to avoid or minimize the release of hazardous substances into the work environment keeping the level of exposure below internationally established or recognized limits.

Contaminations of land from poor solid wastes management

The proponent will be responsible for the efficient management of solid waste generated by the project during its operation. In this regard, solid waste will be collected and sorted out in different containers so that non-biodegradable wastes such as plastics and others will be handled separately. Also, the proponent will provide an adequate number of bins at convenient distances to discourage uncontrolled waste disposal. Storage areas shall be of adequate size and capacity to accommodate the required number of containers consistent with the waste generated and collection schedules.

Deteriorated/impaired water quality (surface and ground) from wastewater disposal

The project proponent shall take reasonable precautions to prevent the pollution of the ground and/or water resources located adjacent to the site due to the project activities. Sanitary arrangements shall be to the satisfaction of the requirement of the EM (SQS), 2007 and EM (WQS) 2007. Septic tank and soak

away shall be designed in such a way waste treatment is achieved by 100% before disposal to the authorised disposal sites.

Compromise quality of soil, ground water and surface water from laboratory effluents

The proponent will consider proper retention tank volume, geometry and compartmentalization to impart adequate hydraulic residence time for sedimentation. The elongated tank with length-to-width ratios of 3:1 or more is will be used to reduce short circuiting of the effluent. Two compartments will be used to achieve, better suspended solids removal rates.

Public health hazards from reject materials/expired chemicals

Proper disposal of reject materials/expired chemicals can be expensive. So, the project proponent will minimize the need for proper disposal, by minimizing chemical purchases. The University will purchase chemicals for the lab according to the need of that particular time. This inventory will be used to inform laboratory manager and staff members when samples become so old/expired that disposal is necessary.

Health and safety risks due to fire hazards

All staff will have training in fire control through regular firefighting drills. Fire extinguishers would be available in accessible area near to fire risk area and ensure that all fire-fighting equipment is regularly maintained and serviced. Fire emergency telephone numbers would be displayed in communal areas. Some of the applicable techniques related to building safety, including hydrant system for protection of the building against fire will be implemented and automatic fire alarm system for the entire laboratory will be installed. Fire hazard signs such as 'No Smoking' signs will be provided.

Occupational health and safety hazards due to inadequacies in provisions for working conditions

OUT shall provide and enforce use of appropriate PPE. Appropriate safety measures will be developed based on a risk assessment and may include adequate ventilation in the laboratory, office or in workers' long exposed working area, and guidance on safe working in confined spaces; establish safe working procedures/guidelines which will be followed by all employees working in the project premises. The OUT will also monitor occupational hazards risks and provide timely rectification before waiting for incidence.

SOCIAL NEGATIVE IMPACT DURING OPERATION PHASE

Risk of SEA/SH within the OUT Kigoma Regional Centre

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

Health Hazards due to social interaction among workers and users

The proponent will support already existing and new initiatives to sensitize / educate the people around the project on the HIV/AIDS pandemic. Also, the proponent will provide HIV/AIDS training / awareness campaign programmes to its employees and will encourage workers who know they are infected and receive care to break through the denial about HIV by talking with their fellow workers, friends and neighbours and reducing the discomfort associated with the subject.

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

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

ENHANCEMENT MEASURES FOR POTENTIAL POSITIVE IMPACTS

Employment/Income generation

This impact is high and of great importance and therefore it will be enhanced by ensuring there is skill transfer through an elaborate programme. Staff will be categorized and each group will be supervised by dedicated skilled personnel to ensure on job training. The proponent will encourage job on training through observation and trial under supervision. Also, the contractor of the project will be encouraged to and committed to hiring local labour (especially marginalized groups such as youth), particularly when only semi-skilled or unskilled labour is required. During the tendering process for project construction, special clause that requires residents to be employed as labourers shall be included in the contractor's contract

Contributing to local economic growth

Where possible the construction contractor will be advised through contractual means to maximize the application and use of locally produced construction material supplies. This will increase the quantity of materials to be procured from the various local suppliers and hence it will enhance the income generation capacity of local suppliers. The use of locally available materials and labour for the proposed project development will contribute to the economy's growth by contributing to the gross domestic product. The consumption of these materials, fuel oil and others will attract taxes, including VAT which will be payable to the government hence increasing government revenue, while the cost of these raw materials will be payable directly to the producers.

Increased income by utilization of local resources

It is expected that, materials such as cement, aluminium, roofing sheets, timber, paving blocks tiles, sanitary, plumbing and electrical appliances, steel, and other miscellaneous materials required for construction can be sourced locally e.g., Kigoma-Ujiji Municipality or other parts of Tanzania, depending on the type of materials required.

Support to local social services and livelihood

The project has a potential of enhancing development of the area through increased business activities and direct employment. As a corporate citizen, OUT will work all along with the Government to achieve the millennium development goals mainly in the area of poverty reduction. This will be done through a non-partisan scheme set by the University, tailored towards extending support to disadvantaged sections of various communities in the area to enable them access education, health care and clean safe water.

Induce development

To enhance this positive impact to the community living in the vicinity and area of influence; OUT shall ensure efficient operation of the Science Laboratory Building at the Busomero Mtaa, and good security within the project area and area of influence

Corporate Responsibility

As part of social corporate responsibility, it is expected for the OUT to establish a separate budget to implement its social commitment in the area. Its priority should focus on the pressing needs in the community such as supporting the community on the ongoing social projects including supporting building dispensaries, classrooms, and water related projects to mention some.

DECOMMISSIONING PHASE

Loss of employment

The proponent shall prepare the workers to be employed anywhere else in the assembly plant through provision of extensive training. Also, the project will prepare workers for forced retirement by providing

skills for self-employment, wise investment. Further shall ensure that all employees are members of the Pension Fund and the employees shall ensure that the developer's contributions are made. In time of decommission of this project, OUT may consider its employees in development of new projects.

Environmental pollution from haphazard disposal of demolished waste

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. 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.

Noise pollution

The OUT will coordinate activities that produce the most noise levels. Use of equipment designed with noise control elements will be adopted where necessary and demolition exercise will be limited at day time only. All workers operating in noisy areas or operating noisy equipment will be provided with earpieces to protect against extreme noise.

Air pollution due to dust

The contractor will douse the surface with water to suppress excessive dust and whenever possible, water sprinklers shall be used. Also, the contractor will provide protective gear (i.e., breathing masks) to workers working in dusty environment.

Soil and water pollution

Demolished materials shall be kept within planned boundaries and with a clear separation. If it is essential to stockpile materials close to runoff, control measures shall be implemented, such as excavation of a shallow water/ sediment collection ditch around the boundaries of stockpiles to contain run-off water for a sufficient length of time to allow for settlement of solids. Stockpiles or other storage compounds (e.g., demolished material) boundaries shall be clearly marked out with physical boundary markers such as posts.

Occupational health and safety

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. The proponent shall establish safe working procedures/guidelines which will be followed by all employees and any subcontractor working in the facility premises

Alternatives Considered

The general principle involved in identifying the option(s) of the proposed project is to ensure that the option chosen would result in optimal social, economic and environmental returns. In practice, if more than one site is available for selection for construction of the laboratory, screening exercise could be used and the site qualifying above the others must undergo a detailed characterization for its suitability in terms of location, accessibility, security, availability of social services (water, electricity etc.) and hydrogeological characteristics. The construction of the Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre was identified after examining and eliminating another site choice. The advantages of this site were the good integration between the existing OUT Kigoma Centre and the proposed laboratory building.

Also, the site is privately owned by the OUT as such it does not involve complicated issues of displacing people, compensation and settlement. The project site is located on the land designated for academic institution development. It is surveyed and planned for academic institution development. All developments on plots are according to the letters of offer (titles) and building permits. The allocated land was designed and planned to accommodate further expansions of the project or support facilities such

as the proposed project. There are no changes in land use as such. This gives an opportunity to OUT to continue planning and also to accommodate new development within their area. The site is easily accessible, and has all utilities needed.

Mitigation Measures and Environmental and Social Management Plan

The Project will implement a suite of best-management practices and compliance measures, referred to herein as “in-built” mitigation measures, designed to avoid or reduce potential impacts on sensitive receptors. These measures have been captured in the initial impact ratings assigned above. “Additional” mitigation measures have been proposed for some impacts those that would affect receptors with higher sensitivity, and where a targeted mitigation measure can readily be applied to reduce the likelihood or magnitude of impact. The proposed mitigation measures are presented in the impact assessment and summarised in an Environmental and Social Management Plan (ESMP). The ESMP included in Chapter 8 of the ESIA has been designed to support the successful implementation of the Project while respecting and conserving the social and environmental aspects of the country.

Environmental Monitoring Plan

An Environmental Monitoring Plan has been developed to monitor the efficiency of the environmental mitigation measures and socio-economic initiatives specified in the ESMP. It supports the ESMP by maintaining a record of environmental performance and enabling adjustments to be made to mitigate environmental and socio-economic impacts during the project's lifetime. The Monitoring Plan consists of the set of mitigation, monitoring parameter, and institutional measures to be taken during construction and operation of the planned facility to eliminate, offset, or reduces adverse environmental and social impacts. The plan also includes the actions needed to implement these measures.

Cost-Benefit Analysis

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

These results suggest that the project is expected to yield significant economic returns and thus is a very sound investment. These are conservative estimates of the project benefits, given that they do not account for other potential benefits, including the social benefits of education and training. The project's total economic and social impact is likely to exceed the economic benefits substantially. The proposed project will increase access and improve the quality of technical programs at OUT. The benefits are expected to emerge from realising economies of scale in training design and delivery in Tanzania. The main costs associated with the Two Storey Science Laboratory Building at Busomero Mtaa include direct project costs (IDA credit and grant), education and training costs for individuals and foregone income (indirect cost) for individuals during training. The additional maintenance cost for construction and additional academic and administration staff are anticipated. Moreover, because HEET supports OUT in staff development, salary increase due to additional qualification/training experience for some staff could be expected.

Decommissioning

The proposed project may exist for a long time since appropriate rehabilitation and upgrading are done when needed. The proposed project has an anticipated life span of about 100 years. However, the centre may be stopped if the Tanzania Government decides so for one reason or another, or technology change may necessitate discontinuation of the existing Science Laboratory Building. If this happens, a preliminary

decommissioning plan has been developed. The plan provides a general description of decommissioning methods considered feasible for the proposed project. The description is intended to demonstrate that the methods considered are practical and that they protect the health and safety of the public and decommissioning personnel.

Project decommissioning has five phases: (1) pre-removal monitoring; (2) permitting; (3) interim protective measures; (4) Project removal and associated protective actions; and (5) post-removal activities, including monitoring of environment and socio-economic activities. The first three phases will occur before removal of the project (i.e., within the first six months). The fourth phase — project removal and associated protective actions — will occur twelve months after closing business. The fifth phase will begin after total removal and continue for at least one year.

Conclusion

This ESIA report concludes that many environmental and social impacts have been identified and assessed. However, none of these are considered severe after mitigation to prevent the further planning, design, and development of the proposed Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre. Thus, considering the nature, duration and location of the project, the ESIA report concludes that all of the potential impacts associated with the proposed project are of a nature and extent that can be reduced, limited or eliminated by applying appropriate mitigation measures. Therefore, with proper implementation of the proposed ESMP, the project will not result in significant adverse effects on the people and environment of project site and its vicinity/surroundings.

Names of Experts Involved in the ESIA


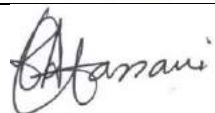
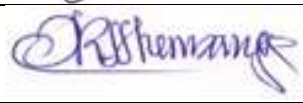



S/N	NAME OF CONSULTANT	POSITION/AREA OF EXPERTISE	SIGNATURE
Certified Experts			
1.	Mr. Abel Sikaona (Reg No. NEMC/EIA/0052)	Environmental Management/Water Resources	
2.	Mr. Bashiru Abdul Hassani (Reg No. NEMC/EIA/0034)	Lead Consultant, Environmental Planning and Social Economist	
3	Eng. Sam Shemsanga	Environmental Engineer	
4	Mr. Sengerema Thomas	Natural Resources Management	
Other Experts			
5	Sesilia Jeremia	Gender/GBV Specialist	
6	Ms. Nasra Abdul	Sociologist	

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ACKNOWLEDGEMENT

This Environmental and Social Impact Assessment (ESIA) report was produced for the proposed Construction of the Two Storey Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipal Council, Kigoma Region, Tanzania. The report was written based mainly on field work and secondary data from other various reports and documents cited in the report.

The Open University of Tanzania would like to acknowledge; - the National Environment Management Council (NEMC) for reviewing the scoping report and the Terms of Reference. This has enabled the Consultants to address all pertinent issues raised by different stakeholders. Also, the Open University of Tanzania wishes to extend special thanks to TRES Consult (T) Limited for carrying out this assignment. All stakeholders, as listed in appendix 2, are also acknowledged for their valuable comments, information and data.

ABBREVIATIONS AND ACRONYMS

CBD	Central Business District
CBOs	Community Based Organisations
CO	Carbon monoxide
CO ₂	Carbon dioxide
dBA	decibels-acoustic
DDI	Domestic Direct Investment
DED	District Executive Director
DOE	Division of Environment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
EMP	Environmental Management Plan
ERB	Engineering Registration Board
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWURA	Energy and Water Utilities Regulatory Authority
FDI	Foreign Direct Investments
GHGs	Greenhouse Gasses
HIV/AIDS	Human Immune Deficiency Virus/ Acquired Immune Deficiency Syndrome
ILO	International Labour Organization
ISO	Organization de Standards International
IUCN	International Union for Conservation of Nature
KCM	Kigoma Ujiji Municipal Council
MV	Medium Voltage
MW	Mega Watts
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGOs	Non-Governmental Organisations
NHSDP	National Human Settlements Development Policy
OSHA	Occupation Safety and Health Authority
PM ₁₀	Particulate matters
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PV	photovoltaic
R.E	Revised Edition
SO ₂	Sulphur dioxide
STDs	Sexual Transmission Diseases
TAC	Technical Advisory Committee
TANESCO	Tanzania Electric Supply Company
TIC	Tanzania Investment Centre
TMA	Tanzania Meteorological Authority
TNS	Tanzania National Standards
ToR	Terms of reference
TRA	Tanzania Revenue Authority
TTCL	Tanzania Telecommunication Company Limited
TZS	Tanzania Standards
UDSM	University of Dar es Salaam
URT	United Republic of Tanzania

VAT	Value Added Taxes
VPO	Vice President Office
WEO	Ward Executive Officer
WHO	World Health Organisation
WHO-GPA	World Health Organization Global Programme on AIDS

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Open University of Tanzania (OUT) is a fully fledged, autonomous and accredited public University, established by an Act of Parliament Number 17 of 1992. The Act became operational on 1st March 1993 by the publication of Government Notice No. 55 in the Official Gazette. The first Chancellor was officially installed in a full ceremony on 19th January 1994 and the first batch of students was admitted in January 1994. In January 2007, following enactment of the Universities Act No. 7 of 2005, OUT started using the OUT Charter and Rules (2007) for its operations. The Open University of Tanzania offers its certificate, diploma, degree and postgraduate courses through the open and distance learning system which includes various means of communication such as face-to-face, broadcasting, telecasting, correspondence, seminars, e-learning as well as a blended mode which is a combination of two or more means of communication. The OUT's academic programmes are quality-assured and centrally regulated by the Tanzania Commission for Universities (TCU).

OUT Headquarters are temporarily located off-Kawawa Road in Kinondoni Municipality, Dar es Salaam. The permanent headquarters are under constructions at Bungo in Kibaha District, off-Soga Road, about 4.0 Km from the main Morogoro highway in Coast Region. OUT operates through a network of about 30 Regional Centres; 10 Coordinating Centres, of which one is in Zanzibar and one in Pemba; two are in Kenya (Egerton and Njoro), one is in Rwanda (Kibungo), one in Namibia and one in Uganda. Other OUT Internal Coordination Centres are the African Council for Distance Education – Technical Collaboration Committee (ACDE TCC), the Centre for Economics and Community Economic Development (CECED) and the SADC Centre of Specialization in Teacher Education (SADC ODL CoS TE). OUT has also 69 Study Centres spread throughout the United Republic of Tanzania. The Open University of Tanzania offers its certificates, ordinary diplomas, degrees, postgraduate diplomas and PhDs through its five Faculties and two Institutes - Faculty of Arts and Social Sciences, Faculty of Business Management, Faculty of Education, Faculty of Law, Faculty of Science, Technology and Environmental Studies, Institute of Educational and Management Technologies and Institute of Continuing Education.

The OUT as public learning institution has received financial support from the World Bank (WB) through the Tanzania Higher Education for Economic Transformation (HEET) project in which part of it will be used for construction of multipurpose science laboratories in seven regions of Tanzania. The 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 labour market relevance, by investing in requisite infrastructure for modern and effective teaching and research.

The OUT is intending to use part of HEET project fund to construct a Laboratory Building at Kigoma Regional Centre for the Open University of Tanzania, Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipal Council, Kigoma Region, Tanzania. The plot area which is the proposed project site, measures One Hundred Seventy-Eight Thousand, Seven Hundred and Twenty-Seven (178,727) square meters and the proposed Two Storey (Ground + 1) laboratory building will use only 1300-1500 m². The laboratory will be used as zonal science laboratory for-science students, researchers, secondary schools and community in the project's area. The project components will cover; -Botany laboratory, Zoology Laboratory, Food science laboratory and Preparation rooms and technical offices for each laboratory on the ground floor. The building also will have 38 total parking bays for the users and visitors. Other associated facilities to support the project are retaining wall, concrete paving blocks,

security guard post, changing room, water storage tank with a pumping system, toilets, solid waste collection area, waste water drainage system, fire system and utilities network. The proposed project will have an investment cost of TZS. 1,298,736,400.00 which is equivalent to USD. 520,000.00 to cover all project components.



Figure 1.1. Map of Kigoma-Ujiji Municipality showing the project ward
 Source: TRES Consult (T) Limited, 2023

1.2 PROJECT RATIONALE

The OUT due to lack of science laboratories, it has been hiring services for conducting practical sessions at Sokoine University of Agriculture (SUA), University of Dar es Salaam (UDSM) and Saint John's University of Tanzania (SJUT) in Dodoma. This exercise has become so costly to the OUT and at the same time denying its faculty members an opportunity to enhance their practical skills towards their academic career in general. Also, the Tanzania Commission for University (TCU) technical accreditation team, strongly recommended for the establishment of science laboratories during the assessment of the faculty's operations in 2007. The generation of competent professionals who are well prepared to move the country forward in terms of science and technological development relies strongly on good and regular hands-on experience in the course of learning. The setting up of science laboratories will create a much more convenient learning environment for the OUT students; promote training in practical and conceptual skills in different scientific sub-disciplines and at the same time reduce the burden placed to our sister universities in handling the OUT students. Further, the involvement of the OUT academic staff in running practical sessions will enhance their professional skills through in-house exposure to knowledge and as well promote individual involvement in research activities.

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

1.3 OBJECTIVES OF THE HEET PROJECT

1.3.1 HEET Project main objective

According to 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 project is geared towards meeting the following strategic objectives

- i) to increase enrolment in priority disciplines,
- ii) to improve the relevance and quality of programs at universities to meet the conditions and standards of the current and future labour market,
- iii) to strengthen system-level coordination, management, and regulations to ensure quantity, quality and relevance of higher education in Tanzania, and
- iv) to increase the rate and extent of graduate employability through improving the relevance of curricula and create new and demand driven programs.

1.3.2 Specific Objectives for OUT – Mwanza Zonal Laboratory Building project

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

- i) Construction of Science Laboratories buildings and associated facilities;

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

1.4 NEED FOR ESIA STUDY

Location, design, mobilization, installation, operation and decommissioning of the proposed science laboratory and may be associated with various environmental issues at any phase of the development. These impacts need to be addressed so that the proposed project does not unnecessarily cause detrimental social and environmental impacts and also to ensure that they are in line with legal regime operating in Tanzania. The Environmental Management Act, cap 191 and the Environmental Management (EIA and Audit) (Amendment) Regulations, 2018, requires that EIA be undertaken for all new projects that may cause adverse environmental and social impacts. The First Schedule of the Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018, categorize major urban projects including multistorey buildings as type B1 project (borderline project), which may or may not require ESIA study. Also, the World Bank Environmental and Social Frameworks (ESF) and Standards (ESSs) require project developers to carry out an Environmental and Social Impact Assessment (ESIA) prior to project implementation. In view of the above, OUT therefore commissioned TRES Consult (T) Limited of Dar es Salaam (Registered Environmental Consultancy Firm) to carry out the Environmental and Social Impact Assessment (ESIA), for the proposed project.

Thus, the OUT as a first step of the ESIA process prepared EIA application documents. The documents included the project Registration Form, Scoping Report and Terms of Reference (TOR) which were submitted to the National Environment Management Council (NEMC). The scoping report and ToRs were approved by the NEMC through the letter dated 19th December 2023 with Reference Number HG.145/88/29/02 (Appendix 5). The ToR was also approved by World bank and used to provide guidance under which this Environmental Impact Assessments were done. Therefore, 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.

1.5 THE SCOPING STUDY

The scoping study was performed to ensure that relevant key environmental and social-economic issues are identified before the ESIA is conducted to ensure that the ESIA study is focused and covers all critical issues. Scoping study activities consisted of reviewing and compiling all existing secondary information about the project area, mobilising the technical team involved, and the means to be assigned to various tasks. A field visit was conducted first to assess the existing environmental conditions, identify potential environmental and social impacts and mitigation measures, and preliminary identification of interested and affected parties.

Therefore, the objectives of the scoping study for the proposed project were to document key issues that are important for the project and identify and involve key stakeholders in the environmental assessment process. This process allowed the stakeholders to express their views and concerns included in the scoping report. Additionally, scoping enabled the consultants to ascertain key issues that are likely to be important during scoping report preparation and to identify and involve all stakeholders in the

environmental assessment process by expressing their views and concerns. Specifically, the scoping report aimed to identify project alternatives, identify ESIA study boundaries, identify information requirements, develop effective methods of approaching the scoping study, and define the terms of reference for the Environmental Assessment study.

1.6 OBJECTIVES OF THE ESIA

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 proposed Construction of the Two Storey Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipal Council, Kigoma Region, Tanzania and propose mitigation measures to minimize 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 design provides mitigation measures of the adverse impacts and plan the monitoring of potential changes that may arise in the course of implementing the project. The Environmental Management (EIA and Audit) (Amendment) Regulations, 2018 provides the general objectives for carrying ESIA, among others a list comprises the following:

- i) To ensure that environmental considerations are explicitly addressed and incorporated into the development decision-making process;
- ii) To anticipate and avoid, minimize or offset the adverse significant biophysical, social and relevant effects of the 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 optimizes resources use and management opportunities;
- v) To establish and assess impacts that are likely to affect the environment before a decision is made to authorize 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 EMP for the plant operations.
- vii) To enable information exchange, notification and consultations between stakeholders.

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

1.7 APPROACH AND METHODOLOGY OF THE ESIA STUDY

The ESIA study applied different participatory methods to involve all the concerned stakeholders. The methodology used in this study is commensurate with the Environmental Management Act, Cap 191 and the Environment Impact Assessment and Audit (Amendment) Regulations, 2018). The study was undertaken based on checklists complimented by the Consultants' experience and through discussion with OUT staffs, local government officials and communities in the vicinity of the project area. The scoping study was done both as a desktop study and field work. It involved the review of literature/documents including HEET Environmental and Social Management Framework (ESMF) report, HEET Stakeholder Engagement Plan, Kigoma-Ujiji Municipal socio-economic profile, development plans and field studies at the project site to gather information and data on various aspects of the project. The environmental assessment required consultations with many stakeholders, including responsible Ministries, Local Government Authorities, etc. The study adopted the following approach:

1.7.1 ESIA Team

A multi-disciplinary team of experienced scientists and environmental professionals was assembled to carry out the required resource assessment, generation of baseline data, determination of potential impacts and recommendation of mitigation measures. An interactive approach was adopted among the environmental team members and other project professionals. The team utilized the checklist for data gathering, analysis, and presentation. The team members conducted the reconnaissance investigations to determine the critical elements for analysis and the issues highlighted for the design and planning process. Team meetings were held to discuss the progress of investigations and analyses and facilitate data integration toward an understanding of the systems at work in both the natural and built environment. Baseline data for the study area were collected using a combination of:

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

1.7.2 Communication with Stakeholders

Identification of stakeholders

The identification was based on the role and relevance of an organization, group or individual to the proposed project. Some of the stakeholders such as the VPO, NEMC, Ministry of Education, Science and Technology, Ministry of Water (Lake Tanganyika Basin Water Offices), Government Chemist Laboratory Authority (GCLA) Central Zonal office; Occupational Safety and Health Authority (OSHA - Central Zonal office), the Open University of Tanzania (OUT), Kigoma Regional Secretariat Office, Kigoma -Ujiji District Commissioner office, Fire Rescue-Kigoma Ujiji office; Kigoma -Ujiji Municipal Executive Director Office, Ward Development Committees – (Ward Councillor, WEO, Ward Environment Committee); Mtaa Council (Chairman/ MEO, Environment Committee) were pre-determined based on the nature of the project, while others and affected groups at the proposed project site and area of influence unfolded as consultations went along. List of stakeholders is found in appendix 3 of this document.

Involvement of stakeholders

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

Identification of stakeholders' concerns

The stakeholders pointed out several issues and concerns. An individual or a group of people who raised an issue was cross-checked by discussing it with other groups. Key issues raised by each stakeholder group were summarized and further analysed in this report. For details of stakeholders consulted, the record of main issues raised, names and signatures of people consulted, records of meetings, communications and comments from key stakeholders, see Chapter 5 and Appendix 2 and 3.

1.7.3 Physical Environment

Information was gathered on the existing physical environment, particularly geology, topography, soils, drainage, water quality, air quality and noise.

Climate, Geology, Topography and Soils

Information and data on the climate, geology, topography, soils were generated from published geological information as well as assessment of the site through field visits, previous site reports and intrusive site reports done and current public domain reports held within various governmental and non-governmental organizations. Aerial photos, satellite imagery and other published maps were also examined. Field work was carried out to augment and verify existing information relating to geology and soils and obtain first-hand knowledge of topography.

Seismic or tectonics activities

In determining the possible seismic hazard associated with a potentially active fault, the history of recent activity was used as a guide. Although it is known that earthquakes are generally caused by fault movements, the fault systems in the area surrounding the project site were not precisely documented, and therefore it was not possible to identify specific earthquake-generating fault with certainty. Consequently, this ESIA endeavoured to delineate seismic tectonic source areas, i.e., seismic occurrences in Kigoma region and its surrounding regions. The criteria for assessment of the provinces around the site were based on observed seismicity, trends of the faulting and stress patterns within the area (Daudi 2007, Msabi 2016).

Hydrology and drainage

Surface and ground water characteristics were assessed using field investigation, maps and data from previous reports. Field investigation was carried out to determine and verify all the existing inflows into the general area, including both natural and man-made features, assessment of drainage issues, sediments transfer and its impact to the project, interviews with local community members and discussions with stakeholders.

1.7.4 Biological Environment

This study aimed at surveying the site to reveal the existing environmental conditions including determination of habitat types as well as revealing the flora and fauna found in the project area. This study involved literature reviews, Google earth satellite image (GE) analysis, and field observation. The flora and Fauna site information are as follows;

Flora

A simple 'walk through' survey of the terrestrial flora within and around proposed project area was conducted within the established transects. Identification was carried out on dominant vegetation species in sample plots/ transects. Whilst carrying out the transect work every plant species encountered both inside and near to the vegetation plots was identified and included in the species inventory. Plants were identified direct in the field by experts and for those difficult to identify specimens was collected and carried to the consultant office for further verification and/or identification using various taxonomical literatures. The principal habitats present within the site were identified, classified, and described basing on the Field Guide to Common Trees and Shrubs of East Africa (Dharani, 2002).

In addition, attempts were made to include aspects of invading species, and an indication of biodiversity and species hinting important historical information among others. The vegetation species were identified and described for their taxonomical, rarity and whether they are endangered species or not. The identified

list of plants found in the area and plant species of ecological conservation concern is included in the report. Possible impact of the project activities on the flora was identified and their mitigation measures and monitoring plans suggested.

Fauna

The proposed project area was surveyed using methodology outlined in the African Forest Biodiversity (Leon *et al.*, 2002). Interviews with the locals to get information on commonly sighted animals in the area and if there exists any migration corridor was also employed. Apart from few small wild animals, no large mammals observed or identified while walking along transect in representative habitats and through observation of animal signs such as droppings, burrows, footprint, or vocalization.

Small mammals, amphibians and reptiles were studied through sighting, droppings whereas, birds and insects were identified through sighting, droppings, burrows, and visualization while walking along the transects established within the project area. Most importantly, information about the presence of any significant species (i.e., locally observed animals) was obtained from local people in the area. List of fauna organisms found in the area, organisms of ecological conservation concern and mapping of any critical habitats were documented. Moreover, possible impact of the project activities on the organisms were identified and their mitigation measures and monitoring plans suggested. All fauna information is included in this report as baseline data.

1.7.5 Specialized Baseline Assessments

1.7.5.1 Determination of Ambient Dust as Particulate Matter in terms of TSP, PM₁₀ and PM_{2.5}

Dust levels were measured by using Aeroqual series 500 monitor (S-500); an instrument that complies with EMC Directive 89/336/EEC of the European Union. The device has been tested according to the standard delivery schedule and complies with the Emissions Directive Standard EN 50081-1:1992 and EN 50081-2:1993. With a resolution of 0.001 mg/m³ (1µg/m³), the device is simultaneously capable of testing dust particles of different dimensions (microns of 2.5 and 10). Both PM₁₀ and PM_{2.5} were preferred due to their harmful effects on humans. These fine particles tend to reduce visibility and cause air to appear hazy when levels are elevated. When inhaled, these particles penetrate into the lungs and evade the respiratory system's natural defences and lodge deep in the lungs.

During measurement, the testing device was fixed at a breathing height of about 1.5 meters from the ground, which is assumed to be the breathing zone of people at their respective locality or working environment. Dust levels were recorded in terms of PM₁₀ and PM_{2.5} during the morning and afternoon. The diurnal recordings measured at each point were used to calculate the daily average value.

1.7.5.2 Ambient Pollutant Gases

Ambient gas concentrations (i.e., CO₂, CO, NO_x, SO₂, H₂S, O₃ and VOC) were measured using "Aeroqual series 500 monitor (S-500)" at the stations. Different sensor heads were used depending on the type of gas that was measured at a particular time. The ambient gases were measured in accordance with the manufacturer's procedure that meets ISO 9001:2008 protocol. The device was elevated at a height of 1.5 meters above the ground; once the device is switched ON, it performs an automatic calibration for three minutes by pumping in fresh air into the sensors so as set the toxic sensors to zero. Ambient pollutant gases were measured during the morning, afternoon, evening and night hours.

1.7.5.3 Noise, Temperature, Humidity and Vibrations quantification

Ambient noise, vibrations and meteorological conditions (temperature, relative humidity and wind speed) were measured according to ISO Code of Practice 1996 and equipment-manufacturer's procedures. The investigation's purpose was to estimate their potential impacts on any potential sensitive onsite and offsite receptors.

Noise Levels

Noise data were recorded at site and at each point, daytime (L_{day}) and night-time (L_{night}) noise levels were measured in accordance with ISO 1996 -1:2003 using a digital sound level meter. On taking measurements, the meter was set to the "A" weighed measurement scale, which enables the meter to respond in the same manner as the human ear. The "A" scale is applicable for workplace compliance testing, environmental measurement, and workplace design and law enforcement. The meter was held approximately 1.5 m above the floor and at least 3 meters away from hard reflecting surfaces such as walls. Periodic measurements were taken to grasp the mean diurnal (morning, afternoon, evening and night hours) noise values for each point. The averaged L_{day} and L_{night} values were calculated and compared with local standards and international guidelines.

Vibrations

Ground vibrations were monitored using a vibrometer data logger, which is designed to measure ground vibrations according to European standard EN 14253:2003. The meter has an accuracy of $\pm 5\%$, acceleration of 200 m/S², a wide frequency ranges of 10 Hz to 1 kHz for capturing almost all possible ground vibrations. On taking measurements, the accelerometer transducer was mounted on the ground to record both ambient and peak vibrations. To produce accurate results, the transducer was secured in direct contact with the ground. The levels of vibrations were recorded in terms of Peak Particle Velocity (PPV) in millimetres per second.

Meteorological conditions (Temperature, Wind speed and humidity)

Thermal (temperature), wind speed and relative humidity were measured in areas using Digital Environmental Quality Meter with thermocouple, anemometer and hygrometer sensors. Averaged values of measured meteorological conditions were recorded and present for future monitoring comparison.

1.7.6 Socio-economic Environment

To determine the cultural and social factors associated with the construction and operation of the proposed project, members of the communities in the general vicinity of the project were interviewed and a review of economic and social literature was conducted. Further, rapid field appraisal techniques in conjunction with desk research were employed to investigations of the socio-economic considerations within the project area. These were undertaken to ascertain information to satisfy the following factors as outlined in the approved terms of reference provided:

- i) Land uses and livelihoods
- ii) Community structure, employment and income
- iii) Developments underway
- iv) Infrastructure in place
- v) Water supply and other utilities
- vi) Waste management practices
- vii) Recreational activities
- viii) Energy supply
- ix) Public health and safety

- x) Access to and delivery of health, education and social services

1.7.7 Policy, Legal and Institutional Arrangement

Policy, legal and institutional arrangement were compiled from review of documents: policies, legislation, guidelines and standards. Information and data on local by-laws, institutional structures and mandates/authority were obtained from local government Council (Kigoma-Ujiji Municipal Council) and relevant committees.

1.8 IMPACT IDENTIFICATION AND EVALUATION

The methodology used considered all potential impacts using a standard Leopold matrix (Leopold et al., 1971), which is the best-known matrix methodology available for predicting the impact of a project on the environment (see section 6.1). The matrix takes into account impacts on the physical environment (e.g., air quality, soil and ground water quality), the ecology (e.g., flora and fauna) and on human socio-economic settings, as shown in table 6.1 above. Environmental, health, safety risk (and other risks) is a measure of the potential threats considering the likelihood that events will cause or lead to damage or degradation and the potential severity of that damage or degradation. The Consultant used the general criteria listed below to evaluate the significance of the identified impacts.

- i) Magnitude and likelihood of impact to occur
- ii) Spatial and temporal extent
- iii) Potential to implement mitigation measures and controls
- iv) Likelihood and degree/timescale of environmental recovery
- v) Value of the affected environment/social component
- vi) Level of public concerns
- vii) Political repercussions of the project

The scale of negative and positive impacts that are likely to occur were determined using a range of low, medium and high, as follows:

- L+ = Low positive
- M+ = Medium/moderate positive
- H+ = High positive
- L- = Low negative
- M- = Medium/moderate negative
- H- = High negative
- 0 = No apparent impact

The grades for compliance and ecosystem have also been combined, arrive at an overall grade for the aspect's environmental significance, favouring the higher of the two grades. The resulting terms for the overall assessment for each environmental aspect were defined thus:

- a) **High** – Risk/impact not acceptable (if any criteria is awarded a (H) high grade);
- b) **Medium** – Risk/impact acceptable if managed (if the criteria have grades combining (M&L) medium and low); and
- c) **Low** - Risk/impact acceptable (if all criteria are (L) low, and there will be no further comment)

The assessment also considers the contribution to local and national environmental and socio-economic issues and global environmental issues.

1.9 REPORT STRUCTURE

The report is presented according to the format given in Section 18 (1 and 2) of the Environment Impact Assessment and Audit (Amendment) Regulations, 2018. It is presented as follows:

Executive Summary

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Acknowledgement

List of Acronyms

Introduction

- i) Project background and description
- ii) Policy, administrative and legal framework
- iii) Baseline/ Existing conditions
- iv) Stakeholders Analysis
- v) Assessment of Impacts and Identification of Alternatives
- vi) Environmental Mitigation Measures
- vii) Environmental and Social Management Plan
- viii) Environmental and Social Monitoring Plan
- ix) Resource Evaluation / Cost-Benefit Analysis
- x) Decommissioning and Closure
- xi) Summary and Conclusions
- xii) References
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2 PROJECT DESCRIPTION

2.1 PROJECT GEOGRAPHICAL LOCATION

The site is within Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipality, Kigoma Region, Tanzania (figure 2.1). The Kigoma-Ujiji Municipality is the headquarters and commercial centre for Kigoma Region and it is located at the North shores of the second deepest Lake in the world, Lake Tanganyika. It is also the western terminal of Central Railway line from Dar es Salaam about 1200 km. On the West the area borders the DRC, to the south, east and north borders Kigoma District. The specific coordinates of the site are 04°55'27.1" South and 29°41'08.73" East. It is well suited for development as it is relatively flat and dry. The environmental and socio-economic influence of the project is anticipated to extend beyond the scope of the project area. The area of influence is a wider area than the project area.

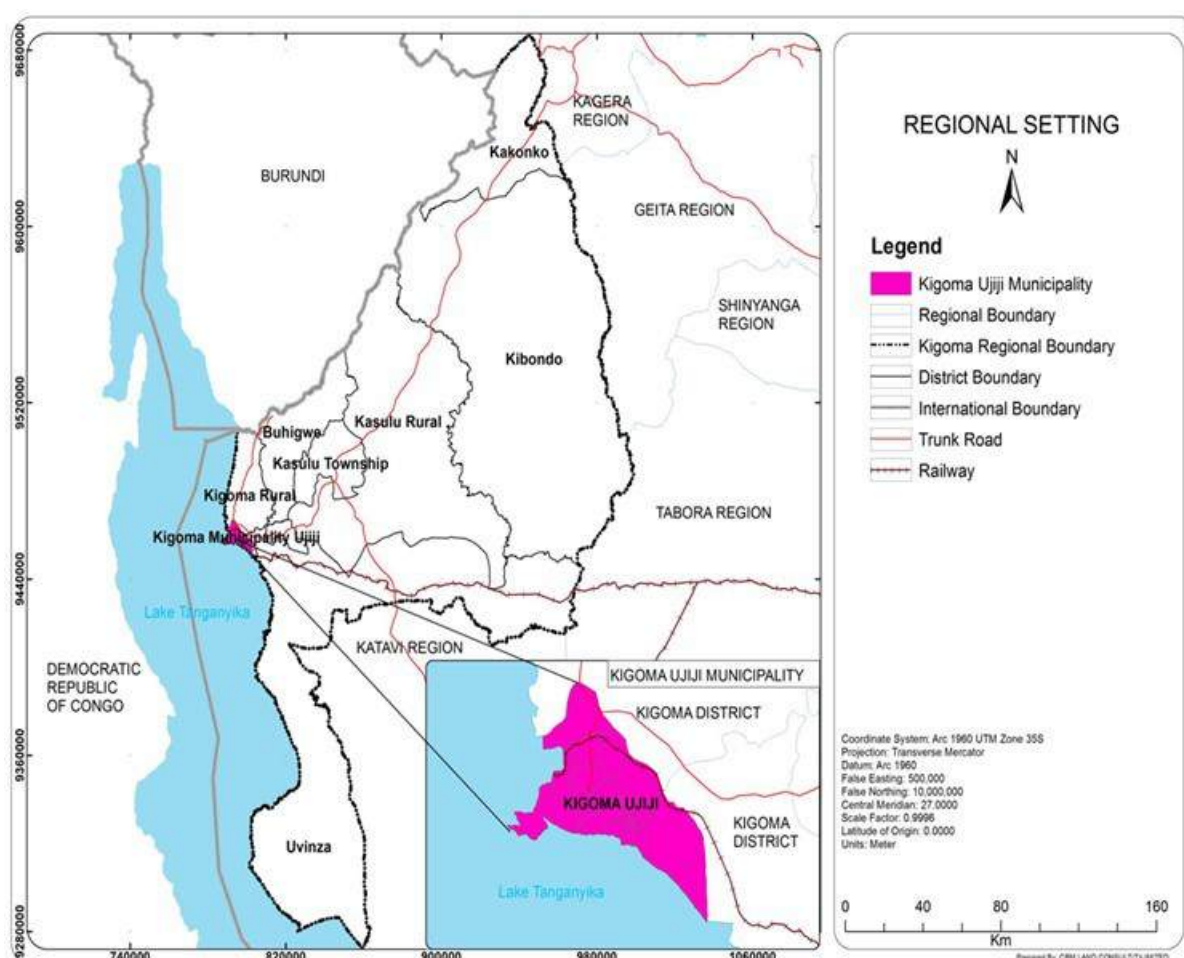


Figure 2.1. Map of Kigoma Region showing location of the Kigoma UJJI Municipality

Source: TRES Consult (T) Limited, 2023

2.2 ACCESSIBILITY

The project area is accessed by an earth road which branches off from Lumumba tarmacked road which connects to the CBD of Kigoma. The Kigoma CBD can be reached from outside by three trunk roads traversing the region namely Mwandiga - Mwanoyovu to Burundi border; Kanyani (Kasulu) - Katavi region border; and Kigoma - Kasulu - Kibondo – Nyakanazi to Kahama. Other routes include Tabora – Urambo–

Uvinza – Kigoma road; Tabora - Kigoma branch of the central railway line; over Lake Tanganyika from Katavi, Mbeya, Burundi, Zambia, and Congo or by air. The project site is about 1,250 km distance from Dar es Salaam by rail and 1,080 km by air.

2.3 SITE DESCRIPTION

The proposed project will be situated within the larger part of the OUT plot located at the Busomero Mtaa. At the project site there is one building which is used as Regional center staff office, examination hall and other teaching facilities. As such some teaching activities are currently being carried out on site. Partly clearance of the project site was done in the course of construction of the existing building and agricultural practised on site. Part of the general area had already been cleared up and currently there are only sprouting grasses and shrubs grown due to seasonal rains. The site was also levelled and thus the current terrain is almost flat however the nearby areas show the general overland flow towards the west side.

The nearby water body is the Lake Tanganyika which is located about 550 meters from the actual proposed project site. However, the larger part of the OUT plot bound the Lake Tanganyika on the Western side. The soils of the project area are typical of the Lake Tanganyika shore areas. Soils are predominantly deep and well drained comprising the reddish to yellowish fine sandy loams, and sandy loams partly stony and severely eroded. The soil in the area could generally well be expressed as deep to moderately deep, well drained loams which is suitable for proposed project. Based on the state of the site during assessment and at the present there is no pristine environment that can promote thriving and existence of the species of conservation concern as per IUCN and CITES standards. Further, there were no cultural or archaeological objects that were reported and likewise during assessment none of the objects were observed or found at site.

2.4 ADJACENT FEATURES

The immediate operations within the area are: public access roads on the eastern side, undeveloped land on the southern and western side. On the north there is OUT existing building. The residential houses are located about 60 metres on the eastern side, Kasingiliga Secondary school is located about 150 meters while Lake Tanganyika is located about 550 meters from the actual project site.

2.5 LAND ACQUISITION AND OWNERSHIP

The proposed project site situated at Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward in Kigoma/Ujiji Municipality with a total land size of 178,727 square meters is owned by the Open University of Tanzania of P.O. Box 23409, Dar es Salaam. The project plot is registered as plot number 17, block 'A' and is covered under Land Office number 497631, survey plan number 78881 with Certificate of occupancy no. 7073 registered on 07th June 2018. The title specifies that the land and building to be erected thereon shall be used for educational building purposes only, use group "K" use classes (b) as define in the Urban Planning (use Groups and Use Classes) Regulations, 2018 which is compatible with the intended project in the area.

2.6 PROJECT COMPONENTS AND DESCRIPTION

2.6.1 Project components

The project components will cover the Botany laboratory, Zoology Laboratory, Food science laboratory and Preparation rooms and technician offices for each laboratory on the ground floor. The first floor will comprise the ICT Multimedia state of the art laboratory, DRC and staff offices, Min library and Modern conference facilities. The building also will have 38 total parking bays for the users and visitors. Other associated facilities to support the project are retaining wall, concrete paving blocks, security guard post, changing room, water storage tank with a pumping system, toilets, solid waste collection area, waste water drainage system, fire system and utilities network.

The building shall be built to the highest acceptable standards using the best available environmentally friendly materials and offering a comfortable and high-quality laboratory and teaching space. The project site is already connected to TANESCO power supply and thus upgrading of the same shall be considered for the project. There is existing public water supply pipeline at the project site that shall be considered for connection. Currently, there is no centralised sewer system within the project site as such the septic tank and soak away system will be used. The solid waste will be collected in waste bins from the laboratory and thereafter to the centralized transfer station (waste collection area) from where Authorized agent will be collecting the wastes to the to the designated Municipal Council's dumping site.

2.6.2 Project designs/concept

The OUT, through its consultants, has already developed the project designs/concept. The design and shape of the building has taken into consideration the maximum and minimum widths of typical laboratory and office spaces. Shared common rooms will be provided on each floor to facilitate efficient use of shared or infrequently used equipment. The design of the building would also allow for inline, continuous expansion of Laboratory, Laboratory Office Space. Provisions for parking, sidewalk access, roadway access as well as green area allocation were carefully considered in the design. The parking area for the proposed project is proposed to be in front of the building, on the eastern side facing the main road, with direct access from the site to the main road. The main entrance of the building is proposed to be on the eastern side of the building.

The delivery and service access of the proposed building is recommended to be on the same eastern side of the building. Design of these facilities have based in part on the types of work that will occur in each Laboratory and the inherent risks associated with that work. The design of the laboratories has followed the principles of biosafety and biosecurity. Biosafety is ensured by introducing various design criteria of laboratory control and containment, through laboratory design and access restrictions, use of containment equipment, and safe methods of managing infectious materials in a laboratory setting. On the other hand, in order to ensure biosecurity, the project envisaged development of strict procedures for 'securing' or limiting access to the facilities, research materials and information during operational phases.

2.6.3 Design requirement of the proposed Laboratory and operation Specifications

The proposed laboratory building to be built will be designed and operated in accordance with guidance for laboratories established by reputable international organizations. The laboratory will be tested for verification that the design and operational parameters have been met prior to operation. Annual verification of laboratory is recommended.

2.6.4 Proposed materials

The proposed project is expected to use several materials and resources to successfully achieve its intended objectives. Each phase of the proposed project will require different types and quantities of materials and resources. At this stage, the quantities and sources are unknown. The proposed laboratory building will be constructed using concrete footing and stem walls with simple reinforced concrete framed structure consisting of the cast in place columns, beams and floors, giving extensive use of natural daylight and ventilation. The panels between concrete frames are of non-load bearing masonry block wall/glass infill. The external façade is finished with double glazed curtain walling and due to the nature of the project, modern techniques are adopted to overcome all building aspects.

The laboratory floors will be impermeable to liquids, monolithic/seamless, or have welded seams. Floors will be easily cleaned, with chemical-resistant flooring (vinyl, or epoxy with fiberglass reinforcement) with a slip-resistant, smooth, hard finish. The walls of the lab will be durable, washable and resistant to detergents/disinfectants (masonry, gypsum board, fiberglass-reinforced plastic, etc.). Walls will also be painted with durable glossy acrylic or epoxy paint. For epoxy paint, if silicone sealants are used for penetrations, the silicone must be applied after the epoxy has been installed. Wall/ceiling penetrations will be kept to a minimum and sealed with non-rigid, non-shrinking silicone or latex sealant. For fire rated walls, sealant will be applied before stopping. The ceiling of the laboratory will be washable and resistant to detergents/disinfectants. Ceiling has to be painted with durable epoxy paint. The ceiling must be of monolithic construction (i.e., gypsum board, not removable tiles). The ceiling must be high enough to allow a canopy/thimble connection or the opening of canopy/thimble door(s). Ceiling height would be at least 10 feet to allow 14 inches of clearance. All penetrations in floors, walls and ceiling surfaces would be sealed, or capable of being sealed to facilitate disinfection, to aid in maintaining appropriate ventilation system air pressures and to keep pests out.

Laboratory doors to be installed for this project would be self-closing and lockable. Doors need to be open inward slide open. Door between room and corridor will have door sweep for pest control. Door openings shall be sized to allow the passage of large equipment. Wall-door frame connection will be made airtight at time of frame installation. Doors and frames will be of solid finish construction, with the required fire ratings and include panic-hardware, hardware appropriate for high-use and kick plates. Doors will be coated metal which is chemical resistant. Methods for restricting access to only those individuals with demonstrated need, proper clearance, and training will be in place. Notices will be posted outside the first door to notify potential entrants of the hazards contained within and measures they must take to protect themselves. Windows (safety glass) will be installed so that the interior of the room, except change rooms and restrooms, is visible. Windows must not allow viewing from public areas. Interior sills will be sloped away from windows for ease of cleaning or to minimize dust collection.

2.6.6 Eyewash/safety shower

An emergency eyewash will be in each laboratory room. A combination emergency eyewash/safety shower unit must be in near proximity to places if personnel are exposed to splash hazards (determined during programming). Emergency eyewash and emergency eyewash/safety shower units will be sited and installed.

2.6.7 Plumbing

All pipes into the laboratories will be secured to prevent movement. Fixtures will be resistant to corrosion of bleach and other disinfectants. Back-flow prevention devices will be installed on all faucets. All pipes

will be identified by using labels and tags. Water supply control will be located outside the containment area.

2.6.8 Sinks

Hand washing sinks in the laboratory will be available in each room near exits. Sinks will be hands-free. Infrared sensors are preferable but may not be suitable for all laboratories. In cases where infrared sensors cannot be used, knee-operated sinks are preferable to foot-operated. Each sink will have chemical-resistant traps (for disinfectants), a coved backsplash, a hot-cold water and pre-mixing faucet. Hand washing sink will be accompanied by a paper-towel dispenser and a hands-free soap dispenser mounted within easy reach.

2.6.9 Laboratory furniture and casework

Furniture and casework in the lab will be sturdy and capable of supporting anticipated loading and uses. In addition, they will be spaced so that areas around and under benches, cabinets and equipment are accessible for cleaning. Benchtops will be impervious to water and resistant to acids, alkalis, organic solvents and moderate heat. For future flexibility, modular mobile casework will be used. Ergonomic considerations will be made while designing laboratory furniture and casework (e.g., adjustable work-surface heights, selection of biological safety cabinets, adequate knee clearances for seated work, adequate toe clearances for standing work, wall cabinet heights, etc.). Fixed casework, if used, will be sealed/caulked to the walls on installation to facilitate cleaning and prevent harbourage for vermin. If fixed casework is used, it would be installed before the coved flooring so that the coving can extend up toe-kicks. For storage, closed cabinets will be used rather than open shelving. Chairs and other furniture would be covered with a non-fabric material that can be easily decontaminated. To facilitate cleaning, cabinets/shelves would be made to have angled tops or be built up to the ceiling.

Activities within the laboratory could involve concurrent use of chemical solvents such as phenol and ethanol as well as corrosives or other reactive chemicals. The laboratory bench or work surface must be resistant to the chemical actions of these substances as well as disinfectants used to inactivate the organisms under study. Wooden or other porous or combustible bench tops are not appropriate because even finished wooden surface can absorb liquids or ignite in the event of a fire. Fibre glass is inappropriate since it can degrade in the presence of some chemicals; it also produces toxic smoke if burned. Laboratory furniture will not be absorbent so that it may be decontaminated effectively. Space must be left between furniture to allow for cleaning and maintenance of devices as required (i.e., biosafety cabinets).

2.7 PROJECT ACTIVITIES

The development phase will involve various phases; design, mobilisation, construction, operation, and decommission, though not shortly. As part of the engineering design work, a detailed programme for the development will be determined.

2.7.1 Mobilization phase

The mobilization phase will mainly involve deploying the required tools and machinery for the work and recruitment of the construction crew. Also, the phase will involve the deployment of construction materials and their transportation from the point sources to the site. Construction materials will include steel poles and concretizing materials (cement, bricks, etc.), stones, sand for associated buildings. About 50-100 construction workers will be required for the project; however, these workers might be required at a

different stage of project development depending on their area of specialization/work. A Contractor will be responsible for this phase with supervision from the proponent management.

2.7.2 Source of materials and construction

Stakeholders mentioned that most of the construction materials such as gravel and sand at the project area are obtained from Kigoma-Ujiji Municipality particularly at Mungonya and Mwandiga. The existence of a quarry in Kigoma-Ujiji Municipality makes it convenient for the project to get gravel and sand, further increasing economic activity in the area. Standard construction techniques will be adopted for building, car parks, roads and pavements, lighting and utility services. The actual construction phase will involve excavating the foundations and trenches, erection of structures and drainage, and minor landscaping. Trenches will be for laying water pipes and electric cables to re-establish the utility network within the project site. Excavators and other construction trucks will be used to clear the area, transporting raw materials from source and disposal of overburden. A contracted construction company will carry out construction and laboratory installation activities at the site. Construction materials such as sand, stone, aggregates, pavement, cement, sanitary ware and steel will be procured locally. The contractor will be responsible for transporting all construction materials and equipment from the point source to the site.

2.7.2.1 Access and transport

Likely, the majority of material and equipment necessary for the construction works will be delivered to at the project site by road. A contractor will develop a construction transport management plan to minimize the number of vehicle movements (e.g., ensuring that inward and outward movements are being utilized for transporting materials/waste, agree to routings for construction traffic, and hours of activity. Standard best practice agreed in advance with the relevant road authority will be adopted to manage potential effects on the entrance to the project site for non-construction traffic. It is unlikely that construction traffic will access the area in front of the current existing OUT building.

2.7.2.2 Construction facilities

The proposal is to construct temporary buildings on-site as a construction office and a sample materials store. Also, washrooms and toilets will be provided on-site for usage by visitors and workers during the construction phase. Safe water from the current source at the project site will be used for hygienic purposes.

2.7.2.3 Material storage and handling

The store for non-hazardous materials will be accommodated within the site office. Materials to be stored in this store shall include samples for review by consultants. Hazardous materials shall include paints, solvents, oil, grease, and vehicle fuel etc. The store for these materials shall be a waterproof concrete floor to contain spills. All hazardous chemicals shall be stored and handled based on the manufacturer's instructions. The bulk materials stored on-site include sand, ballast, stones, cement, quarry chips and timber. The contractor intends to have materials delivered in small quantities to avoid any form of deposit that will impede site activities, induce safety hazards, and create a nuisance to the neighbourhood. A special store will be allocated for storing cement. Since it is readily available in the Municipality, a reasonable quantity will be delivered to the site as appropriate. Timber will be used mainly for roofing, formwork, ceiling, joinery and other carpentry needs, will be used for all formworks. All joinery works will be fixed at the workshop outside the site before being delivered ready for application. Consideration will be given to the working area and material storage requirements to ensure no conflict with the workers' movement.

2.7.2.4 Construction Activities

The construction activities will be done within the fenced site and this will help control access to the site for security and safety purposes. The fence will also reduce the amount of dust and other solid wastes that can get into and out of the site, especially if the climate becomes windy. Site clearance and excavations will be carried out using earth-moving equipment. The project site is generally flat and greenfield. It is not envisaged that significant site preparation will be required to commence work. The excavated material will be removed from the site and dumped at the approved dumpsite. The rest of the excavated material will be used for landscaping.

Backfilling of the excavated area will be carried out using marram and quarry chips compacted in layers to achieve firm bases for the buildings, driveways, and parking. Mixing of concrete using diesel driven concrete mixers will be carried out at the site. The process will generate noise, smoke and dust, especially from the cement. The main contractor will provide workers with appropriate personal protective equipment and sensitize them on their usage and management of air pollution from construction machinery. Local contractors and planners will work based on the recommended designs given by the OUT.

2.7.2.5 Construction contractor qualification

Finding and hiring the right construction agency for the construction of laboratory is the key step for the success of the project. The construction Contractor with satisfactory qualification and expertise helps in making the laboratory functional and achieve standards of biosafety practices for safer working environments. The following essential qualification criteria will be considered when hiring a construction agency for the proposed laboratory: (i) the minimum average annual turnover during the last three financial years (as per their audited balance sheets) must be adequate to make sure that agency would be able to complete the project. (ii) successful and timely completion of at least one similar project (construction, testing, commissioning and validation of laboratory) including civil, electrical, HVAC works, door interlocks, access control system, primary barrier containment equipment, decontamination system, etc. Additionally, the ability of construction agency for designing and planning, correct evaluation of architectural layout plans, men and material movement plans, zoning plans, specialized systems and services schemes, services and utilities schemes, laboratory commissioning and validation protocols, laboratory security protocols and integration of laboratory and equipment will be assessed.

2.8 OPERATION OF THE PROJECT

2.8.1 Commissioning of the laboratory

The building will be used mainly for academic purposes for teaching students through practicals in the noted laboratories. In this case chemicals will be used occasional especially in the chemistry laboratory; organic matter involving both flora and fauna will be used in the life sciences laboratories. Typical office works will be involved as there will be staff offices and conference rooms as well as library. Conducting meetings and seminars in the conference room. Commissioning of the laboratory would be performed by the Project Implementation Unit (PIU) of the Open University of Tanzania. The PIU will furnish checklists for the laboratory features to be evaluated, depending on the design. Initially, the laboratory needs to pass a series of inspections and tests to meet standards that have been pre-developed, authorized, and specified in the design and construction documents before hazardous agents are used.

These are in addition to the desired outcomes by the commissioning team identified prior to initiation of construction activities. A properly designed and constructed containment facility, including its structural and mechanical safety systems, must meet predetermined performance criteria and be operational upon

completion of construction. The integrity of the critical components of the project will be verified by the testing and certification requirements. Certification of the laboratory, including structural components and safety systems, will be included as part of the overall commissioning processes normally undertaken to verify that the design and construction meet applicable standards, and that the project can operate in accordance with the design intent. Commissioning testing will also be performed without degradation to the project or mechanical system that is being tested. All equipment and materials would be tested/evaluated prior to installation; duplicate testing is recommended.

2.8.2 Power supply

Currently the power supply at the project site is from TANESCO through an overhead 33kV transmission line running along the access road. The proposed project will apply for connection to the existing TANESCO line. A new transformer shall be installed for the proposed project. This will step down the incoming power to the project MV reticulation. All medium voltage switchgears shall be designed for a fault level of 50 kA and the circuit breakers will each have earthing switches. Circuit breakers will be located outside the building and will be labelled. In the laboratory an emergency power will be provided for Heating, Ventilation, and Air Conditioning system (HVAC, alarms, emergency lighting, and storage freezers incubators. The project plans to install standby continuously rated generators to fortify power interruptions that may arise during operations. The lighting systems will be low voltage with general light and spotlight fittings built in the ceiling. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

2.8.3 Water Supply System

The project operation will require water for laboratory process, workers use, cleaning and sanitation as well as for emergency specifically for fire-fighting in case the facility catches fire. The project site is already connected to the Kigoma Urban Water Supply and Sanitation Authority (KUWASA). Water supply will be connected from the existing 200mm diameter cast iron pipe. The OUT will design the distribution system of water within the project area. The OUT will install a water storage tanks. Water storage tanks will be covered and frequently inspected to ensure that there has been no contamination and are regularly cleaned.

2.8.4 Solid and liquid and solid waste management

2.8.4.1 Hazardous and non-hazardous solid waste

The proposed project will generate different types of solid waste including electronic wastes like printer cartridges/ribbons, un-functional electronic equipment (computer, printer, bulb, Air Condition, Television), papers, packaging materials, plastics, organic (vegetables and food wastes) from users, visitors, etc. The OUT management will provide a double-lined waste and recycling receptacles at each strategic point. Proper segregation of waste at source generation (at each laboratory section/department) will be done for efficiency and effective in managing waste. Segregation will involve putting different classes of wastes into separate and appropriate temporary storage color-coded containers/bags. Color coding is one of the efficient ways of achieving segregation of waste and for sorting out items such as paper, plastic, glass and metal for recycling. The waste generated from proposed laboratory building will be segregated and color-coded as outlined below in Table 2.1 as recommended by WHO.

Table 2.1: Laboratory waste collection and segregation methods

Waste categories	Colour of container and markings	Type of container	Collection frequency
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Infectious waste	Yellow with biohazard symbol (highly infectious waste would be additionally marked HIGHLY INFECTIOUS).	Leak-proof strong plastic bag placed in a container (bags for highly infectious waste would be capable of being autoclaved).	When three-quarters filled or at least once a day.
Sharps waste	Yellow, marked SHARPS with biohazard symbol.	Puncture-proof container.	When filled to the line or three-quarters filled.
Pathological waste	Yellow with biohazard symbol.	Leak-proof strong plastic bag placed in a container.	When three-quarters filled or at least once a day.
Chemical waste	Brown, labelled with appropriate hazard symbol	Plastic bag or rigid container.	On demand.
Non- hazardous Waste	Black	Plastic bag inside a container or container which is disinfected after use.	When three-quarters filled or at least once a day.

The OUT will designate waste collection from all project components for subsequent delivery to the designated municipal dumpsite (at Msimba area) which is located about 7 km from the urban core. The OUT will use a centralized waste management system whereby it will hire one waste management company to collect all wastes within the project area and will be responsible for transporting them to the Msimba dumpsite. Table 2.2 indicates which types of waste may be disposed of and indicated the manner in which they will be deposited.

Table 2.2: Waste type and disposal options

SN	Waste type	Special Specifications			Disposal options
		Burial	Burning	Approved dump	
1	Inert Construction	Waste / rubble	N/A	Allowed	Re-used to backfill the local quarries and borrow-pits
2	Paper	Allowed	Allowed	Allowed	Incineration at OUT incinerator
3	Cloth	Allowed	Allowed	Allowed	Incineration at OUT incinerator
4	Wood	Allowed	Allowed	Allowed	Incineration at OUT incinerator
5	Scrapers and other metal wastes	Not feasible	Not feasible	Allowed	Sold/provided to NEMC scrap metal dealers for recycling or reused to the extent practicable
6	Plastics	Prohibited	Prohibited	Not feasible	Send waste to recycling plant
7	Organic (vegetables & food wastes)	Allowed	Not feasible	Allowed	Shall be collected and dumped at the Dumpsite
8	Used motor Oil	Prohibited	Prohibited	Not feasible	Collected in drums and stored on dedicated site with a roof and an impenetrable floor. Later the oil will be collected by the authorised NEMC certified oil collector.
9	Used oil filters	Prohibited	Prohibited	Not feasible	Accumulated in the drums at site waiting for certified agents to collect.
10	Electronic wastes and un-functional electronic equipment	Prohibited	Prohibited	Prohibited	Will be collected at the site and when there after will be handed over to the certified government E-waste collectors for final disposal/re-use
11	Batteries	Prohibited	Prohibited	Prohibited	Collected and sent to Dar es Salaam for recycling companies e.g., YUASA
12	Empty chemical containers	Prohibited	Prohibited	Prohibited	collected and stored on the controlled store. Disposal will be handled by hazardous waste handler registered by NEMC

The designated Safety and Waste Management (SWM) staff will be responsible for managing the records of laboratory waste inventory, characterization of waste, assisting with the waste determination and proper separation at source, receiving hazardous wastes from laboratories that will be identified with proper labelling to store at Hazardous Waste Storage Room. All researchers and students who will generate chemical/biological waste will follow the guidelines in the Laboratory Waste Management Plan. They will be responsible for ensure the appropriate handling of waste containers, proper labelling and safe delivery to SWM-staff at a scheduled date.

2.8.4.2 Wastewater

Currently OUT is managing liquid waste with the use of onsite waste treatment system. The treatment system is composed of septic tank//manhole that collectively receives waste from the existing building. Once the waste is submerged in the holding tank, the waste is then flows into consecutives of double chambered septic tank and sock away pits. The septic tank allows the waste to rest in the first chamber and so that the sludge precipitates. Once the sludge is retained, the effluent further enters into sock away pits. This sock away pits are packed with different porous sized gravels, cobbles and sands of different mesh size. Wastewater from auxiliary systems (sanitary water) to be generated by the proposed project also will be treated on new constructed septic tank and soak away pits. The septic tanks will be emptied regularly by Municipal Council Septic tank emptier tankers for final disposal. The amount of wastewater generated from washing and auxiliary at the site is estimated at 1 – 1.5m³ (1000-1500litres) per day when the students are on site using the laboratory.

2.8.4.3 Effluents from the laboratory

Every laboratory trial generates some type of waste materials, depending on the experiments performed in laboratory. Some effluents contain filtering (paper filter, filtration aids), oils and grease, and some contain toxic materials, hazardous chemicals and organic solvents. The effluents generated in these laboratories (Physics, Chemistry and Biology) are characterized by extremely low pH, high COD, heavy metals and sulphate. With the initial uses of about 100 liters per day on the laboratory the anticipated effluents will be in the region of 40 to 50 litres per day. Use of a public sewer line is one of the options considered for treating and disposing effluents generated from the proposed project. However, this alternative is not possible currently because there is no municipal main or trunk sewer within the project area to which an OUT-sewer system could be connected. The proposed project will develop its own septic tank at the project site to dispose its own effluents. Septic tanks will be constructed according to international standard and will be monitored to avoid ground water pollution.

Wastewater collected from the laboratories will flows to a network of collection pipes and from there will be transferred to the constructed wastewater treatment/containment tank (Septic tank) of approximately 5,000 liters. The tank will have two compartments. First compartment will be settling compartment which will again collect finer solids. The settling compartment will be used as chemical treatment compartment mainly neutralization. The Technical Specifications of the chambers are as follows height: 68.125" (170cm); width: 49.25" (123cm) and length: 125" (312cm).

2.8.4.4 Storm water drainage system

The project site drainage system will consist of a storm water channel to drain the storm towards the nearby Municipal drainage system along the access road. The system will be adequate to convey all rain water from the project site.

2.8.5 Health and Safety

Full safety and equipment standards will be applied to the proposed project. To ensure that everybody works in a safe manner in a safe environment, the workers/students will be provided with protective gears. Also, personnel's will be trained in the safe use of equipment and in safe working techniques. Laboratory-safe refrigerators or metal flammable cabinets will be used to store flammable/combustible materials. The laboratory will be periodically monitored to assess its safety. The OUT will install near the exit door of each laboratory room, fire extinguishers such as CO₂, foams and fire horses.

The OUT will install first aid facility and annual first aid training will be provided to all first aiders. First aid kits always will be available at working site / in the vicinity. There will be enough kits in order to provide

optimal help in case of an emergency. Further, an alarm will be provided for fire hazard and intrusion detection systems. Alarms will be audible above ambient noise and visible throughout the project area. Alarms will be on UPS power.

2.8.6 Security

Security measures in place at the project site will include long concrete wall/fence, security lights, and 24-hour security guards. Controlled access points to the laboratory and offices will be established and manned. The laboratory access controls will be provided to record entry and exit times and dates. Attention shall be paid in the design and layout to safe and easy maintenance, as well as emergency escape and fire protection. It is envisaged that actual security will be contracted out. As part of the security contract, a suitable office for the security supervisor and basic equipment will be included in the civil scope. All vehicles that enter the premises through the access points are recorded (reason for visit, time and contact details). Records are filed and used for quality control.

2.8.7 Staffs

The proposed project will have both professional and auxiliary staffs that are required for the continuous and proper operation of the laboratory. It is estimated that the project will create additional permanent employment of about 5 to 6 people during operation and will create about 50 to 100 employment opportunities during construction. The OUT will recruit its staff based on their qualification and experience without consideration of their gender, race, ethnicity, age, religion, pregnancy, marital status, HIV status or sexual orientation as long as they demonstrate that they are capable of doing the job. This commitment will extend to other employment decisions such as promotion, training, compensation, discipline and discharge; and to terms, benefits, privileges and conditions of employment. The OUT actively seek to recruit qualified staff from the local community in order to pass on income and skills development benefits to them.

2.8.8 Project management and supervision

During construction, OUT through the Project implementation Unit (PIU)) and the consultants, will supervise and monitor the implementation of the project construction activities. The management of all project activities during operation is under the PIU, in collaboration with other departments and units depending on the nature of the activity. In general, the PIU falls under the management of the OUT executing day-to-day activities in the project. The PIU is guided by management meetings that are chaired by the Deputy Vice Chancellor. The management meetings provide support, guidance and oversight of the progress of the PIU. Furthermore, an established diverse Advisory Committee advises the OUT on technical and academic issues.

Further during operation, the OUT Kigoma Centre Director will be responsible for ensuring that the physical components of the laboratory designed for academic purposes for teaching students through practical's is properly working and maintained. In case not well maintained, the laboratory operation may be halted.

2.7.9 Communication and handling complains

The Project implementation Unit will oversee all project activities and is responsible for the day-to-day operation of the HEET project. During construction the Project implementation Unit will overseas all environmental issues and assist in safeguarding the major focal point. Internal communication is done in the meetings where a report on progress of the work plans is communicated. The OUT has appropriate communication procedures and processes established within the University organisation structures. The

Regional Advisory Committees (RACs) in the region, PMU and the designated Monitoring and Evaluation team will conduct the internal monitoring of the science laboratories implementation to identify as early as possible the activities achieved and the cause(s) of problems encountered so that arrangements in establishment process can be adjusted. Related information will be collected monthly from the field to assess the progress of science laboratories implementation and will be consolidated every quarter by:

- i) Overseeing that the Laboratory establishment is implemented as designed and approved.
- ii) Verify that funds for implementing the Science Laboratories project are provided in a timely manner and in amounts sufficient for their purposes, and that such funds are used in accordance with the provisions of the intended purposes.
- iii) Record all grievances and their resolution and ensure that problems are dealt with in a timely manner.
- iv) The team will incorporate the status of science laboratories implementation schedule of activities in the overall Project progress report to the funding organ.

Further there is a well-defined Grievance Redress Mechanism (GRM) guideline that guides students, staff, stakeholders, and the surrounding community to raise their concerns. The objective of GRM is to ensure that complaints and grievances of the OUT staff, students the surrounding communities and project's activities are recorded and acted upon in a timely, effective and transparent manner. All grievances associated with the OUT's operations apart from project construction activities are called general grievances. Therefore, the grievance officers shall collect general complaints and concerns and administer them by OUT Grievance Redress Integrity Committee (ORIC) at the University level. If the Grievant is not satisfied with the decision of OGRIC, he/she may channel the Grievance to legal redress.

A GRM document to control procedure according to the OUT guidelines document on grievances handling mechanism (process and procedures) is in place that provides guidance to register and file all environmental and social documents related to the management of the proposed project (including complaints). All environmental and social registers, files and reports related to the project are controlled by the Environmental and Social Safeguards specialist.

2.8 DECOMMISSIONING PHASE

The proposed Two Storey Science Laboratory Building may last for a very long time since rehabilitation is done as the need arise. Major rehabilitation and/or upgrading could involve dismantling and erection of new buildings. Also, the government may decide to develop an entirely new laboratory at a new site or expand the current OUT buildings to be a full-fledged Independent University. This may result in the laboratory eventually closing down.

2.9 ESTIMATION OF TOTAL INVESTMENT IN THE PROJECT

The project total investment cost is estimated at Tanzania Shillings One Billion Two Hundred Ninety-Eight Million Seven Hundred Thirty-Six Thousand Four Hundred only (TZS. 1,298,736,400.00) which is equivalent to USD. 520,000.00.

2.10 LIFE SPAN OF THE PROPOSED PROJECT

The proposed project has an anticipated life span of about 100 years.

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 INTRODUCTION

The project for which this scoping report was prepared needs to comply with the Tanzania's national environmental policy, legislation and guidelines. This is done to ensure that adequate mitigation measures are put in place to deal with the negative impacts on the project affected persons, and that all project related activities are in conformity with the existing laws, and regulations, and international best practices. A legal and regulatory framework is essential for providing mandate, allocating specific responsibility and accountability to key factors and stakeholders, and also prescribes and enforces specific operating environmental procedures and standards to be undertaken during implementation. The institutional framework is required to develop policies, guidelines and plans; to ensure compliance with laws and regulations; and to monitor, review and adapt policies, plans and regulations in the light of experience and as a platform for monitoring compliance. The specific institutions take account of location, cumulative and strategic development issues, and define development objectives, economic and environmental standards and safeguard targets, and decision criteria. Without such a context the findings of any assessment will have little meaning; the decision criteria will be inconsistent, and mechanisms for ensuring compliance with any recommendations will be lacking. In particular, there will be no mechanism for addressing cumulative and incremental environmental issues. The relevant national legislations and policy frameworks as well as the World Bank safeguard operational policies are reviewed and presented as follows.

3.2 RELEVANT POLICIES

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 relevant sectoral 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

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

- Enhance environmentally sound management of land resource for socio-economic development.
- Promote environmental management of water sources.
- Strengthen conservation of wildlife habitats and biodiversity.
- Enhance conservation of aquatic system for sustained ecological services and socioeconomic wellbeing.
- Enhance conservation of forest ecosystems for sustainable provision of environmental goods and services.

- Manage pollution for safe and a healthy environment.
- Strengthen the national capacity for addressing climate change impacts.
- Ensure safety at all levels of the application of modern biotechnology.
- Promote good governance in environmental management at all levels.
- Enhance predictable, accessible, adequate and sustainable financial resources for environmental management and promote gender consideration in environmental management.

The policy advocates using other relevant approaches in environmental management such as economic instruments, environmental standards, indicators and legislation. In carrying out this project, OUT will observe the above provisions.

3.2.2 The Land Policy (1995)

The National Land Policy of 1995 (revised in 1997) emphasizes the importance of undertaking environmental assessment to manage land-based development. The policy promotes and ensures 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 Policy also advocates the protection of land resources from degradation for sustainable development. Among other things, the policy requires that project development should take due consideration the land capability, ensures proper management of the land to prevent erosion, contamination and other forms of degradation. The environmental assessment of this project is intended to identify if there is potential for the adverse impact and to propose means for mitigating them. The OUT understands these provisions and will follow them whenever those issues will arise.

3.2.3 The Water Policy (2002)

The main objective of this revised policy is to develop a comprehensive framework for sustainable development and management of the Nation's water resources, in which an adequate legal and institutional framework for its implementation will be put in place. This framework promotes the optimal, sustainable and equitable development and use of water resources for the benefit of all Tanzanians, based on a clear set of guiding principles. The policy provides for beneficiaries' participation in water supply schemes. It addresses cross-sectoral interests in water, watershed management and integrated and participatory approaches for water resources planning, development and management. The policy provides a shift of Government roles from service providers to coordination, policy and guidelines formulation, and regulation. Public consultations conducted for the cause of the assessment for this project brought stakeholder participation in line with the policy objectives.

Furthermore, by undertaking this study, the potential pollution to water resources has been looked upon for the purpose of mitigating. The potential pollution to water resources has been looked upon to mitigate the potential pollution to water resources has been looked upon to mitigate the same.

3.2.4 The National Human Settlements Development Policy (2000)

The overall objective of the National Human Settlements Development Policy (NHSDP) is to promote the development of sustainable human settlement and to facilitate the provision of adequate and affordable shelter to all people, including the poor. The policy outlines a number of some objectives, including environmental protection within human settlements and protection of natural ecosystems against pollution, degradation and destruction. The NHSDP recognizes planning and management of human settlement areas as one of the broad human settlement issues.

Within this regard, the NHSDP identifies environmental protection as one of the strategic issues in human settlement planning and development. The OUT is expected to abide with NHSDP to ensure compliance of the development with NHSDP.

3.2.5 The National Investment Promotion Policy (1996)

The policy has stressed the need for modernization of equipment and technological upgrading of the process to enable optimal use of available sources, improved efficiency operation, improvement in the quality of products and co-products, etc. The policy encourages the protection of the environment in line with the country's socio-economic policies. Under the policy, developers must undertake activities in a manner that best contributes to consumer and environmental protection. The developers are also encouraged to use local raw materials/components. This environment impact assessment is undertaken to ensure that OUT will abide by the relevant provisions of the policy to ensure compliance with the development.

3.2.6 The National Construction Policy (2003)

Construction project, such as the proposed project, is among key areas embraced by the construction policy. Among the primary objectives of the policy, which support sustainable construction sector include: to promote the application of cost-effective and innovative technologies and practices to support socio-economic development activities such as water supply, sanitation, shelter delivery and income-generating activities and to ensure application of practices, technologies and products which are not harmful to both the environment and human health.

Through this assessment, OUT is expected to abide to the relevant provisions of the policy to ensure compliance of the development.

3.2.7 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 mainly focusing on industry and trade sectors (ii) 10.6, which deals with the 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.

During implementation of the project, the OUT 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.

3.2.8 The Energy Policy of Tanzania (2015)

The policy focuses on utilising various energy resources, including water, forests, gas, coal, petroleum, sun and wind, in a sustainable and environmentally friendly manner. The policy states that energy is a prerequisite for the proper function of nearly all sub-sectors of the economy. It is an essential service whose availability and quality can determine the success or failure of development endeavours. A significant policy objective on energy end uses the progressive reduction of dependence on imported energy through demand management to reduce the negative effects of continued dependence on imported petroleum products. The policy insists that activities in energy auditing in the developmental project and energy conservation should be done.

Major losses shall be dealt with by the O&M, and cost-effective solutions or recommendations on ways to reduce energy losses shall be implemented. Thus, the project is quite in line with the energy policy requirements.

3.2.9 The National Health Policy (2017)

This Policy emphasized the need to increase community involvement in health development and improve access and equity in health and health services. One of the main objectives 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 work-places, promotes sound use of water. It promotes the construction of latrines and their use, and encourages the maintenance of clean environment; a working environment conducive to satisfactory work performance. The O&M shall observe this policy.

3.2.10 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 will result into social interactions among workforce and therefore the proponent will adhere to the policy.

3.2.11 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 phase and operation phases.

3.2.12 The Tanzania Education and Training Policy, (2014)

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

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

3.2.13 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 Municipality centers in order to support the economic, social, cultural and environmental attractiveness of the Municipality 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 urban space during its implementation.

3.3 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:

3.3.1 The Tanzania Development Vision 2025

The Goal for the Tanzania Development Vision 2025 foresees the poverty alleviation through improved socio-economic opportunities, good governance, transparency, and improved public sector performance. These objectives deal with economic issues and include social challenges such as education, health, the environment, and increasing involvement of the people in working for their development. These objectives aim to attain sustainable development of the people. This vision also speaks about that the 21st Century being dominated by the advanced technological capacity, high productivity, modern as well as efficient transport and communication infrastructure, which is quite relevant to this project, Vision 2025 seeks to mobilize the people, the private sector, and resources of the nation towards the achievement of shared goals and achieving a sustainable middle market economy by 2025. The vision outlines Tanzania's plans and strategic goals covering all sectors of the economy. It outlines institutional changes that must take place to enable Tanzania to make progress suggested in the vision. The proposed project will stimulate local economic growth and contributing to realising the Vision's objectives.

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

This Plan is the final Plan in implementing the Tanzania Development Vision 2025 as the National overall development framework. The Plan is a continuation of the Government's efforts in enduring exertion to further improve the standard of living for all Tanzanians. The theme of realising competitiveness and industrialization for human development aims to increase efficiency and productivity in manufacturing using the resources available in the country. Areas of inspiration in the Plan include increasing the country's capacity for production; building a competitive economy that will stimulate the country's participation in trade and investment; and stimulating human development. By implementing this project, the OUT is promoting the development in Tanzania, which is the focus of the FYDP III.

3.3.3 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, OUT 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.

3.4 PRINCIPAL LEGISLATIONS

Tanzania has a number of laws touching on the environment and social issues. This includes legislation requiring developers to subject their proposed projects to environmental impact assessment. This section addresses the legal and regulatory conditions relevant to the proposed project. The proposed project will need to be planned and operated in general compliance with these legislations. Some of the relevant legislation and regulations that are relevant in the management of the environment include the following:

3.4.1 The Environmental Management Act, Cap 191

The Environmental Management Act cap 191 builds on NEP's vision of a consistent and coherent environmental management framework. The Act introduces a concept of the right of Tanzanians to a clean, safe and healthy environment and the right of Tanzanians to access various segments of environment for recreational, educational, health, spiritual, cultural and economic purposes (Section 4 (1) and (2)). The Act imposes an obligation on developers to:

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

This Act also provides a legal framework necessary for coordinating harmonious and conflicting activities to integrate such activities into an overall sustainable environmental management system by providing key technical support to sector Ministries. As such, the OUT undertook, this study to comply with EMA requirement.

3.4.2 The Open University of Tanzania Act, [Cap. 268 R.E 2019]

The Open University of Tanzania (OUT) is a fully fledged, autonomous and accredited public University, established by an Act of Parliament Number 17 of 1992. The Act became operational on 1st March 1993 by the publication of Government Notice No. 55 in the Official Gazette. The first Chancellor was officially installed in a full ceremony on 19th January 1994 and the first batch of students was admitted in January 1994. In January 2007, following enactment of the Universities Act No. 7 of 2005, OUT started using the

OUT Charter and Rules (2007) for its operations. The Open University of Tanzania offers its certificate, diploma, degree and postgraduate courses through the open and distance learning system which includes various means of communication such as face-to-face, broadcasting, telecasting, correspondence, seminars, e-learning as well as a blended mode which is a combination of two or more means of communication. The OUT's academic programmes are quality-assured and centrally regulated by the Tanzania Commission for Universities (TCU).

OUT operates through a network of about 30 Regional Centres; 10 Coordinating Centres, of which one is in Zanzibar and one in Pemba; two are in Kenya (Egerton and Njoro), one is in Rwanda (Kibungo), one in Namibia and one in Uganda. Other OUT Internal Coordination Centres are the African Council for Distance Education – Technical Collaboration Committee (ACDE TCC), the Centre for Economics and Community Economic Development (CECED) and the SADC Centre of Specialization in Teacher Education (SADC ODL CoS TE). OUT has also 69 Study Centres spread throughout the United Republic of Tanzania.

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

The basic principles of the Land Act 1999 are adopted from Land Policy 1995. The Act contains provisions of critical environmental importance. One of important fundamental principles of the Land Act is “*to ensure that land is used productively and that any such use complies with the principles of sustainable development*”. The project activities will be conducted in consent with this principle in order to preserve the environmental integrity of the area. This will be ensured by implementing the Environmental Management Plan as outlined in Chapter 8 of this report.

3.4.4 The Occupation Health and Safety Act, 2003 (Act No. 5/2003)

This Act deals with the protection of human health from occupational hazards. It specifically requires the employer to ensure the safety of workers by providing safety gear at the work place. Relevant sections of this Act to the project activities include Part IV which deals with general health provision, such as provision of regular medical examination of employees; Safe means of access and safe working place; Prevention of fire etc.; and Part V on health and welfare provisions, which includes provision of supply of clean and safe to workers, sanitary convenience, washing facilities and first aid facility. Section 50 deals with fire prevention issues. Section 15 gives powers to the Registrar of factories and workplace to enter any factory or workplace to perform his duties as provided by the Act. Section 16 requires that factories and workplace to register with Registrar of factories and workplaces before commencing operations. OUT will observe the provision of this Act during construction and running of the proposed project.

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

This Act establishes Urban authorities for local government, to provide for the functions of those authorities and other matters connected with or incidental to those authorities. Section 55 of the Act enumerates the basic functions of the Urban authorities. The functions that are relevant to the proposed project are to provide for the prevention and reduction of public nuisances or of nuisances, which may be detrimental to the public health or the good order of the area of the authority and to regulate any trade or business, which may be harmful and detrimental to the public health or a source of public danger, or which otherwise it is in the public interest expedient to regulate, and to provide for the issue of licenses or permits (e.g., building permit) and to facilitate the regulation of any such trade or business, and for the imposition of fees in respect of such licenses. Also, the LGA has the mandate to monitor/ inspect environment and social performance. The provisions under this Act and other enacted subsidiary

legislation and by-laws relevant to the issue of project and environmental pollution have bearing to the OUT. The Proponent will comply with all legal local government requirements.

3.4.6 The Water Resource Management Act, 2009 (Act No. 12/2009)

The Act provides for an institutional and legal framework for sustainable management and development of water resources; outlines principles for water resources management; for prevention and control of water pollution; and provides for the participation of stakeholders and the general public in implementing the National Water Policy. The relevant provision of this act is that the water "Shall not be polluted with any matter derived from such use. Also, to such extent, as to be likely to cause injury either directly or indirectly to public health to livestock, or fish, to crops, orchards or garden, which are irrigated by such water or to any product in the processing of which such water is used". 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.

The OUT will comply with the Water Resource Management Act of 2009. The project needs to understand the procedures for discharges to open environment and water quality maintenance provided by this Act.

3.4.7 The Workers Compensation Act, 2015

An Act to provide for compensation to employees for disablement or death caused by or resulting from injuries or diseases obtained or contracted in the course of employment; to establish the fund for administration and regulation of worker's compensation and to provide for related matter. It applies to both workers in the private and public sector. For one to be compensated, the injury must either cause permanent incapacity or make the worker unable to earn total wages for at least three consecutive days. The employer is obliged to pay compensation irrespective of the cause of the accident. It doesn't matter whether the incapacity or death was due to the recklessness of the worker. Where an injury occurs, an employee is entitled to recover medical expenses and lost wages resulting from the disability, be it temporary or permanent. The law allows for compensation to dependants or personal representatives where the worker is dead.

The OUT respects the provisions of the Workers' Compensation Act and will therefore observe its requirements in addition to safety measures provided in this report.

3.4.8 The Land Use Planning Act No.6 of 2007

The Act provides for the procedures for preparation, administration, and enforcement of land use plans; to repeal the National Land Use Planning Commission, and provide for related matters. The Act has distinctive land use planning authorities in Tanzania laid down with their functions and powers. The power vested to authorities that give them power to enforce approved land use plans, including taking defaulters to the court of law.

The OUT is committed to observing the provisions of this Act and the project is planned under the requirement of this Act. This project has contravened no land use plans and there is no issue of conflicts with existing Land Use plans.

3.3.9 The Urban Planning Act No. 8 of 2007

The law provides for the orderly and sustainable development of land in urban areas such as Kigoma-Ujiji Municipality, 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. The Act provides for procedures for enforcement of Urban Planning; addresses different issues related to urban planning and insists on conservation and environmental protection to enhance social justice in the acquisition of land for planning purposes. This is also an important environmental provision, which introduces the requirements for environmental impact assessment at least in respect of land use matters.

The OUT is committed to observe the provisions of this Act and the project is planned in accordance with the requirement of this Act.

3.4.10 The Contractors Registration (Amendments) Act No. 15 of 2008

The Contractors Registration Board (CRB) is a government autonomous regulatory body established to register all types of contractors and regulate their conduct to protect consumers of construction services in Tanzania. The body is governed by the Contractors Registration Act No. 17 of 1997, amended and published as The Contractors Registration (Amendments) Act No. 15 of 2008. CRB is required to take legal action against unregistered contractors who undertake construction; installation, erection or alteration works; ensure that all construction sites are hoarded; and labour laws, occupational health and safety regulations in the construction industry are adhered to. On executing its construction activities, OUT shall appoint a registered contractor and make sure that the Act's provisions are adhered to.

3.4.11 The Engineers Registration Act No. 15 of 1997 and its Amendments of 2007

The Act provides a restriction that no person other than a registered engineer shall engage in professional engineering work or services, including professional service consultation, planning, designing or responsible supervision of construction or operation in connection with any public or privately owned public utilities, buildings, machines, equipment. Also, processes work or projects where public interest and welfare, or the safeguarding of life, public health or property is concerned or involved, requiring the application of engineering principles and data. Furthermore, the Act stipulates that no person shall employ or continue to employ a professional engineer who is not a registered engineer.

The OUT shall therefore observe the Act's provisions when executing its activities during construction and, if need be, during operations.

3.4.12 The Public Health Act, 2008

This Act provides for the promotion, preservation, and maintenance of public health to ensure the provisions of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters. The Act prohibits indirect discharges of wastewater to public drainages. It is an offence to emptied or to pass into any sewer or any drain any matter likely to injure the sewer or drain, interfere with the free flow of its contents, or effect prejudicially the treatment and disposal of its contents. Part VII of the Act contains provisions relating to the minister's powers to make regulations relating to notification of infectious diseases and communicable diseases, prevention and control of infectious diseases, control of mosquitoes, and vaccinations. It also provides for a general penalty where the specific penalty has not been specified. The OUT will comply with the above provisions through this ESIA study as indicated in the ESMP.

3.4.13 The HIV and AIDS (Prevention and Control) Act, 2008

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

3.4.14 The Fire and Rescue Service Act No. 14 of 2007

This Act provides better organization, administration, discipline and operation of fire and rescue brigade services. Tanzania Fire and Rescue's purpose is to enhance community safety, quality of life, and confidence by minimizing the impact of hazards and emergency incidents on Tanzania's people, environment, and economy. The force manages fire emergencies in Tanzania's major cities and towns and responds to rescues, hazardous materials incidents and possible terrorist activities. The Force work with other government agencies to minimize the impact of bushfires, storms, floods, landslides, building collapses, motor vehicle accidents and other emergencies. Also run prevention and preparedness programs to prevent these emergencies and reduce their impact on the community. The project shall comply with this act as installation of fire hydrant, other firefighting equipment and facilities are integrated in the design. Should there be any fire hazards in the project site and at any time, the project proponent shall allow and comply with the requirements of this Act to enable firefighters to do their work. It should be clearly stated how proponent will make sure that,

3.4.15 The Water Supply and Sanitation Act of 2009

The Act intends for the protection of the water resources and the user so that there is a balance between different uses. In general, the Act provides the legal basis among others for - water resources management at National and Basin levels; the administration to legalize, grant, modify and diminish water rights to the use of water by those entrusted with responsibilities for water resources management; to protect water rights for all legitimate water users, hence monitoring the quality and quantity of water sources; water use conflict management and water pollution control and other related issues like water construction. The relevant objective of this Act to the project is the one which states that "preventing and controlling pollution and degradation of water resources" (Part II 4 (1) (h)). Part VI Article 39 elaborates on the need to prevent pollution and the penalties to be taken against one who pollutes the water resources. Various types of waste produced during construction of the proposed project have the potential to pollute water resources. The Contractor will take all necessary precautions to prevent any pollution from the project activities.

3.4.16 The Persons with Disability Act, 2010

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

3.4.17 The Child Act of 2009

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

3.4.18 Antiquities Principal Act, 1964 and (Amendment 1979)

This Act provides for the preservation and protection of sites and articles of palaeontological, archaeological, historical, architectural, artistic, ethnological, or scientific interest. It serves to protect and preserve the Antiquities of the country. Relevant sections of the Act include Section 3 dealing with declaration of any place as a historical place, section 6 which prohibits excavation within such place without a licence, and removing or collecting of relics or search for ethnographical object without license and Section 9 which prohibits exchange of illicit etiquettes. Since the project will be situated at Busomero Mtaa, OUT will ensure that their contractor is adequately informed of these provisions of the Act.

3.4.19 The Architects and Quantity Surveyors Act No. 16 of 1997 R.E. 2019

This Act established the Board of Architects and Quantity Surveyors responsible for registering and regulating the Architects' conduct, Quantity Surveyors and Architectural and Quantity Surveyors Consulting Firms. The project proponent is observing the requirements of this Act by engaging registered and certified Architects and Quantity Surveyors in the design of the facilities. It is ready to assist the Board during inspections of the project works.

3.5 NATIONAL REGULATIONS

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

These regulations have provided the list of projects which requires an Environmental Impact Assessment study. Since such a project is likely to have some adverse environmental impacts. An in-depth study is required to determine the scale, extent, and significance of the impacts and identify appropriate mitigation measures. Furthermore, the regulation provides explicitly procedures and guidelines for carrying out the Environmental Impact Assessment in Tanzania. This study has been carried out under these 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 G. N. No. 237) Regulation, 2007

These regulations' objective is to set baseline parameters on-air, and emissions based on many practical considerations and acceptable limits; enforce minimum air quality standards prescribed by the National Environmental Standards Committee. This is to help developers keep abreast with environmentally friendly technologies; and ensure the protection of human health and the environment from various sources. The Second Schedule of the Air Quality Standards Regulations (2007) and the Tanzania Bureau of Standards TZS 845:2005 specifies the highest permissible quantity for emissions and the acceptable test methods. In addition, the project during construction will engage heavy earthmoving machinery and may need to provision for heavy-duty farm tractors and harvesters. Also, generators for standby power generation during periods of the power outage and these machines would need to comply with the 4th Schedule of the Act and Tanzania Bureau of Standards (TBS 2005) EMDC 2(1758) Air quality on vehicular exhaust emission limits which applies to motorcycles, cars and heavy-duty diesel engines. The latter is considered in Table 3.1:

Table 3.1: Emission limits for Heavy Duty (HD) Diesel Engines

Pollutant	Limit (g/kWh smoke in m ⁻¹)	Reference Standard
CO	4.5	Euro I
HC	1.1	Euro I
NO _x	8.0	Euro I
PM	0.612	Euro I
Smoke	0.15	Euro III

Source: Environmental Management (Air Quality Standards G. N. No. 237) Regulation, 2007

Under the Environmental Management (Air Quality Standards G. N. No. 237) Regulation 28, any holder of a permit, owner or occupier of premises is required that all incidences of inadvertent or accidental emissions or pollution in contravention of these standards shall report the incident within seven (7) days. The standards as laid down by these regulations shall be adhered to accordingly by the project as indicated in the monitoring plan of this report (chapter 9).

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

The Water Quality Standards Regulations' objective is to protect human health and conservation of the environment, enforce minimum water quality standards prescribed by the National Environmental Standards Committee and the National Environmental Standards Committee. These committees would

assist in determining water usage for purposes of establishing environmental quality standards and value for each usage, and ensure all discharges of pollutants take into account the ability of the receiving waters to accommodate contaminants without detriment to the uses specified for the waters concerned. Thus, the OUT shall adhere to these standards as stipulated in Chapters 8 and 9 of this report.

3.5.6 The Environmental Management (Soil Quality Standards) Regulation 2007

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

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

The Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations (2015) formulated under Sections 140, 147 and 230 of EMA for the control of noise (loud, unreasonable, unnecessary or unusual) and vibration pollution that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. Focus areas include:

- i) Noise management by the owner of machinery or occupier of facility or premises to control noise and to install sound level meters for the measurements and monitoring sound.
- ii) Noise emission License issued by NEMC Director-General to owner or occupier of premises whose work or activity is likely to emit noise over the permissible noise levels.
- iii) Compliance order, protection order or stop order issued by NEMC or any other empowered authority when any condition of any license or permit has been breached or
- iv) Prevention orders and improvement notice issued by Environmental inspector to prevent noise and vibration pollution in an amount, concentration or manner that constitute a risk to human health or environment.
- v) The minister may reward any person who will report an incident of incidental concealment or inadvertent emission or noise pollution or excessive vibration.

The objective of the Quality Standards for Control of Noise and Vibration Pollution Regulations is to protect human health from noise and vibration hazards. In this case, two categories have been defined by the regulations noise and vibration for public health hazards and workers for occupational health and safety hazards. In this case, minimum limits have been established for the ambient environment to protect public health and limits for the protection of workers in the working environment. Thus, the OUT shall adhere to these standards as stipulated in Chapters 8 and 9 of this report.

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. The OUT 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, the OUT 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, the OUT 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, the OUT shall comply with all these requirements during the implementation of the project.

3.6 INTERNATIONAL CONVENTIONS

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, OUT 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, OUT 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 OUT shall ensure workers are protected against occupational hazards.

3.7 WORLD BANK ENVIRONMENTAL AND SOCIAL FRAMEWORK

3.7.1 Objective of the Environmental and Social Framework

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

The ESF offers broad and systematic coverage of environmental and social risks. It makes important advances in areas such as climate change; labour standards; transparency; non-discrimination; social inclusion; public participation; and accountability—including expanded roles for grievance mechanisms. The ESF codifies best practice in development policies. It brings the World Bank's environmental and social protections into closer harmony with those of other development institutions; and encourages Client countries to use, and improve, their own national environment and social policies, when these policies are materially consistent with the ESF and supported by adequate implementation capacity. The ESF provides an incentive for countries to develop and build their own environmental and social policies and capacity.

3.7.2 World Bank Environmental and Social Standards

The World Bank Environmental and Social Policy for Investment Project Financing sets out the requirements that the Bank must follow regarding projects it supports through Investment Project Financing. The Environmental and Social Standards set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts and mitigation measures associated with projects supported by the Bank through Investment Project Financing. The standards are

expected to: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement. The proposed project will apply the ESF. The proposed project will apply the ESF and Table 3.2 below describes the application of the ESSs to the project.

Table 3.2: Application of World Bank’s ESSs to the proposed project

ESSs	Yes/No	Application
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Yes	The site-specific environmental and social impacts will be managed through this report. The report has been prepared to recommend E&S measures to be incorporated into designs of the proposed project
ESS 2: Labor and Working Conditions	Yes	<p>Workers will be contracted for the construction works and operation of the project. In order, to ensure fair treatment of workers, the project will ensure that terms and conditions of employment (hours, rest periods, annual leave, non-discrimination, equal opportunities and workers organizations) are aligned with the requirements of Tanzania law and ESS2. To protect workers appropriate Occupational Health and Safety (OHS) shall be applied to avoid the risk of ill health, accidents and injuries.</p> <p>The proponent will set labor management procedures with roles and responsibilities for monitoring primary suppliers. If child labor or forced labor cases are identified, the proponent will require the primary supplier to take appropriate steps to remedy them. Where remedy is not possible, the proponent will, within a reasonable period, shift the project’s primary suppliers to suppliers that can demonstrate that they are meeting the relevant requirements of this ESS</p>
ESS 3: Resource Efficiency and Pollution Prevention and Management	Yes	The project activities will involve construction works which will generate dust, erosion, wastes (solid and liquid) that will be properly managed via ESMPs and EMP. More or less similar impacts are likely to be experienced during operation phases and will be managed by the same tools as well as operation and maintenance plans.
ESS 4: Community Health and Safety	Yes	<p>The project will not have substantial risk to community health and safety. Only localized negative impacts (like dust emissions noise pollution etc.) to sensitive receptors will need to be managed.</p> <p>Also, community safety especially is an issue of concern due to the influx of the project workers, and later on participants of the project, which might lead to GBV/ SEA/SH, as well as transmission of HIV/AIDs and other communicable diseases. Guidance on HIV/AIDs, COVID-</p>

		19, GBV/SEA/SH and HEET project GRM shall be followed.
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	No	This ESS is not relevant to the proposed Two Storey Science Laboratory Building at the OUT Kigoma Regional Centre.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	No	The project is not located inside or near protected areas and sensitive habitats. In case the project will purchase natural resources commodities such as timber, it will be important to establish the source area and to have a mechanism in place to ensure that the Primary Suppliers are not significantly impacting sensitive ecosystem or degrading natural habitats.
ESS 7: Indigenous People/ Sub-Saharan African Historically Underserved Traditional Local Communities	No	This standard is not considered relevant as the project will mainly be implemented in areas where communities that meet the requirements of ESS7 are generally not available in the area.
ESS 8: Cultural Heritage	No	This ESS is not relevant as the project area has already being developed and there is existing OUT building
ESS 9: Financial Intermediaries	No	This ESS is not relevant to the project.
ESS 10: Stakeholder Engagement and Information Disclosure	Yes	The proponent will provide stakeholders with timely, relevant, understandable and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination and intimidation.

3.7.3 World Bank Group ESHS Guidelines

The World Bank Groups Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. Specific guidelines which will be used is Environmental, Health, and Safety (EHS) Guidelines: Environmental Waste Management. As stipulated earlier the guidelines will be used together with the Environmental, Health, and Safety General Guidelines.

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines will be tailored to the hazards and risks established for the project in accordance to the proposed project activities. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of technical feasibility. The applicability of specific technical recommendations will be based on the professional opinion of qualified and experienced persons.

3.8 INSTITUTIONAL FRAMEWORK

3.8.1 Introduction

The Tanzania EIA practice gives different functions and responsibilities to all parties involved in the EIA process of any proposed development undertaking to which EIA is obligatory. Table 3.3 provides key institutions to the proposed project. The Environmental Management Act (EMA, Cap 191) give mandate to NEMC to undertake enforcement, compliance, review and monitoring of environmental impact assessment and has a role of facilitating public participation in environmental decision-making, exercise general supervision and coordinating over all matters relating to the environment.

The Act empowers NEMC to determine whether a proposed project should be subjected to an EIA, approves consultants to undertake the EIA study, invites public comments and has the statutory authority to issue the certificates of approval via the Minister responsible for environment. NEMC is currently the designated authority to carry out the review of ESIA including site visit and handling Technical Advisory Committee (TAC) meeting, monitoring and auditing of environmental performance of the project (periodic and independent re-assessment of the undertaking).

Table 3.3: Key Institutions to the ESIA Process

Level	Institution	Role and Responsibility
National level	President's Office – Regional Administration and Local Government	<ul style="list-style-type: none"> Responsible for matters relating to Regional Administration and Local Government, including giving policy guidelines necessary for the promotion, protection and sustainable management of the environment.
	Vice President's Office (Division of Environment)	<ul style="list-style-type: none"> Coordinate various environment management activities in Tanzania. Advise the Government on legislative and other measures for the management of the environment. Advise the Government on international environmental agreements Monitor and assess activities, being carried out by relevant agencies in order to ensure that the environment is not degraded Prepare and issue a report on the state of the environment in Tanzania. Coordinate the implementation of the National Environmental Policy.

Level	Institution	Role and Responsibility
	National Environment Management Council (NEMC)	<ul style="list-style-type: none"> • Carry out 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 professional indemnity insurance. • Initiate and evolve procedures and safeguards for the prevention of accidents which may cause environmental degradation and evolve remedial measures where accidents occur. • Undertake in co-operation with relevant key stakeholder's environmental education and public awareness. • Render advice and technical support, where possible to different stakeholders.
	Ministry of Education, Science and Technology	<ul style="list-style-type: none"> • Monitoring and reporting on compliance with the ESMF/ ESMP under the established National Project Coordination Unit (NPCU). • Ensure compliance with the various regulations, guidelines and procedures issued by the Minister responsible for the environment
	Ministry of Lands, Housing and Human Settlements Development	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.
	Occupational Safety and Health Authority (OSHA)	<ul style="list-style-type: none"> • Registration of the construction site, registration of workplace and inspection. • Issuance of OSHA Compliance certificate. • Inspection on OSH related aspects. • Enforcement of Occupational Health and Safety Act, 2003 (Act No. 5/2003).

Level	Institution	Role and Responsibility
Regional level	Kigoma Regional Secretariat Office	<ul style="list-style-type: none"> • 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	Kigoma -Ujiji District Commissioner office	<ul style="list-style-type: none"> • Oversee and advice on implementation of national policies at District level. • Proper management of the environment in their areas of jurisdiction. • Carrying out directives given to promote and enhance sustainable management of the environment and as provided under the Local Government. • Performing any functions as provided by the Local Government (District) Authorities Act, 1982. • Advice on implementation of development projects and activities at District level.
Municipal Level	Kigoma -Ujiji Municipal Executive Director Office	<ul style="list-style-type: none"> • Coordinate all development activities in the Municipal level. • Municipal Environmental Officer (MEMO) is responsible for project monitoring on environmental issues. • Responsible for all development activities, implementation and/or support in the Municipal. • Enforcement of laws and regulations. • Coordinate environmental matters at the Municipal level. • In charge of monitoring implementation of the project. • Advice on the implementation of the development of the project and activities at the local government level. • Overseeing community-investor relations.
Ward Level	Ward Development Committees – (Ward Councillor, WEO, Ward Environment Committee	<ul style="list-style-type: none"> • Oversee general development plans for the Ward. • Provide information on local situation and Extension services. • Technical support & advice. • Project Monitoring.
Community level	Mtaa Council (Chairman/ MEO, Environment Committee);	<ul style="list-style-type: none"> • Information on local social, economic, environmental situation. • View on socio-economic and cultural value of the sites and on proposed drilling operations. • Rendering assistance and advice on the implementation of the project. • Project Monitoring (watchdog for the environment, ensure well-being of residents and participate in project activities.

Level	Institution	Role and Responsibility
	Local communities, NGOs, CSOs, FBOs	<ul style="list-style-type: none"> • Project monitoring and management (as watchdogs) • Socioeconomic development in the area. • Provides assistance and advice on the implementation of the project. • Part of the project beneficiaries through employment opportunities, income generation and CSR projects.

3.8.2 OUT Project Implementation Unit

The OUT responsibility is to ensure that the implementation process of the ESMP and Mitigation measures are in line with the relevant national policies and legislations and World Bank Environmental and Social Standard 1. The OUT has the Project implementation Unit (PIU) with 18 people responsible for supervision and monitoring the implementation of the project construction activities. The management of all project activities during operation is under the PIU, in collaboration with other departments and units depending on the nature of the activity. In general, the PIU falls under the management of the OUT executing day-to-day activities in the project. The PIU is guided by management meetings that are chaired by the Vice Chancellor.

The management meetings provide support, guidance and oversight of the progress of the PIU. Further, among the PIU staffs, 3 are working as EEnvironmental and Social Safeguard Specialists (i.e Gender specialist, Social Specialist and Environment Specialist) who will monitor the environmental and social activities of the project during all project phases. The Environment specialist holds a PHD in environment technology and management, social specialist holds BA in Sociology and Gender specialist holds a PHD in Management Science and Engineering and is a focal gender person of the OUT. Further the OUT shall commission the consulting engineer to supervise the contractor during construction among others on Environmental and Social Issues. The roles and responsibility on environmental and social issues is covered on table 3.4 below; -

Table 3.4: Institutional Responsibilities at Project Level

Institution	Roles and responsibility
World Bank	<ul style="list-style-type: none"> • Project financing • Ensures that the project is carried out to the highest environmental standards strictly in accordance with the ESMF and ESIA project report and the mitigation measures set out therein. • Also requires that environmental and social impacts are managed in accordance with the World Bank ESF and its ESS. • Provide second line of monitoring compliance and commitments made in the ESMPs through supervision.
PS-MoEST	<ul style="list-style-type: none"> • E&S monitoring and surveillance of all project components investments that will be undertaken by project. • The ministry will report results of this monitoring to the World Bank.
NPIU Environmental and Social Team	<ul style="list-style-type: none"> • Coordinate different activities to ensure that, the project meets the country legal and World Bank requirements with regard to Environment and Social Framework
Implementing institutions (OUT -	<ul style="list-style-type: none"> • Maintaining the PIU chaired by the Deputy Vice Chancellor and assisted by qualified and experienced staffs in adequate numbers and under terms of reference as outlined in the Project Operational Manual (POM).

Institution	Roles and responsibility
PIU) Environmental and Social Team	<ul style="list-style-type: none"> • The PIU is vested with the responsibility of the day-to-day implementation of the project activities including financial management, procurement, environmental and social risk management, governance and anti-corruption, monitoring and evaluation, and reporting; • Coordinate specialist/consultants for any support missions or attend different meetings and provide any guidance in the bid to ascertain that the different challenges identified for each sub-project/activity are duly covered from risk. • Support the procurement officer at OUT in making sure that the bidding documents clearly cover the health, safety and environmental component with appropriate provisions of the same for the contractors to bid. • Coordinate preparation of ESIA and environmental and social management plans (ESMPs) done by consultant and site-specific ESMPs (SSESMP). • Ensure that contractors have an Environmental Health and Safety Officers (EHS), who are familiar with the compliance requirements, including WB EHS guidelines
Consultant (Environmental and Social Team)	<ul style="list-style-type: none"> • Work with the NPIU//UPIU to understand the requirements of the environmental and social assessment; • Conduct initial site visits with the UPIU to understand the sub-project setting and site-specific requirements; • Prepare the ESIA and ESMPs based on the procedures described in the ESMF including carrying out an alignment walk, alternatives analysis and baselines studies, identifying the E&S risks and impacts, developing mitigation measures and monitoring plans incorporating EHS requirements; • Cost all the mitigation and management measures proposed in the ESMPs and SSEMPs • Propose a capacity building plan for the implementation of the sub-projects (where necessary) • Carry out public consultations; • Assist the UPIU in preparing documentation to obtain certification from NEMC for the ESIA and ESMPs.
Contractors (Environmental and Social Team)	<ul style="list-style-type: none"> • Compliance with relevant environmental and social legislative requirements (project-specific, district- and national level), including allocating adequate budget for implementation of these requirements; • Work within the scope of contractual requirements and other tender conditions; • Prepare CESMPs based on the ESMP in the bidding documents and contracts; • Train workers about EHS (including relevant WBG EHS Guidelines) and the site specific environmental and social measures to be followed; • The EHS officer of the contractor will participate in the joint site inspections with the UPIU and Environmental Supervision Engineer/consultant; • Immediate notification of the NPIU and supervision engineer of any significant social or environmental health and safety incident linked with the project, and indication about the measures taken or that are planned

Institution	Roles and responsibility
	<p>to be taken to address the incident as well as propose any measures to prevent its recurrence.</p> <ul style="list-style-type: none"> • 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

3.8.3 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) Funding Institutions
- ii) The Open University of Tanzania
- iii) National Environmental Management Council (NEMC)
- iv) Contractor;

3.8.3.1 Funding Institutions

The funding organization will have an overarching responsibility to ensure that the project is carried out to the highest environmental standards strictly in accordance with the ESMF and ESIA project report and the mitigation measures set out therein. Additionally, the funding Institution requires that environmental and social impacts are managed in accordance with the World Bank ESF and its ESS.

3.8.3.2 The Open University of Tanzania - UPIU

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

3.8.3.3 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.

3.8.3.4 The Contractor

The project will be implemented by a Contractor and will be responsible to OUT 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 the OUT 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.

4 BASELINE DATA AND INFORMATION

4.1 INTRODUCTION

Baseline data and information on bio-physical and socio-economic set up of a given project provides an important insight for informed environmental assessment. This chapter provides a description of relevant environmental, economic, and social characteristics of the project core area (site specific), areas in the immediate vicinity of the project area, and a broad description of the area of influence, i.e., Kigoma-Ujiji Municipal Council, Kigoma Region. The various sections' details depend on the interactions between the project activities and the particular environmental or socio-economic aspect. The Consultant relied on secondary data and information found in literature covering the project area and observation at the site. Information provided in this chapter will be superimposed on to the project concept and components for impact identification, evaluation and development of mitigation measures.

4.2 PHYSICAL CHARACTERISTICS

4.2.1 Administration

In the implementation of project activities, OUT will have to communicate and associate with various local government authorities from the regional level to Municipal level, Ward and Village level. Administratively the project is located at Busomero Mtaa, Kasimbu Ward, Kigoma-Ujiji Municipality, Kigoma Region, Tanzania. The Municipality is bordered by Kigoma and Uvinza Districts to the East; Lake Tanganyika to the West; Kigoma District to the North and Kigoma and Uvinza Districts to the South. The Municipality is divided into two divisions, namely; Kigoma North and Kigoma South. The Municipality has 19 wards which are Gungu, Kibirizi, Katubuka, Mwanga Kaskazini, Buzebazeba, Mwanga Kusini, Bangwe, Kagera, Kipampa, Buhanda, Kitongoni, Kigoma, Rusimbi, Kasimbu, Majengo, Machinjioni, Kasingirima, Rubunga and Businde (Figure 2.1 above). The 19 wards are further subdivided into 68 sub-wards (mitaa) administrative units.

4.2.2 Climate Condition

The climate of the project area and Kigoma-Ujiji Municipality in general is tropical with a distinct long wet rainy season beginning from late October to May with a short dry spell of 2-3 weeks in January or February followed by a prolonged dry season. Annual rainfall is variable ranging from 600 mm-1500 mm being the heaviest in highlands, intermediate in the lower slopes and low in the valley bottom and lake-offshore areas. Mean daily temperatures range between 25°C in December, January to 28°C in September. Temperature varies inversely with altitude. The winds blow from east to west for most of the year. The wind directions are mostly north western with an average speed of about 60 km ph within the period of January to May. The rest of the year is characterized by relatively higher speeds.

4.2.3 Topography

The general terrain of the project area and the nearby surroundings are even with no significant topographical features - no hilly area. There are no human-induced features on project area land that could significantly interrupt the even terrain of the area. The topography of Kigoma-Ujiji Municipality is characterized by gently sloping terrain, valleys and hills with altitudes ranging between 600 – 939 metres above sea level. The North eastern side is hilly, while the western and Southern part is relatively low lying (Map 1.5). River Luiche, which runs on the South Western part of the Municipality in the low-lying area, is an important drainage system for the Municipality. The river collects its water into Lake Tanganyika.

4.2.4 Soils

The soils of the project area are typical of the Lake Tanganyika shore areas. Soils are predominantly deep and well drained comprising the reddish to yellowish fine sandy loams, and sandy loams and severely eroded. Most predominant soil type in the project is loamy soils. The soil in the area could generally well be expressed as deep to moderately deep, well drained loams which is suitable for proposed development. The Kigoma-Ujiji Municipality soils are categorized as follows; along the lake shore the soils are deep and well drained comprising the dark reddish brown fine sandy loams, and sandy loams partly stony and severely eroded. The heavy black soils are found in permanently water-logged areas with black clay soils, which have a high proportion of sand in swamp fringes subject to seasonal water logging. These are highly fertile areas because of high proportion of sand and silt. In the low relief areas, the soils are dark reddish clay loams with fairly good internal drainage, while the black and brown alluvial soils are mostly found in areas of high lands.

4.2.5 Geology

The Kigoma-Ujiji Municipality is overlaid by neogene sediments which range in compositions from alluvium to laterites. The Municipality is overlaid by highly metamorphosed basement rocks consisting of biotite and amphibole gneisses. Most of the land under the jurisdiction of the Kigoma-Ujiji Municipal Council is characterised by sandy soil and its hills are affected by severe soil erosion. The soil erosion is further aggravated by deforestation.

4.2.6 Hydrology

There is no permanent or temporary water course that crosses the project site. The nearby water body is the Lake Tanganyika which is located about 550 meters from the actual proposed project site. The natural slope to the western side and various storm water channels prevents storm water from stagnating on the project site during heavy rains. The lowland /valley areas interconnect with the major perennial river Luiche which drains into the lake.

4.2.7 Air quality, noise and vibrations levels

There is no data available with respect to ambient air quality, noise and vibration for the project site and general project area. However, it is generally believed to be good, since there are no major sources of pollution and that the area is not likely to be affected by long range transport of pollutants. For the purpose of establishing the baseline condition of the area for future monitoring, this study established air quality monitoring stations (AQMS) to monitor levels of dust, ambient pollutant gases, noise levels and vibrations. These AQMS were selected based on the norms prescribed by local standards (Environmental Management (Air Quality Standards G. N. No. 237) Regulation, 2007 and the Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations 2015) and international guidelines and predominant wind direction at the area during the study. The methods used for this environmental monitoring study to quantify pollutants, noise and vibration levels are those established by local and international environmental governing bodies, proposed procedures by equipment's manufacturers, and environmental expert's knowledge.

4.2.7.1 Noise levels measurements

The approach taken in determining existing condition on the site as related to noise was to conduct a review of available historic data. The review came up with no available data for that site. The ambient

day noise levels within the project area and nearby surroundings were measured in accordance to ISO 1996 -1:2003 using a digital sound level meter Sper Scientific type 850069 with measurement range of 30 to 130dB (A). The device meets ANSI S1.4 type 2 standards and conforms to IEC 651 type 2, with a reading accuracy of ± 1.5 dB(A). Prior testing, the device was calibrated using electrical calibration with built in oscillator (1 kHz sine wave). The recorded noise results were then compared with Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015 limits together with World Bank (WB) and International Finance Cooperation (IFC) guidelines. During the survey period, daytime (Lday) noise levels were recorded at the identified four (4) different locations as indicated below. The average noise levels in all four sampling points' range between 40 and 50 decibels. Minor disparities between points are accounted due to different wind movement at different location. Despite the fact that wind is also a source of noise (as a background noise), it also carries sound waves with it and thus contributes differently on acoustic measurement. Other factor that contributes to minor disparities are from the generating sources as they are not uniform (i.e., human movements, insects, birds) in the study area.

The noise levels recorded at four stations were within the Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations (2015) limits and WHO/IFC guidelines.

4.2.7.2 Ambient dust (particulate matter) in terms of TSP, PM₁₀ and PM_{2.5}

Dust level (Suspended Particulate Matter) was measured using TSI DustTrak™ 8530 Aerosol Particulate Monitor that allow automatic and continuous data recordings in accordance to manufacturer procedure. The device has been tested according to the standard delivery schedule and complies with the EN 50081-1:1992 and EN 50081-2:1993 standards. With a resolution of 0.001 mg/m³ (1µg/m³), the device is simultaneously capability of testing dust particles of different dimensions (microns of 10 and 2.5 and >10). On taking measurements, the device was placed at breath height of about 1.5 meter from the ground to monitor dust concentrations at each identified station. This position is assumed to be a relatively the breathing zone of the people at their respective locality or working environment. The day time average particulate matter concentrations recorded at four (4) sampling stations ranged from 0.010 to 0.021 mg/m³ for TSP; 0.004 to 0.011 mg/m³ for PM₁₀; and 0.002 to 0.005 mg/m³ for PM_{2.5}, with the minimum and maximum values been measured at AQMS1 and AQMS4 respectively. Moreover, the recorded data were compared with prescribed available limit to check their compliance with both Environmental Management (Air Quality Standard) Regulations, 2007 and WHO/IFC guidelines. The measured TSP, PM₁₀ and PM_{2.5} levels were well below their corresponding limits prescribed by the Environmental Management (Air Quality Standards G. N. No. 237) Regulation, 2007; WB/IFC for ambient air quality.

4.2.7.3 Vibrations

Data logger vibrometer was utilized to quantify the ground vibration at an accuracy of $\pm 5\%$, acceleration of 200 m/s² and a wide frequency range of 10 Hz to 1 kHz in accordance to European standard EN 14253:2003. At each identified station, diurnal readings covering morning and afternoon hours were recorded and their mean value was used to represent the vibration level at that particular station. On taking measurements, the accelerometer transducer was mounted on the ground to record both ambient and peak vibrations. To produce accurate results, the transducer was secured in direct contact with the ground. The levels of vibrations were recorded in terms of Peak Particle Velocity (PPV) in millimeters per second in the vertical direction to secure data associated with the project site. The vibration levels were compared with Occupational Safety and Health (Working Environment) Regulations, 2016 limit of 5 mm/s PPV and also were compared with British Standard of 0.3mm/s and 0.15 mm/s PPV. The highest vibration of 0.10mm/s PPV was recorded at AQMS3. However, based on the recorded data, the vibration level recorded are considered less significant as did neither exceed the 0.15 mm/sec PPV criteria established

to evaluate the extent that can easily be detected by human nor exceed 5 mm/sec PPV criteria established for conducive working environment for a person at work.

4.3 BIOLOGICAL CHARACTERISTICS

4.3.1 Flora

The project site is within an area designated for development of academic facilities for teaching students and there is a building already constructed on site. Due to that much of the indigenous vegetation in the area has long been cleared off to give way to other land uses practiced on the area. Wherever the natural vegetation has been destroyed by human activities such as grazing, farming and fuel wood collection, regenerating bushes mixed with annual herbs and grasses form a typical induced vegetation.

In the general project area (Plot No 17, Block A) grass species with few herbs and forbs occupies the largest part. All grasses and most of the herbs are annuals and biannual. Common grass species and herbs recorded on site are presented in table 4.1 below.

Table 4.1: A List of Annuals and Bi - annuals and their general uses at OUT Project site

Sn	Scientific Name	Local Name	Family	Use
1	<i>Cemtenopsisglacilenta</i>	Mlyandusi	Amaranthaceae	
2	<i>Astripomealanchnosperma</i>	Mhata	Convolvulaceae	Fodder (dry)
3	<i>Neorantanenianitis</i>	Mnhulwa	Papilionidae	Fodder (dry)
4	<i>Vernonia sp.</i>	Mdulwe	Compositae	Medicinal &Nector
5	<i>Cleome hirta</i>	Mhilile	Capparidaceae	Medicinal
6	<i>Arstidaadscensionis</i>		Graminae	Edible medicinal
7	<i>Panicum sp.</i>		Graminae	Fodder
8	<i>Cyperus spp.</i>		Cyperaceae	
9	<i>Tephrosia villosa</i>		Papilionidae	
10	<i>Panicum sp.</i>	Mgunga	Papilionidae	
11	<i>Cynodonsp.</i>	Mahanze	Gramineae	Fodder

Vegetations in the cultivated land are characterized by a cleared land replaced with agricultural crops. Common crops are Mango trees (*Mangifera indica*), Tomatoes, Onion, Green Pepper, Okra, Ngogwe (Nyanyachungu), Cassava (*Manihot esculenta*), Sweet potatoes (*Ipomoea batatus*), Pumpkin (*Cucurbita maxima*), Chinese cabbage (*Brassica chinensis*), Rubber/Kisamvu (*Manihot glaziovii*), Okra (*Hibiscus esculentus*) and Amaranth (*Amaranthus hybridus*). Most of crop present on site are season and harvesting of the crops will be given a first priority. Crops will be harvested by the owner before construction start and therefore no compensation will be paid for crops. OUT will conduct meetings with current users of the site and will inform about the starting of the construction works. This meeting will be convened six months before commencement of the construction works.

Most of the species recorded here are of low conservation concern (IUCN – near threatened) and *Brachystegia spiciformis* (CITES Appendix II category). Majority of the plant species recorded in the proposed project area is represented elsewhere in the adjacent woodland, acacia woodland, bushland and thicket.

4.3.2 Fauna

The proposed project area was surveyed using methodology outlined in the African Forest Biodiversity (Leon *et al.*, 2002). Literature review and interviews with the locals to get information on commonly sighted or visiting animals in the area and if there exists any migration corridor were also employed. Mammals were observed and identified while walking along transect in representative habitats and through observation of animal signs such as droppings, footprint, burrows or vocalization. Domesticated animals frequently found grazed in the general project area outside the core earmarked project site include cattle, goats, and sheep. Other reported by stakeholders and/or occasionally visiting fauna include small wild animals (rodents and squirrels), reptiles (snakes and lizards (i.e., striped skink (*Mabuya striata*)); insects (butterflies and terrestrial macroinvertebrates); avifauna (passerine birds, magpie shrike, crows, francolins, hawk and herons). Moreover, droppings, footprints and/or burrows of rats, birds, rodents, hare and insects were also seen in the project area, further signalling the presence of the named fauna in the project area.

The project area is highly disturbed by various human anthropogenic activities and main fauna reported by local people are snakes, lizards, burrowing rodents and various insects including butterflies, grasshoppers and ants. There are a number of termite hills on the area. Domesticated animals particularly goats illegally graze on the project land. The presences of nearby human settlements that generate bird feeds (garbage); vegetation's - trees, bushes and tall grass have attracted good numbers of birds including partridges, and birds.

4.4 SOCIO-ECONOMIC SETTING

4.4.1 Demographic Profile

Villages and ward population data are very important for fair allocation of the project available employment opportunities and in planning of sustainable initiative support programme. According to the 2022 National Census, Kasimbu Ward was found to have a total population of 5,234 (2,491 male and 2,743 female) with average household size of 5.0. Based on the population census reports of 2022 the Kigoma-Ujiji Municipality had a total population of 215,458, (104,185 being male and 111,273 Female) with Average Household Size of 5.0. The population growth rate is estimated at 1.5 while the national level is estimated at 2.7; average number of people per household is 4.0. In the Municipality the population density is unevenly distributed. About three quarters of the Municipal population live in the central wards of the Municipality. Gross population density of the Council is 1,127 people per square kilometer.

Like many other urban centres, Kigoma-Ujiji experiences migration both in and outside the Municipality. According to household's socio-economic survey conducted, 80 percent of the households interviewed were migrants from both within and outside the Region. The in-flow of the people is influenced by various reasons including different economic activities as well as the political instability in the neighbouring countries. Due to political instabilities in the neighbouring countries, including Burundi and D.R.C, which border Kigoma-Ujiji Municipality, there are also illegal immigrants, a factor which led to the increase of the number of populations within the Municipality.

4.4.2 Ethnic Groups

The main indigenous ethnic group of the project area is the Waha, which is also dominant in all the wards of the Kigoma-Ujiji Municipality. There are a few groups of mixtures of Nyamwezi, Sukuma, Fipa and people with origins from the neighbouring countries like the DRC, Rwanda and Burundi. Kigoma Ujiji Municipality is also dominated by the Waha as an ethnic group. The households socio-economic survey

conducted in 2016 shows that 69.9 percent of the people within the Municipality are the Waha, while other tribes constitute the remaining percent, i.e., 30.1 percent of the total population. The composition of the other tribes includes the Goma, Horohoro, Manyema, Nyakaramba, Bembe, Bwari, Bondo, and Masanze. There are also tribes like the Kusu, Chagga, Fipa, Nyakyusa, Sukuma, Haya, Jita, Zaramo and Nyamwezi. These other ethnic compositions are mostly immigrants from other regions of Tanzania and the neighbouring countries of DRC, Rwanda and Burundi. The Ujiji centre is dominated by Manyema tribe which is an agglomeration of minor tribes of Wabembe, Watongwe, Wabwari and Wagoma.

4.4.3 Land use

The proposed project site situated at Plot No 17, Block A, Busomero Mtaa and the use of the land is Use group "K" use classes (b) as defined in the Urban Planning (use Groups and Use Classes) Regulations, 2018 which is compatible with the intended project in the area. The Kigoma-Ujiji Municipality covers a total area of 12,800 hectares, which includes planned and unplanned areas. While the built-up area covers 7,850.8 hectares, which is about 61.3 percent of the total area of Kigoma-Ujiji Municipality, un-built-up area that is largely used for agriculture, accounts for about 38.7 percent (4,949.2 hectares). The planned area covers 3,530.1 hectares, which is about 27.6 percent of the total area of Kigoma-Ujiji Municipality whereas the unplanned residential area covers 879.2 hectares which is about 6.9 percent of the total area of the Kigoma-Ujiji Municipality.

A large part of the Municipality, especially in wards situated in the peri-urban areas, are not planned and developed for urban functions but are largely used for agricultural activities and forestry such as in Kagera and Bangwe Wards. This is a potential area for future urban expansion and if funds would be available, they could be acquired, planned, surveyed and allocated for land developers to curb future expansion of the informal settlements. Urban agriculture is largely practiced at Kagera Ward especially along Luiche River which passes in the south-east of Kigoma-Ujiji. This area constitutes Luiche Delta which is potential for paddy production. Figure 4.3 depicts the existing land use in Municipality.

4.4.4 Economic activities

The general project area and the Municipality at large has a favourable land for agricultural activities and other types of economic activities. About 90 percent of the people are employed in urban agriculture while the remaining population is employed in fishing, trade and commerce, bee keeping, and lumbering just to mention a few. The total arable land for the region is approximately 1,200,000 hectares out of which only 280,000 hectares are under cultivation which is equivalent to 23.3 percent of the total area. The Municipality is also endowed with tourist attractions, particularly the beaches along the shores of Lake Tanganyika and the historical town of Ujiji, which is also the major tourist attraction, contributing to the Municipal economy. Furthermore, the strategic location of Kigoma Ujiji Municipality at the heart of the Great Lakes makes it an important trading port for East Africa.

Urban Agriculture

Urban agriculture involves both crop cultivation and animal husbandry. According to the household's socio-economic survey conducted, crop cultivation is practiced by about 33.4 percent of the total population within the Municipality. The crops grown are both for food and cash. The main food crops grown in the area are cassava, maize, legumes, bananas, paddy, sweet potatoes and beans. The main cash crops are palms and horticultural crops (including Fruits and Vegetables). Most of the farming activities are conducted in parts of Kitongoni, Machinjioni, Buhanda, Businde, Katubuka, Kibirizi, and Kagera wards.

Livestock sector

Livestock keeping is also an economic activity in the general project area. The livestock sector employs about 0.2 percent of the total population of Kigoma-Ujiji Municipality. Animals which are kept include goats, cattle, sheep, pigs and poultry. Poultry keeping is the leading urban farming activity practiced in Kigoma-Ujiji with a total population of 108,892 poultry distributed in various wards. A comparison of the different types of animals kept shows that sheep is the least in terms of number of animals (which is 588), followed by cattle (972). Cattle keeping is practiced both intensively (zero grazing) as well as extensively.

In terms of livestock infrastructure facilities, the Municipality has two (2) abattoirs, one (1) slaughter slab, one (1) dog dip, as well as two (2) hide and skin sheds. While the named facilities are currently being used by the livestock keepers, there are three cattle dips which are out of service, i.e., not working. Moreover, the Municipality lacks a livestock market. The major challenges facing livestock keeping include animal diseases such as tick-borne diseases, East Coast Fever, heart water, babesiosis and bovine anaplasmosis. The sector also faces challenges related to lack of demarcated land for pastures as well as shortage of extension services including livestock field officers as well as transport facilities.

Fishing

Fishing is one of the main economic activities dominating the economy of Kigoma Ujiji Municipality. Fishing activities are carried out in Lake Tanganyika. The Municipality has a distance of about 50Km of Lake Tanganyika shore line in which fish production potentially is high. Fishing is carried out by artisanal fishermen. It contributes about 30% to the urban economy annually by creating employment opportunities to youths and women in fishing, processing and marketing of the fish products. The predominant fish species are „Dagaa“ (*Stolothris Tanganyikae*) and „Migebuka“ (*Lates steppers*) which are endemic. Lake Tanganyika is also rich with other aquarium species, including *Limnothrissa Miodon (lumbu)*, *Boulengerochromis Microlepis (Kuhe)*, *Lates Angustifrons (Ngomba)*, and *Oreochromis Tanganicae (Ngege)*. Fish catch from Lake Tanganyika is marketed to various parts of the country. The surplus produced is exported to the DRC, Burundi, and Zambia.

Tourism

The project area is rich in tourist attractions, ranging from historical sites to natural and cultural attractions. Ujiji is a historical Town, which began in the Arab era as a major slave-collecting centre. It is also a place where the ancient explorers Dr. David Livingstone and Henry Stanley, met (Rendezvous point of Doctor Livingstone and Henry Morton Stanley at Ujiji). The Dr. Livingstone historical site where main historical tools are preserved. A beautiful belt surrounding Lake Tanganyika is another attraction feature. The Municipality is surrounded by rugged mountains and forests that make it a pleasing and beautiful location for tourism. The town makes a good overland base for visits and chimpanzee safaris to both the Gombe Stream National Park and the Mahale Mountains National Park, the wildlife rich game reserve of Moyowosi, the beautiful golden sand beaches along Lake Tanganyika, and the Livingstone Memorial Monument. The beaches and fresh air from Lake Tanganyika which is the second deepest lake worldwide is also part of the tourist attractions in Kigoma-Ujiji Municipality.

Trade and Commerce

Trade and commerce are an important economic activity in Kigoma Ujiji Municipality. About 75% of Kigoma/Ujiji Municipality residents earn their living from trading, especially from the informal sector trade activities. According to the data obtained from the Municipal Finance Department, there are 16,700 registered businesses in Kigoma Municipality (Table 3.2). Majority of the businesses (about 50 percent) are retail shops, while the rest include groceries and bars, carpentry, restaurants, processing industries, petrol stations, hair dressing saloons as well as garage and workshops just to mention a few. A large number of shops are retailers selling manufactured and industrial goods. Goods like rice, beans, maize, sardines, clothes (vitenge) are sold at Kigoma and neighboring countries like DRC, Burundi and Zambia.

About 70 percent of the businesses are located in the three main markets (Kigoma, Mwanga and Buzebazeba) the other six small market centres are Ujiji, Kagera, Gungu, Nazareti, Kibirizi, and Katonga. The development of trading activities in Kigoma Ujiji is influenced by its geographical location, which attracts people from different regions as well as neighbouring countries, particularly the DRC, Zambia, and Burundi. This is attributed to the available means of transportation such as roads, railway and the water ways (Lake Tanganyika).

Mining

Mining in the Municipality involve largely extraction of building materials, mostly conducted along Masanga hills and the valleys. The main materials that are extracted include sand, aggregates and stones, which are used for building purposes. The mining activities provide employment opportunities to the residents, which contribute to their income. The extracted sand is sold at a price ranging from TZS30,000 to 35,000 per tonne. Despite its usefulness, the uncontrolled extraction causes soil erosion within the specific areas and unpleasant environment due to the presence of un-filled pits.

Employment structure

People in the project area are employed in various economic sectors, including agriculture, petty trade, fishing, business, industrial, construction works, public, and private sectors. According to the household's socio-economic survey conducted in 2016, about 80 percent of the households interviewed are self-employed while the remaining 20 percent is employed either in private or public sectors. Agriculture employs about 33.5 percent of the population followed by trading and small businesses, which employs for 30 percent of the households. Table 3.3 provides a summary for the sectors of employment in Kigoma-Ujiji Municipality.

4.4.5 Economic Infrastructure

Roads and transportation

The project area is linked with the outside areas by road, air, water as well as railway transport systems. The Municipality is well linked to the countries of Congo, Rwanda and Burundi through road, air as well as water transportation. Continued enhanced transportation system is of paramount importance for the socio and economic development of the Municipality. Kigoma Municipality has a total length of 378.44 kms of roads. The Municipality has one primary distributor road which is Lumumba Road, which links Kigoma and Ujiji to the old Kasulu Road. Various collector roads exist in Kigoma Ujiji Municipality. These include Kigoma-Bangwe, Kigoma- Kibirizi, Mwaisenga, Posta- Bangwe via paradise beach, Posta- Airport via Mwaisenga roads. Other collector roads are Livingstone, Kwamchaga road, Bima, and Nazareth roads all linking to Lumumba and Kasulu roads. There are also various access roads such as Stanley Avenue, Kaya Street, Kibirizi street, Kanisa street, Mlole street and Kitunda street.

Air Transport

The Municipality has an airport situated 10 kilometers from Kigoma Town centre occupying part of Katubuka and Busine Wards. The airport constitutes a 3,100m x 45m run away surfaced with bitumen construction. Currently the airport serves small and medium aircrafts both commercial and non-commercial. Commercial airlines operate between Kigoma Ujiji and Dar es Salaam City. Currently two airlines; Air Tanzania and Precision Air provide scheduled flights at Kigoma airport. The airport also serves refugee relief camps and some regional traffic to and from Rwanda, Burundi and Democratic Republic of Congo. The UNHCR and Red Cross international, who provide relief services to Burundian and DRC refugees, operate frequent flights between Kigoma and Dar es Salaam, Mwanza, the DRC, and Burundi. Kigoma Hilltop Hotel also provides airlifts to tourists visiting the Mahale National Park and the safari camps at Muyowosi Game Reserve.

Marine Transport

Water transportation in the project area is facilitated through Lake Tanganyika, which is shared by four countries, namely; Burundi covering 8 percent of the lake; the DRC occupying 45 percent; Tanzania with another 45 percent and Zambia, which shares the remaining 2 percent. The Lake Tanganyika port is an important service point between the region and the neighboring countries. The port has been a major contributing factor to the smooth trade exchange with these neighbours. The port has a cargo handling Capacity of 150,000 metric tonnes per year, but due to the limited/poor storage and handling facilities, it can currently handle up to 60,000 tonnes only per year.

There are two ships namely Mv Liemba and MV Mwongozo which are operated and managed by Marine Shipping line. Mv Liemba and Mv Mwongozo are both passenger as well as and cargo ships which ply the waters of Lake Tanganyika, docking in all the four countries of DRC, Zambia and Burundi. The Mv. Liemba has a capacity of ferrying 200 tonnes of cargo and 700 passengers while Mv. Mwongozo has capacity to ferry 80 tonnes of cargo and 400 passengers. The Marine Shipping line has also 3 other small ships for cargo.

Central Railway Line

The Kigoma-Ujiji Municipality is one of the terminals of the railway line that starts from the port of Dar es Salaam. There are both; regular passenger trains and frequent cargo trains plying on what is generally referred to as the central railway line. The 1250 km railway branches off at Tabora (840 km from Dar es Salaam) and proceeds northwards to Mwanza on the shores of Lake Victoria. There are three passenger trains and on average three cargo trains to and from Kigoma per week. The railway stations include Kigoma as a terminal on the other end, and other smaller stations are at Luice, Kandaga, Kalenge, Kazuramimba, Lugufu, Uvinza, Malagarasi and Nguruka. The cargo trains carry about 20 loaded wagons with a capacity of 2,400 metric tonnes; comprising incoming cargo of mainly transit goods to DRC and Burundi such as wheat, building materials, fertilizers, sugar and fuel. Return cargo from Kigoma to Dares Salaam include salt from Uvinza Salt Mines, coffee, sardine fish, beans, fruit and vegetables.

Energy

The project area is off grid; grid connections are underway through the Northwest Grid (Geita –Nyakanazi – Kigoma) with a 220KV, 500 kilometres transmission line. Currently the electricity generation in Kigoma Ujiji Municipality is 6.5 Megawatts (MW) from five (5) diesel fired machines/engines with 1.25 Megawatts of production each. The TANESCO Kigoma power station located in Bangwe Ward is installed with the 5-diesel fired ABC- 8DZC engines; each with a capacity of 1.25MW making a total installed capacity of 6.25MW. The construction of TANESCO Kigoma power station started in 2009 and started to generate electricity in June 2010, before then, the TANESCO Kigoma power station was installed with Wartislla and Perkins Generating sets which are now out of operation due to deterioration. Currently, the station carries a total maximum load of demand of 5.063 MW, which is about 81% of the total station available capacity. The power generated is currently sufficient for the present demand. Kigoma power station does supplies power not only to Municipality but also to the new Districts of Uvinza and Buhigwe.

Communication Networks

TTCL and mobile operators - Vodacom, Celtel, TIGO provides telephone and fax services mostly in urban areas. Full postal services are provided in nine (9) urban and semi-urban areas of Kigoma, Ujiji, Kasulu, Kibondo, Uvinza, Mabamba, Manyovu, Mwandiga and Nguruka and twelve sub-post offices located in the minor towns or trading centres.

4.4.6 Social Services Infrastructure

Health and health services

The project is served by the UJJI Health Center. The facility is located in Kasimbu ward to provide Health Center services with facility number 108046-4 and registration identification number 1053. The centre is owned by the government and it serves a catchment area of about 215,000 people through several departments including Outpatient, Inpatient, RMNCAH, Lab, Pharmacy and HIV Care and Treatment. Diseases of public concern and cause of higher morbidity and mortality rates are Malaria, Anemia, Cholera, Tuberculosis, Diarrhea, Clinical Aids, Card Disorder, Meningitis, Intestinal Worms and Burn. Generally, the Municipality has a few facilities that provide services to the community surrounding the project area, which are owned by voluntary agencies, private sector and the government.

Education

Buse Village is served with one public primary school (Primary School) and this institution is Government owned. It is mixed (Contain both Boys and Girls) Primary School. Within the area there is one Secondary school namely Kasingirima secondary school. This school is located about 150 meters from the project site. Primary Education development programme (PEDP) has tremendously increase enrolment in our schools resulting to the shortage of educational requirements such as classrooms, teacher houses, text books, teachers' desks etc. These short comings have risen up more problems in implementing education activities in schools and in one way or other bring environmental problems. Education sector in Kigoma is among of many sectors which contribute to the development of the Region.

Water Supply

Water in the project area is supplied by the Kigoma-Ujiji Urban Water and Sewage Authority (KUWASA). KUWASA gets water from Lake Tanganyika, as the main water source. There are also springs, namely; Rutale spring and Nyakageni spring located at Kipampa Ward and Katubuka Ward respectively, both of which supply water to the KUWASA. The water from the different sources including the Lake as well as the springs is treated to disinfect it mainly through chlorination, which is done using manually controlled inline system. KUWASA has several water storage tanks located in various parts of the Town to facilitate distribution of the water by gravity. The storage tanks are strategically located to facilitate water flow by gravity and to supply water into their respective zones of distribution. Households depend on alternative sources, including water vendors, wells, springs, rivers and lakes to meet their domestic water needs. Some of the households that are not connected to KUWASA for domestic water supply, purchase water from neighbours.

There is a high demand for water in Kigoma Ujiji Municipality which is not met by the KUWASA. The volume of water demand is 26,000 cubic metres per day while the supply is about 17,000 cubic metres only per day. The piped water supply covers 65 percent of the Municipal residents and Water Supply capacity is only 37 percent of the total demand. Moreover, KUWASA is facing irregular water supply.

Solid Waste Management

The Municipality has 19.56 hectares of land used as a land-fill for solid waste disposal. The landfill is located at some 6 kilometres from the Municipality, at Msimba Ward in Kigoma District Council. The Municipality disposes most of its waste at Msimba landfill through the Municipal operated trucks. However, the data collected through households survey shows that households in the Municipality use various other ways to dispose their domestic solid waste. The analysis shows that 40.7 percent bury the waste in pits, 19.2 percent throw their waste on river valleys, 14 percent disposal through the Municipal trucks and 9.4 percent burn the waste. It was further revealed that 13.8 percent of the households use a combination of burning as well as burying, while 2.8 percent dump their waste on open areas within or outside their compounds.

Sanitation

The project area and Kigoma/Ujiji Municipality in general do not have a sewerage system and disposal of wastewater and excreta is based on onsite sanitation methods. However, there are currently 2 anaerobic ponds located in Kagera Ward as Faecal sludge Treatment plant coupled with the wetland system and drying beds. Waste water from the septic tanks is collected using a cesspit emptier truck owned by Kigoma Urban Water Supply and Sanitation Authority (KUWASA), charges being Tshs 100,000 per trip for emptying from a domestic, institutional or commercial premise; which most households find to be unaffordable. This situation, coupled with the Municipal's lack of central wastewater collection system, is the primary cause of the pollution of the subsoil, the drainage streams that traverse the Municipality, Lake Tanganyika and the major storm water retaining ponds located in the low laying areas. The commonly used onsite sanitation methods are Septic Tanks with Pour Flush (10%), Ventilated Improved Pits (24%), Improved Traditional Pit Latrines (21.5%), Traditional Pit Latrines (42.8%) and No Toilet (0.2%) (KMC, 2020). Households which have no toilets are predominant among the urban poor, located in the peri urban and un-planned areas of the Municipality. Although some members of these households somehow manage to access toilet services, e.g., through public toilets, it can be assumed that 0.2 % of Kigoma-Ujiji Municipality population practice open defecation.

4.4.7 Labour and working condition

Child labour in Tanzania continues to affect an estimated 4.2 million children aged 5–17 years, about 29 percent of this age group. This share is only one percentage point lower than that of a decade earlier, suggesting that progress against child labour has stalled in the country. It should be underscored in interpreting these numbers that they represent conservative estimates of child labour, because they exclude so-called “worst forms of child labour other than hazardous work.” These forms of child labour include child trafficking, commercial sexual exploitation, child slavery and the involvement of children in illicit activities. In Tanzania, as in most countries, information on children involved in the worst forms of child labour other than hazardous is limited due to both methodological difficulties and cultural sensitivity.

The Employment and Labour Relation Act, 2004 covers prohibition of child labour (minimum age-14 years' old), forced labour, equal opportunity and eliminating discrimination, freedom of association, good working condition (such as hours of work, paid leave). Tanzania ratified the ILO Convention No. 182, known in short as the Worst Forms of Child Labour Convention (see section 3.7.4) on 12:09:2001. However, Child labour in Tanzania continues to affect an estimated 4.2 million children aged 5–17 years old, about 29 percent of this age group as reported in 2014 (ILO, 2018). The progress against preventing child labour in Tanzania has been very slow and the estimates provided excludes the worst forms of child labour covering sexual exploitation and child slavery. The majority of children in child labour have been identified in family-based agriculture. Nearly 95 percent of children in child labour are in the agricultural sector and nearly 93 percent are unremunerated according to ILO 2018.

According to the World Bank 2021 based on ILOSTAT database, the number of people in forced labour has dramatically increased in Tanzania from approximately 20 million in 2009 to 28 million in 2020. In the general project area, the majority of local people work in agriculture industry and some have petty businesses. The OUT shall enter into a contract with all workers and follow the remuneration policy as developed by the OUT.

4.4.8 Gender and related GBV issues

4.7.7.1 Background

In Tanzania, more than one-third of all women (39%) have suffered from physical violence at some point since age 15. One-third (33%) of women suffered from acts of violence during the previous 12months.

This proportion is substantially higher for divorced, separated or widowed women (46%) than single women (21%). More than four-fifths of women who have ever experienced physical violence report that the perpetrator of the violence was a current or former husband/partner. Ten percent (10%) of women had their first sexual intercourse forced against their will (NBS, 2011). In Tanzania, 36.9 percent of parliamentary seats are held by women, and 12.0 percent of adult women have reached at least a secondary level of education compared to 16.9 percent of their male counterparts. For every 100,000 live births, 524.0 women die from pregnancy related causes; and the adolescent birth rate is 118.4 births per 1,000 women of ages 15-19. Female participation in the labour market is 79.6 percent compared to 87.3 for men (UNDP, 2020). There is a recognition in Tanzania of gender discrimination and gender equity in different facets of life (World Bank, 2004).

According to the United Nations Development Programme (UNDP 2020), Tanzania has a GII value of 0.556, ranking it 140 out of 162 countries in the 2019 index. The GII for Tanzania shows a low score in relation to gender equality in-comparison to global standards. There are key challenges for gender equality in Tanzania including girl's access to education, high unemployment rate among young women and challenges for women accessing finances. According to VEOs, women in the project area spend more time in attending home activities and play multiple roles in the community such as income generation activities, parenting, social and political activities. The decision making in a household is mainly by men.

According to the UN Women (2022) a total of 61 per cent of women aged 15-49 in Kigoma have experienced sexual or emotional violence perpetrated by their husband or partner, with 33.4 per cent suffering violence in the 12-months preceding the Demographic and Health survey of 2015/16. The 2010 Human Development Report introduced the gender inequality index (GII), which reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity. Reproductive health is measured by maternal mortality and adolescent birth rates; empowerment is measured by the share of parliamentary seats held by women and attainment in secondary and higher education by each gender and economic activity is measured by the labour market participation rate for women and men (UNWomen, 2021). GBV has a greater impact on women and girls, as they are most of often the survivors and suffer of great physical damage than men when victimized (Odunga, 2021). GBV results from gender norms and social and economic inequities that give privilege to men over women. The World Bank gender assessment report (2022) provide that 40% of women ages 15-49 have experienced physical violence at some point, 22 percent have experienced physical violence in the last year and 17 percent have experienced sexual violence. Sexual and physical abuse is even higher among married women. Violence against children is also prevalent whereby nearly 75% of girls and boys experience physical violence by the age of 18, and 30% of girls' experience sexual violence before adulthood. The Government of Tanzania developed the NPA-VAWC, 2017/18-2021/22 to reinforce its commitment to eliminating violence against women and children. 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, OUT 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. At the District level there is a Department of Community Development, Social Welfare and Youth. The department has a role for raising awareness for development activities for the purpose of eradicating poverty and improving livelihood. The Department also facilitates programmes to improve local livelihood as well as sustaining the welfare of women, youth and children, vulnerable groups as well as wider community.

4.7.7.2 Existing GBV service provider and support system

The government has put in place mechanisms to improve the likelihood that high-level policies on GBV, such as the NPA/VAWC, are successfully translated into improvements on the ground. Women and Children Protection Committees have been established at all levels (Mtaa, ward, council, Region and National level) and have an inclusive membership, with representatives from government, community leaders, and the community members themselves (World Bank, 2022). However, at Busomero Mtaa the Women and Children Protection Committee has not yet been established. During consultation, stakeholders provided that the family is the primary source of support and comfort for the GBV survivors. The family has a role of providing advice, emotional support, and, in the case of domestic violence, help mediate between the woman and her husband. For the existing practice, married women are expected to first speak with their husband's family members before reporting violence to the police. If the matter remains unsettled, a survivor may then report the matter to her parents and, thereafter, a family meeting for both families can be arranged. Other close relatives and friends such as friends, neighbours, and recognised elders may be invited to participate in the mediation meetings.

Failure to resolve the matter at the joint family meetings, is it socially acceptable to approach external sources of support and the immediate is the Mtaa Government Office. GBV survivors of violence go to their local leaders primarily for advice, referrals (within the local government hierarchy) and marital reconciliation services. The leaders at Mtaa include Ten Cell leader, Mtaa Chairman and Mtaa Executive Officer. All attempts would be made to settle the GBV issue at this stage. If the matter not solved, then the matter will be brought before the legal and local courts for settlement. Legal aid mentioned by stakeholders include Ward Reconciliation Councils, Primary and District Courts, Gender and Children's Desks at police stations and legal aid services. Legal aid is most often accessed through CBOs and NGOs. The NGOs available in the area include GAESO and Voice of Empowered Women Foundation (VEWF) all based at Kasimbu Ward, Kigoma-Ujiji Municipal Council. These NGOs empower communities/to address gender-based violence and support survivors. Also respond and reports GBV cases to relevant authority and empower the community to openly discuss the effect and causes of the GBV/FGM and commonly decide on alternative rites of passage.

4.7.7.3 Gender gap at the OUT

The significant statistics show that the percentage of female Science students at the university level is very low. The construction of Science laboratories in the proposed seven zones will be considerably giving special attention to the involvement of female students as part of OUT efforts to promote empowerment of women and girls through science education. The female students pursuing foundation course (OFP) will be considered in special training program on science subjects towards attending laboratory practical's effectively that will enable more females to join up University education in various sciences programmes such as Information and Communication Technologies (ICT) studies. The gender disparity is alarming, there is a need for substantive efforts towards increasing female participation to skills training for employment, science innovation, social wellbeing, inclusive growth and sustainable development. The University will also ensure that during the construction of facilities; access to the facilities as well as provision services take into account needs of female students, staff and visitors as well easy access of people - with special needs such as blind and disabled. Such requirements will also be nested within the framework of programme delivery.

5 STAKEHOLDER ANALYSIS

5.1 INTRODUCTION

The World Bank's Environmental and Social Framework (ESF) includes the Environmental and Social Standard (ESS) 10, "Stakeholder Engagement and Information Disclosure", which recognizes "the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice". ESS10 emphasizes that effective stakeholder engagement can significantly improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. Accordingly, the Environmental Management Act cap 191 and Environmental Management (EIA and Audit) (Amendment) Regulations, 2018, both documents provided procedures for the involvement of stakeholders and the public in the environmental assessment process. For this project a plan for public involvement was developed early in the process. Informing the local people, leaders and key stakeholders about the proposed project was carried out through consultative meetings, key informant interviews, email communication, public meeting and telephone calls. During the consultation process, the stakeholders were taken through the proposed project including its objectives, technologies of implementation and possible impacts associated with implementation of the project. Stakeholders were then given time to ask relevant questions regarding the proposed project to enable the consultants clarify on any issues that they may not have understood properly.

5.2 GOAL OF THE CONSULTATION PROCESS

The involvement of the local population is essential to the success of the project(s) in order to ensure smooth collaboration between project staff and local communities and to minimize and mitigate environmental and social risks related to the proposed project activities. The overall goal of the consultation process is to disseminate project information and to incorporate the views in the design of the mitigation measures and environmental management plan. It is done to ensure the quality, comprehensiveness and effectiveness of the impact assessment to ensure that various groups' views are adequately taken into consideration in the decision-making process so as to avoid conflict at a later stage. Consultation with the stakeholders was aimed at positively conveying information about the proposed project development, clear up misunderstandings, allow a better understanding of relevant issues and how they will be dealt with, and identify and deal with areas which are controversial so as to clarify matters and make adjustments accordingly, while the project is still in its design stage. Stakeholders and public involvement were therefore aimed at assisting the consultant in:

- Improve project design and, thereby, minimize conflicts and delays in implementation;
- Determining the scope of the environmental assessment.
- Deriving specialist knowledge about the site.
- Clarifying any mis-conceptions, mis-understandings, myths and the like that may have arisen from mis-information about the project or local species beliefs
- Improve project design and, thereby, minimize conflicts and delays in implementation;
- Facilitate the development of appropriate and acceptable entitlement options;
- Increase long term project sustainability and ownership;
- Reduce problems of institutional coordination; and
- Gather the information needed to complete the assessment

5.3 THE STAKEHOLDERS IDENTIFIED

Project stakeholders are ‘people who have a role in the Project, or could be affected by the Project, or who are interested in the Project’. Project stakeholders can be grouped into primary stakeholders who are “...individuals, groups or local communities that may be affected by the Project, positively or negatively, and directly or indirectly”... especially... “those who are directly affected, including those who are disadvantaged or vulnerable” and secondary stakeholders, who are “...broader stakeholders who may be able to influence the outcome of the Project because of their knowledge about the affected communities or political influence over them”.

Thus, Project stakeholders are defined as individuals, groups or other entities who: i) are impacted or likely to be impacted directly or indirectly, positively or adversely, by the Project (also known as ‘affected parties’); and ii) may have an interest in the Project (‘interested parties’). They include individuals or groups whose interests may be affected by the Project and who have the potential to influence the Project outcomes in any way. Details about the stakeholders consulted (name of organization, person contacted, etc.) are presented in table 5.1 below and signatures are presented as appendix 2:

Table 5.1: List of Stakeholders Consulted

Level	Stakeholders
Central Government: Ministries, Departments and Agency	Ministry of Water (Lake Tanganyika Basin Water Board-Director office)
	Occupational Safety and Health Authority (Central Zonal office)
	Government Chemist Laboratory Authority (GCLA) centralZonal office
	Fire Rescue-Kigoma Ujiji office
Kigoma Ujiji Municipal Council	Municipal Director Office
Kasimbu Ward Authorities	Ward Development Committee (represented by the Ward Executive Officer)
Busomelo Mtaa Authorities	Chairman, MEO
	Other Mtaa Council members (religious, teachers, traditional chiefs, elders, etc)
Other Stakeholders	OUT-Kigoma centre

5.4 STAKEHOLDERS AND PUBLIC CONCERNS

The study has identified main concerns and issues raised by the different stakeholders. Generally, stakeholders view the proposed project as important project for economic development of the area and national at large as the laboratory provide students with various opportunities to learn and experiment, which plays a crucial role in the ongoing intellectual development of students at any academic level. They added that science labs give students the time, space, and resources to explore and experiment. Summary of the issues are covered here-under, detailed stakeholders’ issues and concerns are presented as appendix 3 of this report.

5.4.1 Project acceptance

The stakeholder stated that the construction of the laboratory is expected to contribute in providing high level teaching facilities on the area and the community is highly positive about its construction and is waiting anxiously. They urged to speed up all the studies that will allow the starting of the construction of the laboratory on planned time without wasting time. The stakeholders were of optimistic that the project will create employment opportunity to the local unemployed youth during its construction phase. In its

operation phase the laboratory will also employ highly skilled and trained professionals and is expected to adopt new and improved technologies.

5.4.2 Developing practical experiences and skills

Stakeholders were of concern that the proposed laboratory is the most important sections of the OUT as it will provides various practical experiences and skills. They added that laboratory experiences include enhancing mastery of science subject matter, developing scientific reasoning abilities, increasing understanding of the complexity and ambiguity of empirical work, developing practical skills, increasing understanding of the nature of science, cultivating interest in science and science learning, and improving teamwork abilities. Also, stakeholders commented that as the project will house the ICT component, this will add more value to the lectures provided by the OUT. The ICT based lectures, presentation and simulations of natural phenomena and large scientific databases are more likely to be effective if they are integrated into a thoughtful sequence of classroom science instruction that also includes laboratory experiences.

5.4.3 Observe the safety measures

Stakeholders pointed out that one of the most important things about laboratories is to follow the safety measure. It is mandatory for each and every user of the facility to follow the safety measures and guidelines given by the laboratory's teachers or assistant. The science labs are very risky therefore users should be advised to observe procedures and rule while using the laboratory.

5.4.4 Increased employment opportunities

Some stakeholders noted that there are many local people within the area qualified for many works who should be considered first for any such work needed, as part of Project consideration for local employment. Contractors, drivers, work clerks and machinery operators will benefit in terms of employment opportunities by the proponent. Likewise, local stakeholders requested that employment opportunities that emerge during project implementation should involve locals with the project especially in non-technical jobs. This will initiate and strength social relationship between the proposed project and the surrounding community. These recommendations have been incorporated into the impact and mitigation measures described in the report.

5.4.5 Increased market base for local products

Stakeholders commented that Engineers/contractor will source equipment for use for the construction works from third parties who will be paid. Further filling material (soil and rock) will be purchased from quarries which will, therefore, benefit from an increased market base for their products and sale of rumble.

5.4.6 Benefit to local producers and suppliers

Stakeholder mentioned that construction of the Science Laboratory Building at Busomero Mtaa will provide an avenue for selling of products by the locals. Local suppliers will have an opportunity to supply different products such as food, timber, cement, and roofing products, which will improve the local economy. This may contribute to increased incomes of the local people. They also mentioned that businesses supplying consumables such as diesel, oil and lubricants for the site machinery will benefit from increased turnover due to the demand increase on account of the proposed project.

5.4.7 Loss /disturbance of biodiversity

Stakeholders were of concern that site clearance is associated with the removal of existing vegetation cover and topsoil. Stakeholders added that vegetation clearance, trampling by people and machines, vehicle and equipment movement will result in wide spread land disturbance and increased erosion. With rain, sediment laden runoffs may empty in aquatic systems and habitats. Typically, when the earth's surface is exposed to the impacts of rainfall, there is an increase in the volume and velocity of runoff. It was advised that the project proponent should avoid unnecessary clearance of vegetations.

5.4.8 Soil and ground water contamination from mismanagement of waste

Stakeholders pointed out that various activities are expected to take place in the project building and as such substantial solid and liquid waste will be generated. If not properly disposed of, waste may provide sites for re-production of vermin and rodents. Effluents from the laboratories if not fully treated or is improperly disposed of, will become a focal point for the spreading of diseases. This is not only in the close vicinity of the proposed-OUT project area but also at considerable distances since bacterial, viral and parasitically infected material is carried away by scavengers, flies and mosquitoes.

5.4.9 Occupational health and safety aspects

Stakeholder commented during construction, workers will be subject to situations that could be detrimental to their health and safety. This may include: injuries when handling construction equipment or from accidental contacts, spills and leakage of hazardous materials, communicable disease hazards due to interactions among the workers or with service providers such as food vendors. Emissions of dust from clearing and excavation works and fumes from vehicles and other machinery and noise and vibrations from construction equipment's. Further stakeholder advised that the developer is required to register the project with OSHA and the initial drawings for the project are required to be inspected and approved by OSHA before project construction/installation. Conducting risk assessment to identify hazards are among of the requirements of the OSHA Act. Likewise, it was insisted that the workers should conduct the medical examination before and after employment while maintaining the periodical checks as required by the Act.

5.4.10 Increased noise and vibration level

Stakeholders at the local level expect construction activities to be undertaken during the day to avoid excessive noise and disturbances at night because the proposed project location is in an academic environment and residential area. The accumulated effects from various sources of noise and vibration can adversely affect the health and well-being of workers, as well as people residing in the proximity of the site. These recommendations have been incorporated into the impact and mitigation measures described in the report.

5.4.11 Increased exposure to diseases

Stakeholders were of opinion that a number of people will be employed by the project. Due to that there will be increased interaction among locals and new project workers. This might increase susceptibility to health problems especially HIV/AIDS and Sexual Transmitted Diseases (STD). Further, the nearby community may be at risk of disease outbreaks i.e., diarrhoea, intestinal diseases, cholera, etc.

5.4.12 Increased number of vehicles during construction

Stakeholders also expressed their concern on the impact of the construction activities on traffic flow in their neighbourhood by blocking roads and damaging the un-tarmacked access road. They added that

construction activities may result in a significant increase in number of vehicles during transport of construction materials and equipment, which will lead to increasing risk of traffic-related accidents or injuries to workers and the community. Stakeholders advised that, during construction work, the OUT should look on how to upgrade the road to tarmacked. The University should use its influence to request the Municipal Council to upgrade the road.

5.4.13 Corporate Social Responsibility

Local stakeholders suggested that the OUT should collaborate with the local community and the Mtaa and Ward office in the interest of corporate social responsibility. It was suggested that local support for OUT will have positive impacts in the community and will result in positive feedback to the presence of OUT project in the area. The OUT is committed to ensuring that the CSR actions, projects and activities are in place to support local communities. Their main focus areas are health, education and environment.

5.4.14 Key issues raised by stakeholders regarding Gender-Based Violence (GBV)

During the ESIA study GBV assessments was carried out seek to identify and improve understanding of violence against women and girls, protective and risk factors for violence, and available services. According to stakeholders a total of 61 per cent of women aged 15-49 in Kigoma have experienced sexual or emotional violence perpetrated by their husband or partner. Lack of adequate services provided to victims of violence, especially in rural areas, has been identified as the reason for the latter not having timely access to appropriate services after acts of violence or abuse against them. Many of the victims have been missing out on vital support due to lack of services such as social welfare, police units and health care facilities at one centre, thus leading perpetrators to continue with such atrocities without fear.

Further they added that the GBV issues in the area are enhanced by poverty, school dropping, bad parenting, drunkenness, witchcraft, drought dominance and culture and identity. The GBV has significant impact at the individual level, with victims suffering from physical and mental effects, loss of earnings and increased healthcare costs. The Community expect that the project will generate a good number of employment opportunities to youths of the area. The project contractor and the OUT management should consider the people especially youth from the local area for casual and permanent employments. Jobs that do not require professions/skills; priority shall be given to local residents of local community. Failure to do so an influx of male construction workers within the project area can be an early warning sign of high risk of project-related GBV, sexual harassment and spreading sexually transmitted diseases (STDs). The health and safety of the project workers and neighbouring community should be given priority and enhanced. Further, in many constructions works similar to the proposed NIT project, women workers are managed and supervised by men. This results in power imbalances often where women are sometimes forced against their will to work in dangerous conditions and use dangerous substances. When women and girls lack power in the workplace, or if their accommodation is tied to their employment, they face greater risks of sexual harassment and violence.

The stakeholders mentioned that the main actions which may minimize the GBV for the proposed project activities include adoption of clear codes of conduct, awareness raising and training of the locals who will be involved in the project activities and OUT should put specific clause in the contract which will favour women in the employment opportunities during construction. Also, complaint mechanisms to address GBV issues should be provided.

It was proposed that once the risks have been identified, it is important to implement the measures that ensure the mitigation of any form of violence heightened by the project, bearing in mind that of the gender-

based violence is cultural and part of identifying the project area. It was provided that it is important to identify how societal structural inequalities based on gender can be reproduced in an institution.

To address gender issue at the project site, it was recommended that OUT should have its own Gender Policy that will include GBV issues based on their planned operations. The project risks are related with influx of people from outside of the area and the transmission of HIV and sexually transmitted diseases (STDs). However, large influx of male workers in the project area, could create a high GBV risk in the project.

6.0 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF ALTERNATIVES

6.1 ASSESSMENT METHODOLOGY

This section of the report assesses the significance of the environmental and social impacts that have been identified by the specialists that formed part of the team which conducted the environmental and social impact assessment process. The team members conducted literature reviews of available information related to the site conditions and concerning similar project operations before visiting the site. During the site visit, the team spent the time -site gathering information, including gathering samples for identification at their offices in Dar es Salaam. The combined site visits by all specialists assisted in integrating ideas and findings between the specialists. The ESIA team undertook a social survey by conducting interviews with a broad spectrum of community members. The role of each specialist was to collect sufficient data to assess the environmental and social impacts. To achieve this, the ESIA team used a standard Leopold matrix (Leopold et al., 1971), which is the best-known matrix methodology available for predicting the impact of a project on the environment. The matrix takes into account impacts on the physical environment (e.g., air quality, soil and ground water quality), the ecology (e.g., flora and fauna) and on human socio-economic settings, as shown in table 6.1. The matrix establishes the relationship between project components and elements of the environment. All impacts identified and described were assessed by a grid evaluation of impact significance based on intensity criteria (including the value), scope and duration.

The intensity of the impact refers to the magnitude of changes disrupting the integrity, function and usage of each component of the environment affected by the project. Its assessment in the context of this project reflects the ecological context or social environment concerned and enhancement of the component. The intensity of the negative impact can be high, medium or low. It is strong when the impact destroys the component, calls into question his integrity or results in a major change in its general distribution or use in the middle. The intensity is moderate when the impact changes the component affected, without jeopardizing its integrity or its use entails a limited modification of its general distribution in the middle. Finally, the intensity is low when the low impact component alters but does not really alter its quality, its general distribution or use in the middle.

The second criterion for assessing impact is the extent that refers to the area affected and the portion of the population affected, it may be regional or local basis. The scope is regional impact if a component is felt throughout a large area or affects a large portion of its population: it is the case in this study of the study area enlarged. The scope is local if an impact on a component is felt over a limited portion of the study area or its population that is in the case of this study to the detailed study area. The extension is timely if an impact on a component is felt in a confined space or limited by some people: that is the limited study area.

The final criterion is the term that refers to the period during which the effects will be felt in the middle. The duration of an impact can be long, medium, short. The time is long when the impact is felt continuously or intermittently over a period exceeding five years or longer than the life cycle of a species. This is often an impact permanent and irreversible. The duration is average / medium when the impact is felt temporarily, continuously or intermittently, during phases of construction or operation. This impacts the duration of which exceeds one year but less than five years, or do not exceed the duration of the life cycle of a species. This type of impact could be reversible. The duration is short when the impact is felt temporarily, continuously or intermittently, during phases of construction or operation. These impacts, the duration of which varies from several days to several months, or during a short part of the life cycle of a

species. This type of impact could be reversible. These criteria are grouped in a grid and serve to clarify the importance of the impact of a project activity on a given component. For each type, the prediction and analysis of the impacts were made on the basis of biophysical characteristics of settlement areas on the one hand and the nature of the activities included in the project. For purposes of this study impacts on the environment, different stages of the project to be considered are: site selection, design phase, mobilization phase, construction and management and operational phase.

Table 6.1: Matrix of impact identification

Project Activity	Physical environment		Ecological environment			Socio-economic setting		
	e.g., Air quality	Fresh water quality	Flora	Fauna	Other ecosystem components	Social	Economic	Cultural
Site Selection Phase								
Activity 1								
Activity 2								
etc.								
Design Phase								
Activity etc								
Mobilization Phase etc...								

6.1.1 Environmental and Social impact rating scale

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

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

To ensure integration of Environmental and social impacts, to facilitate specialist assessment of impact significance, and to reduce reliance on value judgments, the severity of the impact within the scientific field in which it takes place (e.g., vegetation, fauna) was assessed first. After that, each impact was assessed within the context of time and space, and the degree of certainty in the prediction was indicated. The impact was then assessed in the context of the whole environment to establish the “significance” of the impact. This assessment incorporates all social, cultural, historical, economic, political and ecological aspects of the impact. Thus, the severity or benefit of an impact within a specialist discipline was first assessed before the significance of the impact was evaluated in a broader context. Consequently, two rating scales were required, one to determine the severity or benefit and one to determine environmental and social significance.

6.1.2 Severity / benefit

Severity is based on the professional judgement of the various specialists to evaluate the extent to which negative impacts would change the current conditions, or how beneficial positive impacts would be on a particular affected system (for environmental impacts) or a particular affected party (for social impacts). The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious

the impact is when nothing is done about it. The word mitigation means not just “compensation”, but also ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. Mitigation or optimization must be practical, technically feasible and economically viable.

Table 6.2: Severity rating scale

Negative impacts	Positive impacts
<i>Very severe</i>	<i>Very beneficial</i>
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example, change in topography.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no alternative to achieve this benefit. For example, the creation of a large number of long-term jobs.
<i>Severe</i>	<i>Beneficial</i>
Long-term impacts on the affected system(s) or party(ies) could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	A long-term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time-consuming, or some combination of these. For example, an increase in the local economy.
<i>Moderately severe</i>	<i>Moderately beneficial</i>
Medium- to long-term impact on the affected system(s) or party(ies) could be mitigated. For example, it is constructing a narrow road with an area with low conservation value.	A medium- to long-term impact of real benefit to the affected system(s) or party(ies). Other ways of optimizing are equally difficult, expensive and time-consuming (or a combination of these), as achieving them in this way.
<i>Slight</i>	<i>Slightly beneficial</i>
Medium- to short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example, a temporary fluctuation in the water table due to water abstraction.	A short- to medium-term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimizing the beneficial effects are more accessible, cheaper and quicker, or some combination of these—for example, a slight increase in the number of goods available for purchasing.
<i>No effect</i>	<i>Don't know/Can't know</i>
The proposed development does not affect the system(s) or party(ies).	In some instances, it may not be possible to determine the severity of the impact.

6.1.3 Spatial scale

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

Table 6.3: Spatial scale

Individual	Individuals in the area could be affected.
Household	Households in the area could be affected.
Localized	The specific area to which this scale refers is defined for the impact to which it refers.
Study Area	Includes the entire project area.
District	Includes area within the Kigoma-Ujiji Municipal Council and Kasimbu Ward,
Regional	The impacts will be of such a nature that it may affect the Kigoma Region.
National	The impacts will be of such a nature that it may affect the entire Tanzania.
International	The impact would affect resources and processes outside the border of Tanzania.

6.1.4 Temporal scale

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

Table 6.4: Temporal scale

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

6.1.5 Significance

Significance indicates the overall importance of the impact, taking into account all the assessment mentioned above criteria. Significance was assessed in the relevant context, as an impact can be relevant to the either ecological or social environment, or both. By ensuring that all specialists adhered to the abovementioned objective criteria, subjectivity was reduced as far as possible. However, there is always an element of judgment that cannot be removed entirely from the assessment of significance. The significance of an impact is not always directly proportionate to severity, even though one would expect a direct relationship, i.e. an impact with *severity* would be of *high significance*. However, this is not always the case. For example, changes to the geology might be *severe*, but the significance is regarded as *low* since the change in the environment is considered by society as being unimportant.

Table 6.5: Significance of an impact

Significance	Explanation	Examples
Very high	These impacts would be considered by society as constituting a significant and usually permanent change to the natural and/or social environment, and usually result in severe or very severe effects or beneficial to highly beneficial effects.	<ul style="list-style-type: none"> The loss of species will be viewed by informed society as very high significance. The establishment of a large amount of infrastructure in a rural area, which previously had few services, would be regarded by affected parties as resulting in benefits with VERY HIGH significance.
High	These impacts will usually result in long-term effects on the natural and/or social environment that will only be mitigated over very long periods.	<ul style="list-style-type: none"> The loss of a diverse vegetation type, which is pretty common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated. The change to soil conditions may have a severe impact on the natural system, and the impact on the affected parties (in the case of people harvesting natural herbs on the soil) would therefore also be HIGH. However, if no land available elsewhere, this impact could be rated as VERY HIGH.

Moderate	These impacts will usually result in medium to long-term effects on the natural and/or social environment. These impacts are real but not substantial and usually result in moderately severe or moderately beneficial effects.	<ul style="list-style-type: none"> The loss of a sparse, open vegetation type may be regarded as very severe by the specialist. Still, due to the nature of the vegetation and habitats, its significance could be regarded as only being of MODERATE significance. Providing an efficient health service in a rural area would be regarded as being moderately beneficial and result in a benefit of MODERATE significance.
Low	These impacts will usually result in medium to short term effects on the natural and/or social environment. These impacts are considered to cause relatively unimportant and usually short term changes to the (natural and/or social) environment. These impacts are not substantial and likely have a little real effect.	<ul style="list-style-type: none"> The temporary change in the water table of a wetland would be rated as slight, as these systems are adapted to fluctuating water levels. The significance of this impacts, therefore, LOW. The increased earning potential of people employed as a result of development would only be slightly beneficial to people who live some distance away, resulting in a benefit of LOW significance.
No significance	There are no primary or secondary effects that is important to scientists or the public.	<ul style="list-style-type: none"> A loss of Species of Special Concern (SSC) will not occur since none occur in the study area, resulting in NO significant impact.

6.2 SITE PREPARATION/MOBILIZATION PHASE

Mobilization will include clearance of the project site and, if necessary, sites for support facilities (storage, crew); transportation of construction equipment, materials and labour; and setting up and operating of construction base offices; delivering of fuel and water; arranging and connecting tanks, pumps, generators etc.

6.2.1 Positive social impacts during site preparation/mobilization phase

6.2.1.1 Increased income to local communities from employment opportunities

One of the main positive impacts during the project mobilization phase will be the availability of employment opportunities, especially to casual workers and several other specialized workers (including designers, architects, contractors, crew, and other related workers). It is estimated that 50-100 personnel will be involved with the project structure development and recruitment of skilled labour is mostly of Contractor's choice. Employment opportunities are of benefit both economically and in a social sense. In the economic sense, abundant unskilled labour will be used in construction hence economic production. Several workers, including casual labourers, masons, carpenters, joiners, electricians and plumbers, are expected to work on the construction sites from the start of the project to the end. Apart from casual labour, semi-skilled and unskilled labour, formal employees are also expected to obtain gainful employment during construction. Food vendors who are mostly women will benefit by supplying food to the workforce. *This impact is predicted to be positive, cumulative, and short-term to long-term and of moderate significance.*

6.2.1.2 Conflicts due to access restrictions

During mobilisation, construction and operations of the project the piece of land earmarked for development of the proposed project will be enclosed by a wall to prevent intruders and for public safety. Within that the large OUT land (Plot No 17, Block A), there are a number of local access pathways from the main access road to Lake Tanganyika on the Western side of the plot. Also, other noticed pathways are used to access a number of cultivated plots within the OUT plot. Possible impacts caused by blocked access could be nuisance and disturbances to current users of the pathways. However, those pathways were not legally constructed as Plot No 17, Block A is a surveyed land and has a title deed (No. 7073 registered on 07th June 2018). A quick assessment by the ESIA team revealed that there are other alternative authorized roads which could be used by the community in case OUT decide to close these pathways. Further, within the land earmarked for the project there are no access road or pathways. As such the proposed project activities will occur in a designated area only within which no access would be restricted. *This impact is predicted to be negative, long-term and of moderate significance.*

6.2.2 Negative environmental impacts during site preparation/mobilization phase

6.2.2.1 Damage / loss of valuable vegetation cover

Site clearance to give a way for construction works to commence is usually associated with the removal of existing vegetation cover and topsoil. Main Potential impact is loss of /disturbance of biodiversity (flora, fauna and ecosystem). The earmarked land for development of the proposed project has long been cleared off to give way to other land uses previously practiced on the area. The site is overgrown by scattered exotic trees, shrubs and grasses. Thus, clearance in this regard will not result in the loss of vegetation/biodiversity of significance value. Based on the nature of flora and fauna biodiversity in the vicinity of the site the potential for irreversible impacts on these species or their ecological systems is limited. Impacts would be localized and, in some cases, displaced species may disperse to surrounding undisturbed land that borders the site. Further, based on the location and neighboring land uses, site development is not expected to limit or impede migratory pathways for any known fauna. Nevertheless, mitigation measures to minimize ecological effects of construction works are recommended and included. *Therefore, this impact is predicted to be negative, short term and of low significance*

6.2.2.2 Deterioration/impairment of local air quality from equipment's/vehicular emissions

During short period of mobilisation, degradation of air quality will be caused by vehicles and equipment's with internal combustion engines with potential to emit noxious gases such as CO₂, CO, NO_x, SO₂, VOC and CH₄. The greatest potential for impacts on air quality from traffic associated with mobilization of the proposed project would be in the areas immediately adjacent to the principal means of access for mobilization traffics. The extent of the impacts will depend on: number of vehicles operating at a particular time; prevailing atmospheric conditions - wind regime, temperature and rainfall; atmospheric conditions and duration of construction works. It is expected that the number of vehicle movements during mobilisation phase will be approximately 1-2 vehicle per day, and also the equipment and machinery planned to be used will be limited. Mobilization of plant equipment and machinery will be a one – off event, requiring very limited number of trucks. Emissions from trucks will not give rise to significant reduction in the air quality except in the immediate vicinity of the road in circumstances where the wind is still. Vehicle emissions will therefore make negligible contribution to local and global air quality issues. *This impact is predicted to be negative, cumulative, short-term and of low significance.*

6.2.2.3 Deterioration/impairment of local air quality from dust pollution

Dust pollution is mostly likely to occur during the delivery of construction materials in trucks. In construction zones, the dust generated by vehicle movements and local air pollutant emissions from vehicles may be temporarily elevated during the busiest periods of mobilization activity, however no significant local air quality effects are predicted. Any quantity of dust emissions will have the potential impact on the air environment and affect sensitive receptors in the proximity areas, such as users of the nearby road and public library, nearby residents and nearby shops. Fine dust particles (PM₁₀) from concrete batching operations can enter neighbouring premises and adversely affect amenity as well as adverse health impacts. Dust also has the potential to settle on nearby project structures and landscaped grounds. However, the Tanzania Bureau of Standards (TBS Standards) have published the maximum tolerable emission of particulate matter as 250mg/Nm³, a value unlikely to be reached or exceeded during rehabilitation works. Any nuisance would be temporary. *The impact is predicted to be negative, short-term and of moderate significance.*

6.2.2.4 Disturbance/nuisance to receptors from increased noise levels

Noise is expected from trucks transporting materials to the site and other construction machinery. The impact of noise from the source of these activities could have effects on the users of the nearby OUT building centres and nearby community in the areas. This means a continuous generation of noise may be a nuisance/ affect the health of centre user and nearby residents. The size of the construction to be made shows that relatively few trucks will be involved in transporting the materials per day. Further along the access road there are a number of vehicles in the area and the nearby areas are also under construction. Albeit annoying, this negative impact will be short-term (limited to the duration of the rehabilitation works and is not considered to be of any significant threat to the health or well-being of humans. *Therefore, this impact is predicted to be negative, cumulative, short-term duration and low significance.*

6.2.2.5 Increased soil erosion of exposed surfaces

The development of the site would create a high level of soil disturbance, which would leave the site susceptible to erosion. Also leaving these excavated or vegetation cleared areas nude might cause soil erosion if wind or moving water act on these areas. The wide flat topography has tendency of having high winds. Further, trampling may cause land disturbance leading to dislodging of the rocks, soil erosion/ landslides down the slope. The project area is predominated by reddish to yellowish fine sandy loams, and sandy loams. The likelihood of acceleration of soil erosion due to loss of ground cover is high due to the fragility of this type of soil, which can be easily eroded when exposed to torrential rains and wind. Further, loss of most mature plants in the area could result into soil erosion among other things. Soil erosion might result into sedimentation into the nearby water bodies with impacts to the riverine ecology. *The impact is predicted to be negative, short term and of moderate significance.*

6.3 CONSTRUCTION PHASE

6.3.1 Positive social impacts during construction phase

6.3.1.1 Increased income to local suppliers and service providers

The proposed project will need construction materials and other services within the Kigoma region. Materials needed for this project is very substantial. Materials such as cement, aluminium, roofing sheets, timber, paving blocks tiles, sanitary, plumbing and electrical appliances, steel, and other miscellaneous materials required for construction can be sourced locally e.g., Kigoma Ujiji Municipality or other parts of Kigoma Region, depending on the type of materials required. This is good news to suppliers of building

materials as well as those who will provide food and waste collection services. *The impact is predicted to be positive, short term and of high significance*

6.3.2 Negative environmental impacts during construction phase

6.3.2.1 Impacts on air quality from construction emissions

The most significant aspects that could potentially impact ambient air quality during construction are combustion gas emissions and nuisance dust. The principal sources of combustion gases would include the operation of a concrete batch plant, diesel powered construction machinery, and vehicle exhaust. Vehicles and equipment with internal combustion engines can emit poisonous gases such as CO₂, CO, NO_x, SO₂, VOC, and CH₄. Emission levels, however, is a functioning speed, condition of the road, application etc. The main impact is impairment of local air quality, which will depend on: the number of vehicles operating at a particular time; prevailing atmospheric conditions - wind regime, temperature and rainfall; atmospheric conditions and duration of construction work.

However, it is expected that the number of vehicle movements during construction, equipment and machinery planned to be used will be limited. With the low forecast number of vehicle movements, the limited quantity of equipment/machinery, and the adoption of good maintenance regimes, the emissions of air pollutants from these sources will be limited. Additionally, based on the location and duration of works on the project site, it is unlikely that the above threshold value will be exceeded. The impact is considered reversible because construction vehicles will leave after the construction activities are complete. The impact has a local scale. With in-built mitigation, and given the short duration of the construction activities, this impact is assessed as negligible. *The impact is predicted to be negative, cumulative, short-term duration, and moderate significance.*

6.3.2.2 Nuisance and disturbance on/offsite receptors from increased noise level

In a general context, construction activities will involve the construction of foundations for the project buildings and their associated facilities. The existing road network will be used and no new access roads are required for construction purposes and. Therefore, noise and vibration effects associated with road construction are not expected. There are no blasting requirements during the construction process. The mechanical equipment which is planned to be involved in the construction of the proposed project includes, but is not limited to: track loader, excavator, hydraulic hammer and breaker, mobile crane, air compressor, dump trucks, generators, concrete pump, etc. Noise is measured in decibels and is considered to be a nuisance when the following conditions are all met: (i) the combined expected maximum noise level exceeds 70dB (A), (ii) the relevant noise is at least 1.0dB above the prevailing noise level and (iii) the contribution to the increase in noise level of the new or altered development is at least 1.0dB (A). The Environmental Management (Quality Standards for Control of Noise and Vibration Pollution) Regulations, 2015 stipulates maximum permissible day time noise levels of 70 dBA for industrial area and 60dBA for residential and industry/small scale production and commerce.

Table 6.2: Maximum Permissible Noise levels for general environment

FACILITY	NOISE LIMITS in dBA (L _{eq})	
	DAY	NIGHT
Any building used as hospital, convalescence home, home for the aged, sanatorium, and learning institutions, conference rooms, public library, and environmental and recreational site.	45	35
Residential building	50	35

Mixed residential (with some commercial and entertainment)	55	45
Residential and Industry/small scale production and commerce	60	50
Industrial area	70	60
TIME FRAME	6:00 am -10:00 pm	10:00 pm-6:00 am

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

However, the size of the construction to be made shows that relatively few equipment and trucks will be involved in transporting the construction materials. Compared with the usual background noise levels at the area, the additional nuisances caused by the proposed construction activities will not be perceptible to people. Perceptible will be the presence of additional traffic and short-term noise and vibration impulses, but that's a more psychological effect. Albeit annoying, this negative impact will be of short-term effects restricted to working time, mainly around the proposed construction area and is not considered a significant threat to the health or well-being of humans. *The potential impact is predicted to be negative, short term, cumulative, and moderate significance.*

6.3.2.3 Deteriorated/impaired air quality from dust pollution

As with any construction site, dust may be generated as a result of surface preparation and earthworks, including earth moving and materials handling. Internal site movement on un-surfaced land may cause sufficient disturbance of loose surface materials to generate dust, particularly during the dry season. Also, air quality will be mostly affected from heavy plant, cement mixer, concrete rubbles and blocks, logistic of workers and other equipment. The impact receptors are likely to include site workers and neighbouring community especially the nearby existing OUT centre and Kasingirma Secondary School. The substance, which will most significantly contribute to air pollution, will be particulate matter (PM₁₀), which may cause health hazards when inhaled in significant amounts and can also reduce the visibility.

Due to the nature of the construction process, potentially dust emitting activities would not be constant and emissions would be limited to the operating periods for and the combination of machinery being used at any one time. The main risks from dust and particulate air emissions generated during construction would be to construction site workers, users of existing OUT building and personnel on a short term or limited basis. Nevertheless, implementation of the recommended mitigation measures to minimize dust and diesel emissions impacts will be required. *The impact is predicted to be negative, short-term duration and of moderate significance.*

6.3.2.4 Nuisances and health hazards due to increased vibrations

Planned construction activities and use of equipment and machinery will be a source of vibration. The response of people to vibrations on the ground is influenced by many factors. Some of those factors are physical, like amplitude, duration and frequency content of vibrations, while other factors like the type of population, age, gender and expectations are physiological. This means that people's reaction to vibrations is subjective and differs for different people. It is generally accepted that for the majority of people, vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity are just perceptible. The table 6.3 below presents distances at which vibration may be perceptible for certain types of construction activity. These figures are based on historical field measurements and information available in literature.

Table 6.3: Distances at which vibration may be perceptible

Construction activity	distances at which vibration may be perceptible [m]
Excavation	10-15
Vibratory compaction	10-15
Heavy vehicles	5-10

Due to the fact that the size of the construction to be made and that relatively few equipment and trucks will be involved in transporting the construction materials, it is highly unlikely that vibration from the construction of the proposed plant would be perceptible. *The impact is predicted to be negative, short term and of low significance.*

6.3.2.5 Visual effects during construction

The area within the construction zones, established at the proposed project site, will be temporarily changed during construction phase. These zones, together with the localities where the construction materials and prefabricated segments of the building will be stored, will be visually discernible, and will draw changes in the aesthetics of the area. However, these changes will be of a short-term nature, with their duration equal to the time of construction, no more than 12 months. Therefore, and having in consideration the current land use forms in the project area, these changes will be of minor importance. After the completion of construction activities, the micro – relief and the landscape in the area will be subject to restoration and landscaping activities. *The impact is predicted to be negative, short term and of low significance.*

6.3.2.6 Deteriorated/impaired water quality (surface and ground) due to accidental spills of hydrocarbons

Vehicles and machinery that will be operating at the project site will required fossil fuels i.e., gasoline and engine oil for their operation. This will create the opportunity for accidental spills of hydrocarbons and contaminants could be washed into the environment. Taking into consideration of the number of vehicles that will be involved, these will be in small quantities and they can easily be handled. Incidental spillage of fuels and oils may occur from storage tanks, during refuelling and minor equipment repairs or leak from equipment's that are not well maintained. These may contaminate land or be washed into local surface and ground water resources and impair the quality of these receiving bodies. *The impact is predicted to be negative, short-term duration and of moderate significance.*

6.3.2.7 Loss of aesthetics due to improper disposal of construction waste

The solid waste generated during site preparation and construction work would include cut vegetation and typical construction waste (e.g., wasted concrete, steel, wooden scaffolding and forms, bags, waste earth materials, timber, paper, plastics etc.).The fractions of waste that will be created as a result of construction activities are in relation to the types of materials and equipment to be used during the performance of the various construction stages (earth and concrete works, electro-mechanical works, installation works, etc.). This waste would negatively impact the site and surrounding environment if not properly managed and disposed of at Kigoma/Ujiji Municipal Council dumpsite. Cleared vegetation burnt onsite would generate smoke, possibly impacting negatively on ambient air quality and human health. If allowed to accumulate in drainage ways, solid waste could cause pooling and flooding. Pooling of water, in turn, would create conditions conducive to the breeding of nuisance and health-threatening pests such as mosquitoes. *The impact is predicted to be negative, short term and of moderate significance.*

6.3.3 Negative social impacts during construction

6.3.3.1 Traffic accident impacts

Construction activities may result in a significant increase in number of vehicles during transport of construction materials and equipment, which will lead to increasing risk of traffic-related accidents or injuries to workers and local community. However, transportation and delivery of the project machines and equipment will be by using standard vehicles. Therefore, no specialised vehicles with non-standard dimensions are required. The traffic accident will be minimal, and the duration of the impact will be short-term occurring only during the construction phase. The sensitivity of receptors is high given that some accidents would lead to permanent damage and others loss of life while the intensity of the impact is low given the relatively small incremental increase of the traffic volume caused by the construction activities. *Therefore, potential impact is predicted to be negative, cumulative, short term but of moderate significance.*

6.3.3.2 Occupational health and safety impacts during construction

The construction phase of the proposed project will involve activities including, but not limited to: excavation, erection of temporary facilities, foundation preparation, and electrical and mechanical work. These activities will expose the workforce to potential hazards. If care is not taken in terms of awareness of construction crew, provision and usage of appropriate protective gears accidents might occur at the construction site. Not only accidents but also exposure to construction hazards like noise, dust might have long-term effects to the workers. Potential occupational health and safety issues during construction activities include: falls and slips; failures of support systems and/or platforms; collision with mobile plant or vehicles; road safety relating to heavy machinery.; exposure to dust and to hazardous materials; burns; crushing by heavy plant or collapse of structures; falling debris; adverse weather conditions; falls into voids during piling; and contact with concrete. The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action if needed. *This impact is predicted to be negative, long term and of high significance.*

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

Construction works of the proposed project will be associated with availability of employment opportunities and hasty generation of income. People with different social background will immigrate in the project area to access opportunities created. This influx of people in the project area and resultant social interactions among workers and locals is inevitable, especially on the construction areas, transportation routes, etc. The obvious relative wealth of the project workers may lead to exploitative behaviour on the hosts' side. Consequence of these interactions could be increased incidences of health impacts such as spread of STDs, HIV/AIDS, breaches of security as well as attitudes and behaviour change to indigenous people. The local people especially youth and women are the most vulnerable group to that social interaction due to their social economic background. The prevalence of HIV infection among adult's blood donors in Kigoma-Ujiji Municipality is in the range of 2.5% to 3.0%. However, the proposed project is one among several construction works and other investments taking place in Kigoma-Ujiji Municipality. *The impacts are predicted to be negative, long-term, and of moderate significance.*

6.3.3.4 Increased local population due to labour influx

There is a possibility of the project to attract people during construction and implementation phases. Presence of the construction crews could potentially create a source of social challenges as a result of interaction of local people with project workers. The influx of people may result into social conflict between foreign workers and locals; use of alcohol and substance abuse among workers leading to anti-social

behavior; pressure on existing infrastructure; increase of health risks (i.e., spread of diseases such as HIV/AIDS) and feel of unrest for local women as a result of workers moving to the area, as due to the nature of the project, it is not expected that there will be large workforce required for the project. Estimated that 50 to 100 people will be required during the construction phase. Also, the presence of construction workforce will be temporary and therefore the demographic effects are not expected to cause significant long-term impacts. Once construction is completed, many foreign workers and contractors will leave the project area. The operation stage will require much less workers compared to the construction stage and will be accommodated within the area. Despite the fact that labor influx is associated with negative impacts, the labor influx also can have a positive impact on community wellbeing through supporting local enterprise, local content support (community capacity and human capital) and employment opportunities for local communities. *The impact is predicted to be negative, long term but of low significance.*

6.3.3.5 Potential risks and hazards associated with child labour

Due to high prevalence of child labour and forced labour in Tanzania there could potentially be impacts associated with lack of work contracts, long hours with no pay and children working at supplier's sites. However, based on the fact that the majority of unskilled workers will be sourced from Kasimbu Mtaa and Kigoma-Ujiji Municipality, there is little risk of influx of migrants from other districts and far off areas. Aside from locals, there will be a small fraction of workers who will be skilled specialists from outside the Kigoma region. Given the relatively small scale of the project area there will be less risk associated with child labour and forced labour within supply chain. During operation phase, the majority of contracts will be expected to be permanent and therefore easier to regularly monitor labour performance. *The impact is predicted to be negative, long term but of moderate significance.*

6.3.3.6 Potential GBV/SEA/SH related incidences

The GBV/SEA/SH are acknowledged as a social issue in Kigoma Region and particularly in the Kasimbu Ward. The GBV committee has been formed and meets regularly to solve the emerging GBV cases. The proposed project is expected to employ not more than 100 construction workers at one time from local communities and outside the community. There will be no campsite and this will lead the workers to be hosted in the nearby facilities. The presence of workers increases the risk of SEA/SH (GBV) towards members of the community in particular female students who may be present at the project site. Such risks are known to occur on construction projects.

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

6.3.3.7 Gender inequity in employment

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

6.4 OPERATION PHASE

6.4.1 Positive social impacts during operation phase

6.4.1.1 Increased aesthetic value of the project area

The proposed project will be developed on land characterized by urban agricultural and with a number of undeveloped plots. The proposed project includes a plan to landscape the developed areas using trees and lawns. This will bring about long-term changes to landscape character of the general area by re-configuring features and elements within the area. The project development will also involve modernisation and other measures that will increase the value of the building in real terms. The aim is to achieve technical and visual improvements to structural components. Humans are naturally inclined to enjoy beauty in nature and all have attractive qualities in the form of their symmetry and colour. *This impact is predicted to be positive, cumulative, long-term, and of high significance.*

6.4.1.2 Increase of admission of Students to OUT

The proposed project components will provide adequate academic facilities to Open University of Tanzania Kigoma Regional Centre, people and the country at large. These will increase admission of students from high schools and other college as a result more Tanzanian people will be benefited. Also, the proposed project components shall provide adequate and conducive space for meetings, trainings, seminars, workshops etc. In order to maximise benefits, it is essential that increased admissions are inclusive and consider the needs of vulnerable groups and people. To this end it is important that curricula is inclusive, buildings are accessible and persons with disabilities are able to fully participate in learning opportunities. *This impact is predicted to be positive, cumulative, long-term, and of high significance.*

6.4.1.3 Increase of revenue to the Open University of Tanzania

The OUT will increase students' enrolment which in return will increase revenues through university fees. This will increase the Open University of Tanzania financial standing which will good governance and efficient running of the University. Thus, the goals of academic institutions to become centre for seeking knowledge and disseminating it to a wide spectrum of beneficiaries at national and regional levels are going to be fully realized. *This impact is predicted to be positive, cumulative, long-term, and of high significance.*

6.4.1.4 Risk of SEA/SH within the OUT Kigoma Regional Centre

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

6.4.1.5 Health and safety hazards from chemical handling in the laboratories

The handling of chemicals will be a typical routine activity for many laboratory workers to be employed. Many organic and inorganic laboratory chemicals according to the Material Safety Data Sheet (MSDS) are corrosive to the skin and to the eyes, and can be toxic. Chemical hazards represent potential for

illness or injury due to single acute exposure or chronic repetitive exposure to toxic, corrosive, sensitizing or oxidative substances. They also represent a risk of uncontrolled reaction, including the risk of fire and explosion, if incompatible chemicals are inadvertently mixed. Occupational chemical exposure may result from laboratory procedures performing and handling of chemicals. The proposed project operators would have procedure to prevent chemical hazardous.

This control measures would be designed and implemented accordingly and the OUT would continue providing training on the appropriate usage, handling and storage of chemicals. Chemical hazards can most effectively be prevented through a hierarchical approach that includes: Duration of the impact would be long-term lasting through the entire life of the affected person or short-term depending on the hazard exposed to. The intensity of the impact is low if appropriate "facility design" is adopted and PPE used by workers. *This impact is predicted to be negative, long-term, and of high significance.*

6.4.2 Negative environmental impacts during operation phase

6.4.2.1 Contaminations of land from poor solid wastes management

The laboratory apart from using it for experiments and trainings also will have office space, where office-related waste such as paper, toner cartridges, universal wastes (light bulbs, and electronics), plastics (in many forms), aluminium cans, glass, textile, food remains and general trash will be generated. Several types of waste may be produced at the residential building, such as organic (vegetables and food wastes) from the kitchen, wastewater, rubber, and woodworks. These have the potential for soil/groundwater pollution, creating visual and odour impacts if not well managed. However, considering the size of the proposed project, wastes expected to be generated will be small in quantity. They will be disposed of according to the requirements of statutory authorities. Also, during the site inspection, the ESIA team noted that the OUT Kigoma Centre has a well-established solid waste management system. Dust bins of different sizes will be placed in strategic areas to ensure all wastes generated are collected at the source. Data on the quantity of waste generation at the project site will be collected daily. The bins will be emptied daily and waste will be transported to the dumping site. Hence, it is anticipated that the proposed project will not affect the soil environment. *This impact is predicted to be negative, long-term of moderate significance.*

6.4.2.2 Deteriorated/impaired water quality (surface and ground) from wastewater disposal

This pollution will be mainly a result of sanitation system (Septic tank system) that will be used during project operation. This is due to the fact the proposed project will increase number of students with time. Onsite sanitation systems always cause ground water pollution due to infiltration of the effluent during disposal. Also, surface water is at risk of pollution due to drainage of contaminated impervious surfaces. In this case, the main pollutants include solid matters, floating and macro waste, heavy metals and organic matters. During the rainy season, the surface waters will drain the pollutants directly towards the natural discharge system if the project does not envisage pre-treatment of rain water. Thus, the risk of water degradation is assessed as important, which may have an indirect impact on the water table too. *This impact is predicted to be negative, long-term, and of high significance.*

6.4.2.3 Compromise quality of soil, ground water and surface water from laboratory effluents

Most of effluents resulting from science laboratory experiments are considered hazardous, so the generation, storage and disposal of effluents require a special consideration in every experiments. The proposed project will develop its own septic tank to dispose its own effluents. Septic tanks will be constructed according to international standard and will be monitored to avoid ground water pollution.

However, several risk factors can reduce the efficiency of the septic tank. The risk can be imparted during designing or operation phase. During designing phase if risks such as inadequate tank volume geometry and compartmentalization, inconsideration of tank access space and plan that involves the use of substandard construction materials are not managed properly it can reduce the efficiency of the septic tank treatment system. In addition, a faulty designing can result also in cracking of the tank, leakage (ground infiltration), tank flotation and inadequate retention time of effluent. Faults from designing and operation of the septic tank can last for long-term and have high impact on the quality of ground water table, soil and receiving surface water. However, if proper risk mitigation strategies are in place and with the good septic tank management techniques built in the project, the occurrence of impacts on the receptors will be low. *This impact is predicted to be negative, long-term, and of high significance.*

6.4.2.4 Public health hazards from reject materials/expired chemicals

Impacts from reject materials/ expired laboratory chemicals shall be the main risk during the operation phase. Measures to contain, transport and dispose them shall be required during this phase. Reject materials are products which are out of specification, or have deteriorated during storage and/or handling in such a way that they can be considered potentially hazardous. They cannot be used in the laboratory and may require treatment to render them safe. Examples include; unopened chemicals that have reached the manufacturers expiration date, those which contain more than the maximum permitted level of active ingredient; those which have physically degraded into fines and could fail to produce the required results, the resistance to test, where applicable, and products grossly contaminated with reactive substances.

Those that do not comply with such specifications shall be rejected to prevent their use in operations for which they are unsuitable. These materials shall not be incinerated as they have a potential significant risk to the surrounding air quality from generation of fly ash. The major impact that will arise from the incinerator is the emissions of air pollutants from fly ash whose particulate matter has a potential to air related diseases such as lung related illness, heart related diseases, birth defects and other potential congenital abnormalities and hormonal defects. *These impacts are predicted to be negative, long-term of moderate significance.*

6.4.2.5 Health and safety risks due to fire hazards

During the operational phase of the laboratory, there is a potential risk of fire that may result from the use of the highly flammable biological and chemical reagents. Also, electrical fault is by large the main culprit in fire accidents in buildings in Tanzania. Buildings are very prone to fire hazards because of different types of combustible materials and machines, which are used and installed, respectively. The components of a fire are fuel (combustible substance), heat and oxygen. Unless all three are present fire will not occur. Fire can cause the following effects loss of lives; serious Injuries; and loss of properties etc. The risk to fire will be properly mitigated and will take into account the resilience of the building materials to withstand fire for a certain period. In addition, the building require sufficient fire emergency exists in case of an outbreak of fire. *This impact is predicted to be negative, long term and of high significance*

6.4.3 Negative social impacts during operation phase

6.4.3.1 Occupational health and safety hazards due to inadequacies in provisions for working conditions

Employee well-being requires consideration of the occupational health and safety of workers and contractors, workplace conditions (e.g., wages, benefits, security, rights and growth opportunities), as well as job satisfaction and pride. Most OHS impacts encountered in factories include dust emissions, noise, working at height, moving machines, revolving parts, heat, electrical hazards, coolants, transport equipment's and inhalation of noxious gases. The health and safety risks in a plant during operations include potential for respiratory diseases, burns, allergies and industrial accidents. Also, it is known that workers exposed to noise levels beyond 85dB could impair their hearing ability irreversibly. Dust exposure, particularly dust and fumes may result in bronchitis complications. Temperatures above 1,000°C may affect the health of the workers.

A system to measure, monitor and report on health and safety performance will be developed within the project, covering common definitions, reporting indicators, and guidelines for occupational health and safety management systems and for general health. In general, OUT will put in place a policy on OHS, procedures for management of the same which will be deployed for the proposed project. All such hazards will be successfully controlled by the adoption of safe plant methods and occupational health and safety management systems. Also, workers will be provided with health and safety training and personal protective equipment suitable for the types of activities that they will participate in. *These impacts are predicted to be negative, long term and of high significance.*

6.4.3.2 Health Hazards due to social interaction among workers and users

With the anticipated increase in number of visitors and employees in project area, the social interaction among them may not be avoided and will be of high significance. Some of interactions may be of intimate nature resulting in contracting of sexually transmitted diseases such as HIV/AIDS. Considering the nature with which HIV/AIDS is contracted and spread, this makes it a significant contribution to the pandemic. The youth especially girls are the most vulnerable group to that social interaction due to the nature of their work and their social economic background. Other public health hazards could occur due to high congestion of people into a small area where disease like TB, eye disease, upper respiratory tract infections etc may occur. Also, poor sanitation, haphazard disposal of waste and excreta could lead to the outbreak of cholera and diarrhea. *Considering that human health is involved the impacts are predicted to be negative, of long-term duration and high significance.*

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

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

This necessitates more considerations of the inclusion of expectations of PWDs in the design of the proposed project components to avoid the elimination of all forms of discrimination and social exclusion. Further, in Tanzania, women and girls face inequity in society. A girl with a disability is less likely to attend

school. Additionally, physical barriers may restrict people with disabilities movement in building and hinder their performance. Consideration to PWD shall be given a high priority during designing and if no any mitigation will be taken, then, the impact has high significance. *The impacts are predicted to be negative, cumulative, long-term, and of moderate significance.*

6.5 DECOMMISSIONING PHASE

The proposed project may exist for a very long time since rehabilitation and upgrading is done when need arise. However, the laboratory may be stopped if the OUT or the Tanzania Government decides so for one reason or the other, or change in technology may necessitate discontinuation of the project. Also, the project may be decommissioned due to constraints in resources or approach changes in the core operations of the project. If this happens environmental as well as social impacts may occur as follows.

6.5.1 Negative social impacts during decommissioning phase

6.5.1.1 Loss of employment

The employee and their family will be depending directly or indirectly on the project for their living. Decommissioning of the project means they will lose their means of generating income and this may result into social stress/unrest to the community and may give rise to conflict with investor. *Loss of job is predicted to be negative, long-term duration and since survival of the people is very important here the impact is considered of high significance.*

6.5.1.2 Occupational health and safety

During decommissioning phase, risks of accidents and ill health as a result of demolition activities, noise and dust, are likely to take place. Demolition workers and neighbouring residents are also likely to be affected by the dust generated. *The impact is predicted to be negative, short-term and of low significance.*

6.5.2 Negative environmental impacts during decommissioning phase

6.5.2.1 Environmental pollution from haphazard disposal of demolished waste

Demolition of the project structures particularly the project office administration building, foundations and related infrastructure will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, dry wall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia, which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality. *These impacts are predicted to be negative, long term and of high significance.*

6.5.2.2 Noise pollution

During the various stages of the decommissioning works, noise sources and potential impacts associated with the demolition works are likely to occur. This includes noise from site traffic (including light and heavy vehicles), noise from the operation of machinery/equipment and from dismantling and demolition activities. The demolition works will lead to significant deterioration of the acoustic environment within the

project site and the surrounding areas. *The impact is predicted to be negative, short-term duration and of high significance.*

6.5.2.3 Air pollution due to dust

The air quality will be most affected during the demolition work with the emission of dust particles from machinery like excavators, electric grinders and mixer. The impact receptors are likely to include site workers. The substance, which will most significantly contribute to air pollution, will be Particulate Matter. PM₁₀ may cause health hazards when inhaled in significant amounts and can also reduce the visibility. Most of those dust particulate will come from dust particulates which themselves come from the concrete rubbles and blocks. *The impact is predicted to be negative, short-term duration and of high significance.*

6.5.2.4 Soil and water pollution

The potential impacts on the soil and groundwater environment during demolition activities may include: - water and soil quality impacts from the demolition/removal of structures within project site; changes in soils and groundwater regime due to excavation works during the demolition activities; contamination of soil and groundwater quality with hazardous materials such as oils, heavy metals, etc on site during the demolition activities; site drainage; disposal of wastewater and sewage disposal; and accidental spillages of fuel, oil and chemicals. *The impact is predicted to be negative, short-term and of high significance.*

Table 6.4: Summary of potential impacts

Phase	Potential Impacts	Significance Value
Preparation / Mobilization	Increased income to local communities from employment opportunities	This impact is predicted to be positive, cumulative, and short-term to long-term and of moderate significance
	Conflicts due to access restrictions	This impact is predicted to be negative, long-term and of moderate significance
	Damage / loss of valuable vegetation cover	This impact is predicted to be negative, short term and of low significance
	Deterioration/impairment of local air quality from equipment's/vehicular emissions	This impact is predicted to be negative, cumulative, short-term and of low significance
	Deterioration/impairment of local air quality from dust pollution	The impact is predicted to be negative, short-term and of moderate significance
	Disturbance/nuisance to receptors from increased noise levels	This impact is predicted to be negative, cumulative, short-term duration and low significance.
	Increased soil erosion of exposed surfaces	The impact is predicted to be negative, short term and of moderate significance
Construction	Increased income to local suppliers and service providers	The impact is predicted to be positive, short term and of high significance
	Impacts on air quality from construction emissions	The impact is predicted to be negative, cumulative, short-term duration, and moderate significance
	Nuisance and disturbance on/offsite receptors from increased noise level	The potential impact is predicted to be negative, short term, cumulative, and moderate significance
	Deteriorated/impaired air quality from dust pollution	The impact is predicted to be negative, short-term duration and of moderate significance.

Phase	Potential Impacts	Significance Value
	Nuisances and health hazards due to increased vibrations	The impact is predicted to be negative, short term and of low significance.
	Visual effects during construction	The impact is predicted to be negative, short term and of low significance
	Deteriorated/impaired water quality (surface and ground) due to accidental spills of hydrocarbons	The impact is predicted to be negative, short-term duration and of moderate significance
	Loss of aesthetics due to improper disposal of construction waste	The impact is predicted to be negative, short term and of moderate significance
	Traffic accident impacts	Therefore, potential impact is predicted to be negative, cumulative, short term but of moderate significance
	Occupational health and safety impacts during construction	This impact is predicted to be negative, long term and of high significance
	Increased incidence of diseases transmission including HIV/AIDs and STDs	The impacts are predicted to be negative, cumulative, long-term, and of moderate significance
	Potential risks and hazards associated with child labour	The impact is predicted to be negative, long term but of moderate significance
	Increased local population due to labour influx	The impact is predicted to be negative, long term but of low significance
	Potential GBV/SEA/SH related incidences	The impact is predicted to be negative, long term but of moderate significance
	Gender inequity in employment	The impact is predicted to be negative, long term but of moderate significance
Operation	Increased aesthetic value of the project area	This impact is predicted to be positive, cumulative, long-term, and of high significance
	Increase of admission of Students to OUT	This impact is predicted to be positive, cumulative, long-term, and of high significance
	Increase of revenue to the Open University of Tanzania	This impact is predicted to be positive, cumulative, long-term, and of high significance
	Risk of SEA/SH within the OUT Kigoma Regional Centre	This impact is predicted to be negative, cumulative, long-term, and of high significance
	Health and safety hazards from chemical handling in the laboratories	This impact is predicted to be negative, long-term, and of high significance
	Contaminations of land from poor solid wastes management	This impact is predicted to be negative, long-term of moderate significance
	Deteriorated/impaired water quality (surface and ground) from wastewater disposal	This impact is predicted to be negative, long-term, and of high significance
	Compromise quality of soil, ground water and surface water from laboratory effluents	This impact is predicted to be negative, long-term, and of high significance
	Public health hazards from reject materials/expired chemicals	These impacts are predicted to be negative, long-term of moderate significance
	Health and safety risks due to fire hazards	This impact is predicted to be negative, long term and of high significance

Phase	Potential Impacts	Significance Value
	Occupational health and safety hazards due to inadequacies in provisions for working conditions	These impacts are predicted to be negative, long term and of high significance
	Health Hazards due to social interaction among workers and users	The impacts are predicted to be negative, of long-term duration and high significance
	Non-user-friendly buildings for Persons with Disabilities (PWDs)	The impacts are predicted to be negative, cumulative, long-term, and of moderate significance
Decommissioning	Loss of employment	This impact is predicted to be negative, long-term duration and of high significance.
	Environmental pollution from haphazard disposal of demolished waste	These impacts are predicted to be negative, long term and of high significance
	Noise pollution	The impact is predicted to be negative, short-term duration and of high significance
	Air pollution due to dust	The impact is predicted to be negative, short-term duration and of high significance
	Soil and water pollution	The impact is predicted to be negative, short-term and of high significance
	Occupational health and safety	The impact is predicted to be negative, short-term and of low significance

6.6 CONSIDERATION OF ALTERNATIVES

6.6.1 Introduction

In the early stages of the development of the proposed Construction of the Two Storey Science Laboratory Building at the OUT Kigoma Regional Centre, different project alternative option has been considered from the point of view of site layouts, alternative designs, alternative processes and materials. The “no action” alternative was also considered to evaluate the scenario in the absence of the project taking place. With this in mind, the general principle involved in identifying the option(s) of the proposed project is to ensure that the option chosen would result in optimal social, economic and environmental returns. In effect the option chosen should corroborate well not only for the OUT, but also for the environment and stakeholders in the area. The option with the highest cost benefit factor, the most technically feasible and with least residual impact is identified as the preferred option. The following alternatives have been identified and have been discussed with project proponent as means of reducing environmental effects. They are discussed in further detail below

6.6.2 Assessment of the no-go alternative

The no-go alternative is the option of not proceeding with the development of the proposed establishment of the Two Storey Science Laboratory Building. The ‘do nothing’ alternative does not involve capital investment costs and in such a scenario the potential environmental and social impact directly associated with the project will not occur. In addition, none of the anticipated benefits of the project, as described in section 6.5 above will be realised. Based on the above motivations, it would be beneficial to pursue projects such as the propose Two Storey Science Laboratory Building project that may assist to meet tremendous demand of the Science Laboratory Building at the OUT.

The practical aspects of the science laboratory training programs have been ineffective due to lack of access to the lab facilities. Hence the need for having the laboratory facility at the zonal area for effective

deliverance of the science courses. The presence of Zonal Science laboratory will give the public to access the services offered by the OUT in Kigoma Region. This project also has the potential to provide much needed training and employment opportunities for local communities in the Kigoma-Ujiji Municipality. The aspiration and desires to proceed with this sustainable project became apparent during public consultations and site visits to the study area.

6.6.3 Site selection

The project options should be provided within the constraints of the aim and broad economic, technical and environmental factors". The construction of the Two Storey Science Laboratory Building at the Open University of Tanzania Kigoma Regional Centre Plot No 17, Block A was identified after examining and eliminating another site choice. The advantages of this site were the good integration between the existing OUT Kigoma Centre and the proposed laboratory building. In the context of this study therefore the choice of site has been dictated by the following the factors:

- a) Ownership of the site. This site is privately owned by the OUT as such it does not involve complicated issues of displacing people, compensation and settlement.
- b) The project site is located on the land designated for academic institution development. It is surveyed and planned for academic institution development. All developments on plots are according to the letters of offer (titles) and building permits.
- c) The allocated land was designed and planned to accommodate further expansions of the project or support facilities such as the proposed project. There are no changes in land use as such. This gives an opportunity to OUT to continue planning and also to accommodate new development within their area.
- d) The site is easily accessible, and has all utilities needed.
- e) Size of available land was desirable for the proposed project

6.6.4 Design considerations alternatives

The design options for the proposed Two Storey Science Laboratory Building have followed laboratory design and construction experience in which international codes, references, standards and guidelines are strictly considered. Every effort was made to follow these codes and standards; however, enforcement was based on a case-by-case basis, after weighing the benefit against the inevitable cost implications. In all cases, however, safety was not compromised. As a result, several design layouts were considered during the design phase. The preferred site layout (attached) of the proposed building consists of the Botany laboratory, Zoology Laboratory, Food science laboratory and Preparation rooms and technical offices for each laboratory on the ground floor. The first floor will comprise the ICT Multimedia state of the art laboratory, DRC and staff offices, Min library and Modern conference facilities. The building also will have 38 total parking bays for the users and visitors. Other associated facilities to support the project are retaining wall, concrete paving blocks, security guard post, changing room, water storage tank with a pumping system, toilets, solid waste collection area, waste water drainage system, fire system and utilities network.

Moreover, sustainable design concepts incorporated for implementation during construction and operation phases of the Science Laboratory Building includes:

- Locally available materials will be selected to reduce transportation and processing costs.
- Material that uses recycled materials and generally use sustainable laboratory processes will be given priority over those that do not.
- existing trees will be saved as many as practical.

- Light shelves will be considered to reflect light deeper in to the buildings to reduce use of artificial lighting during the day.
- Building management Systems (BMS) will be considered to control and maximize efficiency of lighting and HVAC operation.
- Water saving plumbing fixtures such as automatic faucets and low consumption toilets and urinals will be considered.
- Rain water and grey water recycling will be considered, at least, for landscaping purposes.

6.6.5 Management technology alternative

The overall laboratory technologies, instruments, laboratory layout and operational procedures to be utilized and installed during the operational phases will also determine the impacts of the proposed project on environment and public health. The lab instruments and layouts, the laboratory operational procedures as well as the waste treatment and disposal facility options to be selected for use by the proposed project will have a direct and/or indirect influence on the environment and public health. Several alternatives and standards were considered to determine the design and technology selection criteria for developing the proposed laboratory. The type of waste treatment and disposal facilities, its operational efficiency as well as easiness for use and maintenance will also influence the occurrence of negative impacts on the environment and public health. As a result, the development of the proposed laboratory has considered various available technology options and make choices that guarantee high level efficiency and biosafety in waste treatment and disposal operations and the following alternatives were considered.

6.6.5.1 Solid waste management alternative

Sanitary landfill alternative

Sanitary landfills, if properly constructed and operated, could provide a relatively safe disposal method for municipal solid waste including laboratory wastes. This method, however, requires a larger space for compaction of each day's waste and there is no readily available sanitary land fill in Kigoma Ujiji Municipality that can receive and safely dispose wastes. Hence, this option was not selected.

Waste Incineration alternative

Incinerators, if operated properly, eliminate pathogens from the waste and reduce waste to ashes. However, certain types of waste e.g., chemical waste from the laboratory require higher temperatures for complete destruction. Higher operating temperatures and cleaning of exhaust gases limit the atmospheric pollution and odours produced by the incineration process. This option is a preferred alternative because of the many additional advantages of incinerators in safely disposing laboratory wastes. However, the incinerators to be installed at OUT need to full fill the minimum emission standard specified in the World Bank Group EHS guideline. Nevertheless, this option is risky and expensive based on the small amount of waste to be generated at the project site and in the context of the proposed project.

Recycling alternative

Secondly, recycling, reuse, and composting waste will be the second alternative in priority. This will call for a source separation programme to be put in place. Recycling of wastes such as paper, glass (produced from laboratory and offices), metal (maintenance site), plastics (from laboratory and offices), wood, waste oil and solvents (from maintenance and engineering operations), kitchen wastes and vegetable oils is to be effectively carried out.

Source reduction alternative

First, the OUT will prioritize reduction at the source of the materials. This option will demand a solid waste management awareness programme for management and the employees.

6.6.5.2 Wastewater (effluent) management alternatives

Use of a public sewer line alternative

Use of a public sewer line is one of the options considered for treating and disposing liquid waste generated from the proposed laboratory. This involves the construction of system to connect the municipal sewer line and it is inexpensive. However, this alternative is not possible currently because there is no municipal main to which the proposed project could be connected.

Use of septic tanks alternatives

The proposed project will develop its own containment septic tank to dispose its own effluents. Septic tanks will be constructed according to international standard and will be monitored to avoid ground water pollution. For sewage the project will involve the construction of underground concrete-made tanks to store the sludge with soakaway pits. It is expensive to construct and requires regular emptying in large discharge points, is also expensive and time consuming. However, the OUT may choose to have this well thought of option to operate to relieve the sewage blockages in the area and water shortages.

Waste water treatment plant alternatives

This can be constructed for the purpose of using chemicals to treat effluent water to acceptable levels before discharging the water into the open environment. This process is expensive and requires vigilant attention and use of substantial amount of space. An enclosed channel will have to be constructed all the way to the stream.

Constructed wetland alternatives

Constructed wetlands are engineered system designed and constructed to mimic natural processes taking place in the natural wetlands. Constructed Wetlands remove pollutants in wastewater through the combination of physical, biological and chemical processes. Two types of constructed wetlands exist based on the flow of wastewater through them. 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.

Use of stabilization ponds/lagoons alternatives

This refers to the use of a series of ponds/lagoons which allow several biological processes to take place, before the water is released back to the water body. Speaking of space, this method requires a larger field for natural treatment to take place. Furthermore; lagoons will present vulnerable situations due to tress passers. They are usually a nuisance to the public because of smell from the lagoons/ponds. However, with strict and professional management, they are the most economical and environmentally sound in the long term.

6.6.6 The “No Action Alternative”

The “no action” alternative is required to ensure the consideration of the original environment without any development. This is necessary for the decision-makers in considering all possibilities. The selection of the “No Action” alternative would mean the discontinuation of project designs and result in the site being retained in its existing form. The “No-action” alternative is challenging to consider as a viable option due to the existing situation. The Institute has planned to establish a Zonal Science laboratory to address the challenges resulting facing students enrolled on science courses at the University. Further, currently the land use at Plot No 17, Block A, Busomero Mtaa mainly include a sizable built-up area mixed with agricultural development and undeveloped parts. Thus, the No-action alternative option will not have much significance in helping to preserve environmentally sensitive or aesthetically attractive plots of land. Instead, the no-project alternative will prolong the underutilization of the available land resource in the

Busomero Mtaa for designated type of land uses by the Kigoma Ujiji Municipal Council Master plan. In summary, the “No-action” option will undermine the huge social benefits that OUT and the country at large can harness from the development and operationalization of the proposed project. Due to the proposed quality of the development, it is considered that the positive benefits of zonal science laboratory development outweigh the potential adverse environmental and social effects. Therefore, the no-development option is not recommended.

6.6.7 Overview preferred Alternative

This alternative would see the construction of the development as proposed by the OUT, and as outlined in this document. This option has good support by the institutions which would be most affected by its implementation, i.e., Kigoma Regional Commissioner Office, Kigoma-Ujiji Municipal Council, Kasimbu Ward and community in Busomero Mtaa. The proposed development is being designed and built to meet or exceed local and international standards and regulations.

Based on the above comparison the proposed project as described in chapter two will provide adequate academic facilities to Open University of Tanzania Kigoma Regional Centre, people and the country at large. These will increase admission of students from high schools and other college as a result more Tanzanian people will be benefited. Also, the proposed project components shall provide adequate and conducive space for meetings, trainings, seminars, workshops etc. However, the potential negative impacts identified will be mitigated by the proposed mitigation measures in chapter seven. Appropriate Environmental and Social Management Plans have been prepared as per the proposed project.

7 ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

7.1 INTRODUCTION

The impacts which are most likely to affect the environment in the execution of the proposed project have been identified and analysed in Chapter 6. Based on the analysis and hence classification of the most likely environmental impacts, specialists were requested to indicate what mitigation measures need to be applied to the negative impacts to either reduce them or avoid them completely. Key mitigation measures, as well as the time frames for their implementation, the responsible staff and measurable targets, have been incorporated in the Environmental and Social Management Plan (ESMP), which accompanies this ESIA as chapter 8. Mitigation measures have been written, where possible, to address the source of the impact rather than the after-effect (“end-of-pipe” solutions), since addressing the source is more efficient and effective than addressing the after-effect.

7.2 PREPARATION / MOBILIZATION

7.2.1 Negative environmental impacts during preparation / mobilization phase

7.2.1.1 Damage / loss of valuable vegetation cover

The OUT and Contractor shall ensure that clearance of the site for construction purposes shall be kept to a minimum and areas that the project will not impact shall not be disturbed. The Contractor shall mark out the extent of clearing within the approved worksite and instruct all construction workers to restrict clearing to the marked areas and not work outside defined work areas. In the same vein, there will be strict control of construction vehicles to ensure that they operate only within the area to be disturbed by construction works. Also, OUT will rehabilitate by seeding or planting ornamental trees to all areas that will not be occupied by the buildings and other project facilities. The project will consult natural resources experts for advice and potential flora stocks.

7.2.1.2 Deterioration/impairment of local air quality from equipment's/vehicular emissions

Reducing air emissions from exhausts shall be achieved by contracting new equipment or well serviced and maintained equipment. No vehicles or equipment's to be used that generate excessive black smoke. Where practical, the contract will inspect machines and vehicles on delivery. Also, contractor will enforce vehicle load restrictions to avoid excess emissions from engine overloading.

7.2.1.3 Deterioration/impairment of local air quality from dust pollution

Dust generating activities (excavation, handling and transport of soils) shall not be carried out during times of strong winds. The Contractor shall suspend earthworks operations wherever visible dust is affecting properties adjoining the project site. Water shall be applied whenever dust emissions (from vehicle movements or wind) are visible at the site in the opinion of the Supervisor. Vehicles delivering soil materials will be covered to reduce spills and windblown dust and vehicle speeds will be limited to minimize the generation of dust on site and haul routes. Any complaints received by the Contractor regarding dust will be recorded and communicated to Supervisor. Also asphalt plants and concrete batching plants will be well sealed and equipped with a dust removal device.

7.2.1.4 Disturbance/nuisance to receptors from increased noise levels

Best practice procedures will be implemented to reduce mobilization noise. Such measures will include hydraulic construction in preference to percussive techniques where practical. Also, all plant and equipment will be maintained appropriately, silenced where appropriate and operated to prevent excessive noise and switched off when not in use. Loading and unloading of vehicles dismantling of equipment such as scaffolding or moving equipment or materials around the site will be conducted as practicable during daytime hours, and noise complaints will be immediately investigated.

7.2.1.5 Increased soil erosion of exposed surfaces

The OUT and contractor will, if possible, ensure that civil or earth work is done during dry season when there is no run off to reduce the impact severity. Deliberately re-cover exposed soils with grass and other appropriate species as soon as possible during dry season to enable vegetation growth before wet season. Also, temporarily shall bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses. Further the contractor shall ensure that backfilling is done adequately, compacted, and the site restored. The earth used for backfilling shall be free from all roots, grass, shrubs, vegetation, trees, and rubbish. The backfilling operation will be performed in such a manner so as to prevent washing away of soil.

7.3 CONSTRUCTION PHASE

7.3.1 Negative environmental impacts during construction phase

7.3.1.1 Impacts on air quality from construction emissions

All personnel working on the project will be trained before starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained to minimise emissions during construction. Specific training will minimise dust and exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idling of engines. Also, equipment shall be properly tuned and maintained. No vehicles to be used that generate excessive black smoke. The proponent shall enforce vehicle load restrictions to avoid excess emissions from engine overloading. Where practical, switch off engines when not in use. This will also be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased to reduce the number of trips done or the number of vehicles on the road.

7.3.1.2 Nuisance and disturbance on/offsite receptors from increased noise level

The noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site. These include installation of portable barriers to shield compressors and other small stationery equipment where necessary, use of quiet equipment (i.e., equipment designed with noise control elements) and the proponent will ensure all vehicles have properly functioning mufflers. The noise level will be within acceptable limits and construction activities shall, where possible, be confined to regular working hours. Noise sensitive areas like OUT existing offices shall be notified at least five days before construction works are due to commence in their vicinity. Any boisterous activity shall be conducted outside of office hours, were approved by the OUT. All construction machinery will be maintained and serviced under the contractor's specifications; silenced where appropriate and operated to prevent excessive noise and switched off when not in use. Loading and unloading of vehicles, dismantling of equipment such as scaffolding or moving equipment around the site will be conducted as practicable during daytime hours, and noise complaints will be immediately investigated. Workers operating equipment that generates noise will be equipped with the appropriate noise protection gear.

7.3.1.3 Deteriorated/impaired air quality from dust pollution

Dust generating activities (excavation, handling and transport of soils) shall not be carried out during times of strong winds. The Contractor shall suspend earthworks operations wherever visible dust affects properties adjoining the project site. Water shall be applied whenever dust emissions (from vehicle movements or wind) are visible at the site in the opinion of the Supervisor. Vehicles delivering soil materials will be covered to reduce spills and windblown dust. Vehicle speeds will be limited to minimize dust generation on-site and haul routes. Any complaints received by the Contractor regarding dust will be recorded and communicated to Supervisor. Also, Asphalt plants and concrete batching plants will be well sealed and equipped with a dust removal device.

7.3.1.4 Nuisances and health hazards due to increased vibrations

It is prudent for the proposed project to reduce the level of vibration exposure as much as practical to prevent its effects on buildings/structures. This will be done by well-planned engineering designed and controls, the use of protective equipment and safe working practices. Also, the design of vibration-damped equipment and engine mountings are the most effective engineering methods of controlling vibration exposure.

7.3.1.5 Visual effects during construction

To mitigate the impact of haphazard storage of construction materials safe storage areas will be identified and retaining structures put in place prior to the arrival and placement of material. Stockpiles of fine materials will be covered with tarp during windy conditions to prevent a dust nuisance. The stockpiling of construction materials will be properly managed and controlled.

7.3.1.6 Deteriorated/impaired water quality (surface and ground) due to accidental spills of hydrocarbons

The OUT and contractor shall ensure that re-fuelling and services for vehicles is done off the project site. Spill control measures such as storage and handling of chemicals and fuels on impervious areas (such as concrete surfaces) will be implemented to minimize impacts in case of spills. Equipment will be checked for lubricant leaks, and workers will be trained not to dispose of waste improperly in the area. Emergency response measures shall be put on site in case of accidental oil spill that will include having absorbent materials, sand kits at site, and alike. Fuel is stored at designated area that will have concrete surface with the containment bund.

7.3.1.7 Loss of aesthetics due to improper disposal of construction waste

An efficient collection and disposal system based on the principles of reduction, re-use and recycling of materials, shall be instituted at the project site and will include instructions to the contractor to put on his/her methodologies for handling hazardous waste such as oils, lubricants and non-combustible waste during the bidding process; and introduction of waste disposal bins, warning notices, "DOs & Don'ts" etc posted at strategic points, through the project area. Much of the excavated soil and rubble materials will be reused as initial filling materials where levelling of the project site is required. Cleared vegetation and top soil will fill up any other infrastructures (roads, pits, etc) that need filling. OUT will use the existing solid waste disposal and collection system. Wastes not suitable for incineration and general waste dumping (e.g., Batteries, plastics, rubbers, tyres, etc) shall be removed from the site for recycling,

treatment, and/or disposal by licensed contractor as appropriate. Waste management training for all personnel, operators and services providers at the project site will be provided.

6.3.2 Negative social impacts during construction phase

7.3.2.1 Traffic accident impacts

Traffic accidents will be avoided by ensuring good driver awareness and maintaining speed limits for main roads and material access roads. Also, by providing both road and safety signs to the public and drivers at the core activity project site(s). All large or over-size transport vehicles will be accompanied by escort cars equipped with flashing yellow warning lights while in transit on public roads. Delivery of construction plant, equipment, and goods will be planned to minimize the total number of required trips and be scheduled outside of peak hour traffic times. The spill response plan will include actions for responding to accidents involving hazardous materials on or off the project area.

7.3.2.2 Occupational health and safety impacts during construction

To mitigate this impact, OUT and contractor shall comply with relevant Tanzania (OSHA, 2003) and International Finance Cooperation's Performance Standards and regulations on health and safety requirements, including the provision of Person Protection Equipment (PPE), reasonable working hours and good working conditions and facilities. Also, health and safety on-site shall include standard best practice provisions in the construction contract, together with (i) appropriate BoQ items so that at least some elements of H&S are a pay item (financial incentive), (ii) a mechanism for withholding payments if the contractor is not compliant with the H&S provisions. Note that the provisions shall include insurance to enable the contractor to pay for any treatments required by his workers, including those of all sub-contractors, and any subsequent lifelong disability payments or loss of life or personal effects.

7.3.2.3 Increased incidence of diseases transmission including HIV/AIDS and STDs

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

7.3.2.4 Potential risks and hazards associated with child labour

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

7.3.2.5 Increased local population due to labour influx

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

7.3.2.6 Potential GBV/SEA/SH related incidences

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

7.3.2.7 Gender inequity in employment

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

7.4 OPERATION PHASE

7.4.1 Negative environmental impacts during operation phase

7.4.1.1 Contaminations of land from poor solid wastes management

The proponent will be responsible for the efficient management of solid waste generated by the project during its operation. In this regard, solid waste will be collected and sorted out in different containers so that non-biodegradable wastes such as plastics and others will be handled separately. Also, the proponent will provide an adequate number of bins at convenient distances to discourage uncontrolled waste disposal. Storage areas shall be of adequate size and capacity to accommodate the required number of containers consistent with the waste generated and collection schedules. Containers shall be clearly labelled for their intended use (e.g., plastics, paper glass and garbage) and equipped with lids. Containers and waste storage areas shall be cleaned regularly; and waste material shall be removed to the disposal site at the earliest opportunity. The OUT will put in place a monitoring system to ensure all observe the proposed solid waste measures.

7.4.1.2 Deteriorated/impaired water quality (surface and ground) from wastewater disposal

The project proponent shall take reasonable precautions to prevent the pollution of the ground and/or water resources located adjacent to the site due to the project activities. Sanitary arrangements shall be to the satisfaction of the requirement of the Environmental Management (Soil Quality Standards) Regulation, 2007 and the Environmental Management (Water Quality Standards G. N. No. 238) Regulation, 2007. Septic tank and soak away shall be designed in such a way waste treatment is achieved by 100% before disposal to the authorised disposal sites. The Kigoma Regional Centre will establish a continuous environmental monitoring program to ensure that O&M management are well informed of the environmental performance of the project at all levels and at all times.

7.4.1.3 Compromise quality of soil, ground water and surface water from laboratory effluents

The proponent will consider proper retention tank volume, geometry and compartmentalization to impart adequate hydraulic residence time for sedimentation. The elongated tank with length-to-width ratios of 3:1 or more is will be used to reduce short circuiting of the effluent. Two compartments will be used to achieve, better suspended solids removal rates. Manways 18 to 24 inches in diameter or square will be designed to access the tank for regular monitoring and maintenance. Tank joints will be designed for water tightness and tank will be located where it can be accessed easily for septage removal and sited away from drainage or depressions where water can collect. The proponent will maintain minimum horizontal set back distances requirement from buildings, property boundaries, wells, water lines, and the like. The backfill material will be free flowing and free of stones larger than 3 inches in diameter and debris. The Kigoma Regional Centre will establish a continuous environmental monitoring program to ensure that O&M management are well informed of the environmental performance of the project at all levels and at all times.

7.4.1.4 Public health hazards from reject materials/expired chemicals

Proper disposal of reject materials/expired chemicals can be expensive. So, the project proponent will minimize the need for proper disposal, by minimizing chemical purchases. The University will purchase chemicals for the lab according to the need of that particular time. Also, as the University has other Zonal laboratories, centralizing chemical purchasing will be an effective way to do this. Having a single person assigned to purchase all chemicals for all laboratories will help and ensure that duplicate orders are not made by different members of the laboratory staffs. The O&M will maintain an inventory of all the chemicals in use or stored in the laboratory. Procurement personnel will record the receipt of all purchased chemicals. The inventory will incorporate the date into the inventory to manage materials that expire. Chemicals from the inventory when they are used will be removed to keep track of materials and this will be monitored regularly. This inventory will be used to inform laboratory manager and staff members when samples become so old/expired that disposal is necessary. Thus, these expired chemicals will be stockpiled in the dedicated store room for further guidance from regulatory authority.

7.4.1.5 Health and safety risks due to fire hazards

All staff will have training in fire control through regular firefighting drills. Fire extinguishers would be available in accessible area near to fire risk area and ensure that all fire-fighting equipment is regularly maintained and serviced. Fire emergency telephone numbers would be displayed in communal areas. Some of the applicable techniques related to building safety, including hydrant system for protection of the building against fire will be implemented and automatic fire alarm system for the entire laboratory will be installed. Fire hazard signs such as 'No Smoking' signs will be provided. Directions to exit in case of any fire incidence and emergency contact numbers will be provided. The contact/emergency numbers will be displayed within the laboratory.

To avoid short circuiting, an earthing system shall be designed and installed. Grid resistance will be decided based on soil resistivity and allowance for corrosion. Electrical equipment's shall be flame proof in and around the plant. To avoid road accidents due to spillage of chemicals / substances and blockages of road, proper parking and road safety signs both inside and outside the plant shall be provided.

7.4.1.6 Occupational health and safety hazards due to inadequacies in provisions for working conditions

To protect workers from occupational hazards, the OUT shall provide and enforce use of appropriate PPE. Appropriate safety measures will be developed based on a risk assessment and may include adequate ventilation in the laboratory, office or in workers' long exposed working area, and guidance on safe working in confined spaces; establish safe working procedures/guidelines which will be followed by all employees working in the project premises. The OUT will also monitor occupational hazards risks and provide timely rectification before waiting for incidence. Further, OUT shall formulate the Occupational Health and Safety Policy (requirement of section 96 of OHS Act 2003). The medical examination shall be carried out every six months by Occupational Health Physician as per section 24 of the Occupational Health and Safety Act, 2003. Manuals and training regarding the correct handling of materials and packages shall be in place and updated as new or updated material safety data sheets becomes available; and maintenance of hygiene conditions at all workplace – washroom.

7.4.2 Negative social impacts during operation phase

7.4.2.1 Risk of SEA/SH within the OUT Kigoma Regional Centre

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

Also, GBV measures needed to protect students at the national level and the institutional level including the need for institutions to develop GBV policies to address SEA/SH, training and awareness raising, GBV responsive GRMs, educator/ staff codes of conduct (to be signed), student agreements, referral pathways etc., will be defined. The OUT will identify and create a partnership with a local NGO to report workers' misconduct and complaints/reports on GBV or harassment through the GRM.

7.4.2.2 Health and safety hazards from chemical handling in the laboratories

Only small amounts of chemicals necessary for daily use would be stored in the laboratory. Bulk stocks would be kept in specially designated rooms away from the laboratory. The proponent will replacement of the hazardous substance with a less hazardous substitute and will implement engineering and administrative control measures to avoid or minimize the release of hazardous substances into the work environment keeping the level of exposure below internationally established or recognized limits. Where corrosive, oxidizing, or reactive chemicals are used, handled, or stored, qualified first-aid would always be ensured. Appropriately equipped first-aid stations would be easily accessible throughout the place of work, and eye-wash stations and/or emergency showers would be provided close to all workstations where the recommended first-aid response is immediate flushing with water.

The proponent will communicate chemical hazards to workers and student through labelling and marking according to national and internationally recognized requirements and standards, including the International Chemical Safety Cards (ICSC), Material Safety Data Sheets (MSDS) or equivalent. Any means of written communication would be in an easily understood language and be readily available to exposed students, workers and first-aid personnel. Also, workers will be trained in the use of the available information (such as MSDSs), safe work practices, and appropriate use of PPE. Full safety wear shall be provided to any members of the team or student handling chemicals, and provisions to treat any exposure or clean spillages should be present in the laboratory.

7.4.2.3 Health Hazards due to social interaction among workers and users

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

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

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

7.5 DECOMMISSIONING PHASE

7.5.1 Negative social impacts during decommissioning phase

7.5.1.1 Loss of employment

In order to minimise the impacts that may result from this eventuality the proponent shall prepare the workers to be employed anywhere else in the assembly plant through provision of extensive training. Also, the project will prepare workers for forced retirement by providing skills for self-employment, wise investment. Further shall ensure that all employees are members of the Pension Fund and the employees shall ensure that the developer's contributions are made. In time of decommission of this project, OUT may consider its employees in development of new projects.

7.5.2 Negative environmental impacts during decommissioning phase

7.5.2.1 Environmental pollution from haphazard disposal of demolished waste

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. 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. 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.

7.5.2.2 Noise pollution

The OUT will coordinate activities that produce the most noise levels. Use of equipment designed with noise control elements will be adopted where necessary and demolition exercise will be limited at day time only. All workers operating in noisy areas or operating noisy equipment will be provided with earpieces to protect against extreme noise.

7.5.2.3 Air pollution due to dust

The contractor will douse the surface with water to suppress excessive dust and whenever possible, water sprinklers shall be used. Also, the contractor will provide protective gear (i.e., breathing masks) to workers working in dusty environment.

7.5.2.4 Soil and water pollution

Demolished materials shall be kept within planned boundaries and with a clear separation. If it is essential to stockpile materials close to runoff, control measures shall be implemented, such as excavation of a shallow water/sediment collection ditch around the boundaries of stockpiles to contain run-off water for a sufficient length of time to allow for settlement of solids. Stockpiles or other storage compounds (e.g., demolished material) boundaries shall be clearly marked out with physical boundary markers such as posts. Windbreaks or fencing shall be erected between the stockpiles and the predominant wind direction. Monitoring and auditing of the works and site practices shall be undertaken, including monitoring the water quality during the works. This will be necessary to enforce good site practice and principles as well as good and compliant behavior.

7.5.2.5 Occupational health and safety

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. The proponent shall establish safe working procedures/guidelines which will be followed by all employees and any subcontractor working in the facility premises

7.6 ENHANCEMENT OF POSITIVE SOCIO-ECONOMIC IMPACTS

7.6.1 Employment/Income generation

This impact is high and of great importance and therefore it will be enhanced by ensuring there is skill transfer through an elaborate programme. Staff will be categorized and each group will be supervised by dedicated skilled personnel to ensure on job training. The proponent will encourage job on training through observation and trial under supervision. Also, the contractor of the project will be encouraged to and committed to hiring local labour (especially marginalized groups such as youth), particularly when only semi-skilled or unskilled labour is required. During the tendering process for project construction, special clause that requires residents to be employed as labourers shall be included in the contractor's contract

7.6.2 Contributing to local economic growth

Where possible the construction contractor will be advised through contractual means to maximize the application and use of locally produced construction material supplies. This will increase the quantity of

materials to be procured from the various local suppliers and hence it will enhance the income generation capacity of local suppliers. The use of locally available materials and labour for the proposed project development will contribute to the economy's growth by contributing to the gross domestic product. The consumption of these materials, fuel oil and others will attract taxes, including VAT which will be payable to the government hence increasing government revenue, while the cost of these raw materials will be payable directly to the producers. Other opportunities can be enhanced to contribute to the growth of the economy at local, district, regional and national level includes food vendors (mama Lishe), Kiosk, Taxes from the workers' salary, tax, procurement of goods and services, charges, fees, levies.

7.6.3 Increased income by utilization of local resources

It is expected that, materials such as cement, aluminium, roofing sheets, timber, paving blocks tiles, sanitary, plumbing and electrical appliances, steel, and other miscellaneous materials required for construction can be sourced locally e.g., Kigoma-Ujiji Municipality or other parts of Tanzania, depending on the type of materials required. Therefore, such a demand would create a market for local people and should be enhanced.

7.6.4 Support to local social services and livelihood

The project has a potential of enhancing development of the area through increased business activities and direct employment. As a corporate citizen, OUT will work all along with the Government to achieve the millennium development goals mainly in the area of poverty reduction. This will be done through a non-partisan scheme set by the University, tailored towards extending support to disadvantaged sections of various communities in the area to enable them access education, health care and clean safe water.

7.6.5 Induce development

To enhance this positive impact to the community living in the vicinity and area of influence; OUT shall ensure efficient operation of the Science Laboratory Building at the Busomero Mtaa, and good security within the project area and area of influence

7.6.6 Corporate Responsibility

As part of social corporate responsibility, it is expected for the OUT to establish a separate budget to implement its social commitment in the area. Its priority should focus on the pressing needs in the community such as supporting the community on the ongoing social projects including supporting building dispensaries, classrooms, and water related projects to mention some.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 INTRODUCTION

The Environmental and Social Management Plan (ESMP) is presented below in table 8.1. This ESMP aims to address identified impacts associated with the proposed project. Based on the assessment undertaken as part of the ESIA, a series of mitigation measures have been identified that aim at reducing and/or eliminating the predicted impacts of the project. It is essential that these mitigation measures are appropriately applied to the project during pre- construction, construction, operation and decommissioning phases, and this management plan provides a strategic framework for their implementation. The project proponent and any Contractor shall implement components relevant to design, mobilization of materials and machines and works. The ESMP include an estimation of the costs of the measures so that the project proponent can budget the necessary funds. The estimated costs for implementing the mitigation measures are just indicative, thus, appropriate bills of quantities shall give the actual figures. In any case, the Consultant used informed judgment to develop these figures.

8.2 PURPOSE OF THE ESMP

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

- i) To bring the Project to comply with Government of Tanzania applicable national environmental and social legal requirements, policies and procedures;
- ii) To guide on EHS issues as required by the IFC, World Bank Group EHS Guidelines and the Equator Principles (June 2006);
- iii) To outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts; and
- iv) To provide an operational reference and tool for environmental and social management during implementation of project activities.

All contractual and legal obligations relating to the ESMP apply to the proponent, the main contractors and any sub-contractors. It is the responsibility of the contractors to provide adequate resources to ensure effective implementation and control of the ESMP. The sub-contractor is responsible to its respective contractor for compliance with the measures presented in the ESMP. It is also the proponent's responsibility, any contractors and their sub-contractors to ensure that all project staff are trained and procedures are understood and followed. Further reasonability of each part is given under section 3.8.2. The summary of the key issues of the proposed project and their management are shown in Table 8.1 below.

Table 8.1: Environmental and Social Management Plan

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
Preparation / Mobilization	Negative environmental impacts				
	Damage / loss of valuable vegetation cover	The OUT and Contractor shall ensure that clearance of the site for construction purposes shall be kept to a minimum and areas that the project will not impact shall not be disturbed. The Contractor shall mark out the extent of clearing within the approved worksite and instruct all construction workers to restrict clearing to the marked areas and not work outside defined work areas. In the same vein, there will be strict control of construction vehicles to ensure that they operate only within the area to be disturbed by construction works.	Type, number, distribution etc. of species, minimum vegetation clearance to the extent possible	OUT	5,000,000
	Deterioration/impairment of local air quality from equipment's/vehicular emissions	Reducing air emissions from exhausts shall be achieved by contracting new equipment or well serviced and maintained equipment. No vehicles or equipment's to be used that generate excessive black smoke. Where practical, the contract will inspect machines and vehicles on delivery. Also, contractor will enforce vehicle load restrictions to avoid excess emissions from engine overloading.	EM (AQS) TBS and WHO standards, No complaints from the local people	OUT	5,000,000
	Deterioration/impairment of local air quality from dust pollution	Dust generating activities (excavation, handling and transport of soils) shall not be carried out during times of strong winds. The Contractor shall suspend earthworks operations wherever visible dust is affecting properties adjoining the project site. Water shall be applied whenever dust emissions (from vehicle movements or wind) are visible at the site in the opinion of the Supervisor. Vehicles delivering soil materials will be covered to reduce spills and windblown dust and vehicle speeds will be limited to minimize the generation of dust on site and haul routes.	PM _{2.5} not to exceed 250 mg/Nm ³ (peak readings), No reports of excessive dust, Minimum public/resident annoyance on dust	OUT	5,000,000
	Disturbance/ nuisance to receptors from increased noise levels	Best practice procedures will be implemented to reduce mobilization noise. Such measures will include hydraulic construction in preference to percussive techniques where practical. Also, all plant and equipment will be maintained appropriately, silenced where appropriate and operated to prevent excessive noise and switched off when not in use. Loading and unloading of vehicles dismantling of equipment such as scaffolding or moving equipment or materials around the site will be conducted as practicable during daytime hours, and noise complaints will be immediately investigated.	EM (SCNVP) R, 2015 75 dB(A) (peak readings), daytime or 55 dB(A) (peak readings) at night	OUT	4,000,000
	Increased soil erosion of exposed surfaces	The OUT and contractor will, if possible, ensure that civil or earth work is done during dry season when there is no run off to reduce the impact severity. Deliberately re-cover exposed soils with grass and other appropriate species as soon as possible during dry	No erosion tendencies on site	OUT	5,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
		season to enable vegetation growth before wet season. Also, temporarily shall bind exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent water courses.			
Construction	Negative environmental impacts				
	Impacts on air quality from construction emissions	All personnel working on the project will be trained before starting construction on methods for minimizing air quality impacts during construction. This means that construction workers will be trained to minimise emissions during construction. Specific training will minimise dust and exhaust gas emissions from heavy construction vehicles. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idling of engines. Also, equipment shall be properly tuned and maintained. No vehicles to be used that generate excessive black smoke.	SO ₂ : average 100 µg/Nm ³ (0.129mg/kg) for 24hour; NO ₂ : 150 µg/Nm ³ for 24-hours average value; CO: 10mg/Nm ³ for 8 hours; Black smoke PM ₁₀ : 40 to 60 µg/Nm ³	OUT	4,000,000
	Nuisance and disturbance on/offsite receptors from increased noise level	The noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site. These include installation of portable barriers to shield compressors and other small stationery equipment where necessary, use of quiet equipment (i.e., equipment designed with noise control elements) and the proponent will ensure all vehicles have properly functioning mufflers. The noise level will be within acceptable limits and construction activities shall, where possible, be confined to regular working hours.	EM(SCNVP) R, 2015 75 dB(A) (peak readings), daytime or 55 dB(A) (peak readings) at night, Minimum public annoyance on noise	OUT	4,000,000
	Deteriorated/impaired air quality from dust pollution	Dust generating activities (excavation, handling and transport of soils) shall not be carried out during times of strong winds. The Contractor shall suspend earthworks operations wherever visible dust affects properties adjoining the project site. Water shall be applied whenever dust emissions (from vehicle movements or wind) are visible at the site in the opinion of the Supervisor. Vehicles delivering soil materials will be covered to reduce spills and windblown dust.	PM _{2.5} not to exceed 250 mg/Nm ³ (peak readings), No reports of excessive dust, Minimum public/resident annoyance on dust	OUT	5,000,000
	Nuisances and health hazards due to increased vibrations	It is prudent for the proposed project to reduce the level of vibration exposure as much as practical to prevent its effects on buildings/structures. This will be done by well-planned engineering designed and controls, the use of protective equipment and safe working practices. Also, the design of vibration-damped equipment and engine mountings are the most effective engineering methods of controlling vibration exposure.	Human detection level, <0.15	OUT	3,000,000
	Visual effects during construction	To mitigate the impact of haphazard storage of construction materials safe storage areas will be identified and retaining structures put in place prior to the arrival and	EM (SWM), 2016	OUT	5,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
		placement of material. Stockpiles of fine materials will be covered with tarp during windy conditions to prevent a dust nuisance. The stockpiling of construction materials will be properly managed and controlled.	As minimum as possible; no complaints from the local people		
	Deteriorated/impaired water quality (surface and ground) due to accidental spills of hydrocarbons	The OUT and contractor shall ensure that re-fuelling and services for vehicles is done off the project site. Spill control measures such as storage and handling of chemicals and fuels on impervious areas (such as concrete surfaces) will be implemented to minimize impacts in case of spills. Equipment will be checked for lubricant leaks, and workers will be trained not to dispose of waste improperly in the area.	EM (WQS) (hydrocarbons <10mg/l); No leakage /spillage of hydrocarbons	OUT	5,000,000
	Loss of aesthetics due to improper disposal of construction waste	An efficient collection and disposal system based on the principles of reduction, re-use and recycling of materials, shall be instituted at the project site and will include instructions to the contractor to put on his/her methodologies for handling hazardous waste such as oils, lubricants and non-combustible waste during the bidding process; and introduction of waste disposal bins, warning notices, "DOs & Don'ts" etc posted at strategic points, through the project area.	As minimum as possible; no complaints from the local people	OUT	5,000,000
Negative social impacts					
	Traffic accident impacts	Traffic accidents will be avoided by ensuring good driver awareness and maintaining speed limits for main roads and material access roads. Also, by providing both road and safety signs to the public and drivers at the core activity project site(s). All large or over-size transport vehicles will be accompanied by escort cars equipped with flashing yellow warning lights while in transit on public roads. Delivery of construction plant, equipment, and goods will be planned to minimize the total number of required trips and be scheduled outside of peak hour traffic times.	No injury and sufficient no of road signs	OUT	5,000,000
	Occupational health and safety impacts during construction	OUT and contractor shall comply with relevant Tanzania (OSHA, 2003) and International Finance Cooperation's Performance Standards and regulations on health and safety requirements, including the provision of Person Protection Equipment (PPE), reasonable working hours and good working conditions and facilities. Also, health and safety on-site shall include standard best practice provisions in the construction contract, together with (i) appropriate BoQ items so that at least some elements of H&S are a pay item (financial incentive), (ii) a mechanism for withholding payments if the contractor is not compliant with the H&S provisions.	Tanzania OSHA 2003, Low risk to workers and no exposure	OUT	5,000,000
	Increased incidence of diseases	The OUT and Contactor will devote time in raising awareness of the dangers of the HIV/AIDS within the project premises. Although basic knowledge of HIV/AIDS is high among Tanzanians, knowledge of self-protection measures and behaviour change will	Tanzania AIDS/HIV Policy, no new	OUT	5,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
	transmission including HIV/AIDS and STDs	be provided and a preference will be given to those who are vulnerable and to empower women for they compose one of the most vulnerable groups. When the need arises OUT and Contractor will seek for professional assistance from organizations working in the field of public health and control of HIV/AIDS for instituting a health education and disease control programme at the workplace.	HIV/AIDS victims recorded		
	Potential risks and hazards associated with child labour	The OUT and Contractor will comply with the provisions in the Employment and Labour Relation Act,2004 and the ILO Convention No. 182. OUT will develop transparent human resources policies and procedures for recruitment process, working conditions, terms of employment wages, worker-employer relations, non-discrimination policy, monitoring, roles and responsibilities. The OUT expects its contractors to adhere to the principles set forth in the Contract which will cover inter alia, standards related to Labour and prohibition of Child Labour.	Zero child labour in the construction activities	OUT	4,000,000
	Increased local population due to labour influx	Semi-skilled and unskilled labour required by the project will be sourced locally to provide communities with employment and the opportunity to earn an income during the construction phase. Local communities will be given prior information through village government offices on available employment opportunities and required qualifications. A special clause that requires local peoples to be employed as labourers during construction will be included in the contract.	High recruitment from local community; no complaints from the local people	OUT	4,000,000
	Potential GBV/SEA/SH related incidences	The OUT will emphases to all contractor to provide equal employment opportunities between men and women depending on required qualifications at all level. During construction local employment shall be optimized by allocating jobs fairly (consider gender, marginalized groups), involve community leaders/ committees to identify suitable/able people for the jobs, review to avoid bias or favouritism observe national/and international labour standards.	As minimum as possible; No GBV victims	OUT	5,000,000
	Gender inequity in employment	The OUT will ensure that women are given adequate employment opportunities during recruitment and job postings. Regular sensitization and awareness campaigns to the workers will be done to promote gender equity in employment during the construction works and during operation. Gender disaggregated data, separate bathing, changing room, sanitation facilities for men and women will be provided.	Increased women opportunities	OUT	5,000,000
Operation	Negative environmental impacts				
	Health and safety hazards from	Only small amounts of chemicals necessary for daily use would be stored in the laboratory. Bulk stocks would be kept in specially designated rooms away from the laboratory. The proponent will replacement of the hazardous substance with a less	OSHA 2003, Low risk to workers No exposure	OUT	4,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
	chemical handling in the laboratories	hazardous substitute and will implement engineering and administrative control measures to avoid or minimize the release of hazardous substances into the work environment keeping the level of exposure below internationally established or recognized limits.			
	Contaminations of land from poor solid wastes management	The proponent will be responsible for the efficient management of solid waste generated by the project during its operation. In this regard, solid waste will be collected and sorted out in different containers so that non-biodegradable wastes such as plastics and others will be handled separately. Also, the proponent will provide an adequate number of bins at convenient distances to discourage uncontrolled waste disposal. Storage areas shall be of adequate size and capacity to accommodate the required number of containers consistent with the waste generated and collection schedules.	EM (SWM), 2016 No haphazard disposal of waste; no complaints from the local people	OUT	4,000,000
	Deteriorated/impaired water quality (surface and ground) from wastewater disposal	The project proponent shall take reasonable precautions to prevent the pollution of the ground and/or water resources located adjacent to the site due to the project activities. Sanitary arrangements shall be to the satisfaction of the requirement of the EM (SQS), 2007 and EM (WQS) 2007. Septic tank and soak away shall be designed in such a way waste treatment is achieved by 100% before disposal to the authorised disposal sites.	EM (WQS), As minimum as possible; no complaints from the local people	OUT	4,000,000
	Compromise quality of soil, ground water and surface water from laboratory effluents	The proponent will consider proper retention tank volume, geometry and compartmentalization to impart adequate hydraulic residence time for sedimentation. The elongated tank with length-to-width ratios of 3:1 or more is will be used to reduce short circuiting of the effluent. Two compartments will be used to achieve, better suspended solids removal rates.	EM (WQS) As minimum as possible; no complaints from the local people	OUT	4,000,000
	Public health hazards from reject materials/expired chemicals	Proper disposal of reject materials/expired chemicals can be expensive. So, the project proponent will minimize the need for proper disposal, by minimizing chemical purchases. The University will purchase chemicals for the lab according to the need of that particular time. This inventory will be used to inform laboratory manager and staff members when samples become so old/expired that disposal is necessary. Thus, these expired chemicals will be stockpiled in the dedicated store room for further guidance from regulatory authority.	Tanzania OSHA 2003, Low risk to workers and no exposure	OUT	5,000,000
	Health and safety risks due to fire hazards	All staff will have training in fire control through regular firefighting drills. Fire extinguishers would be available in accessible area near to fire risk area and ensure that all fire-fighting equipment is regularly maintained and serviced. Fire emergency telephone numbers would be displayed in communal areas. Some of the applicable techniques related to building safety, including hydrant system for protection of the	Zero accidents, Zero exposure	OUT	5,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
		building against fire will be implemented and automatic fire alarm system for the entire laboratory will be installed. Fire hazard signs such as 'No Smoking' signs will be provided.			
	Occupational health and safety hazards due to inadequacies in provisions for working conditions	OUT shall provide and enforce use of appropriate PPE. Appropriate safety measures will be developed based on a risk assessment and may include adequate ventilation in the laboratory, office or in workers' long exposed working area, and guidance on safe working in confined spaces; establish safe working procedures/guidelines which will be followed by all employees working in the project premises. The OUT will also monitor occupational hazards risks and provide timely rectification before waiting for incidence. Further, OUT shall formulate the Occupational Health and Safety Policy (requirement of section 96 of OHS Act 2003).	OSHA 2003, Low risk to workers No exposure	OUT	4,000,000
Negative social impacts					
	Risk of SEA/SH within the OUT Kigoma Regional Centre	The OUT will draft, approved and implemented a GBV Action Plan and will assess the SEA/SH risks associated with the project based on existing data and input from key stakeholders. This will include identification of risks to workers and communities during construction as well as risks to students within operating institutions. The GBV requirements and expectations will be defined in the bid documents including codes of conducts (to be signed by workers), training, awareness raising for workers and the community, GBV responsive GRMs and approach to GBV case management.	As minimum as possible; No GBV/ SEA/SH victims	OUT	5,000,000
	Health Hazards due to social interaction among workers and users	The proponent will support already existing and new initiatives to sensitize / educate the people around the project on the HIV/AIDS pandemic. Also, the proponent will provide HIV/AIDS training / awareness campaign programmes to its employees and will encourage workers who know they are infected and receive care to break through the denial about HIV by talking with their fellow workers, friends and neighbours and reducing the discomfort associated with the subject.	Tanzania AIDS/ HIV Policy, No HIV/AIDS victims	OUT	5,000,000
	Non-user-friendly buildings for Persons with Disabilities (PWDs)	The building will be designed and built with ramps and other special facilities such as toilets to facilitate access and use by PWDs. Detailed consultation with the PWDs community will be undertaken during the design process to ensure key access and user-friendly facilities are designed and constructed.	Easy access to all users	OUT	4,000,000
Enhancement measures for potential positive impacts					
	Employment/Income generation	This impact is high and of great importance and therefore it will be enhanced by encouraging on job training through observation and trial under supervision. Also, the contractor of the project will be encouraged to and committed to hiring local labour	Local people to be employed as much as possible	OUT	5,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
		(especially marginalized groups such as youth), particularly when only semi-skilled or unskilled labour is required. During the tendering process for project construction, special clause that requires residents to be employed as labourers shall be included in the contractor's contract			
	Contributing to local economic growth	Where possible the construction contractor will be advised through contractual means to maximize the application and use of locally produced construction material supplies. This will increase the quantity of materials to be procured from the various local suppliers and hence it will enhance the income generation capacity of local suppliers. The use of locally available materials and labour for the proposed project development will contribute to the economy's growth by contributing to the gross domestic product.	As maximum as possible	OUT	4,000,000
	Increased income by utilization of local resources	It is expected that, materials such as cement, aluminium, roofing sheets, timber, paving blocks tiles, sanitary, plumbing and electrical appliances, steel, and other miscellaneous materials required for construction can be sourced locally e.g., Kigoma-Ujiji Municipality or other parts of Tanzania, depending on the type of materials required. Therefore, such a demand would create a market for local people and should be enhanced.	As maximum as possible	OUT	4,000,000
	Support to local social services and livelihood	The project has a potential of enhancing development of the area through increased business activities and direct employment. As a corporate citizen, OUT will work all along with the Government to achieve the millennium development goals mainly in the area of poverty reduction. This will be done through a non-partisan scheme set by the University, tailored towards extending support to disadvantaged sections of various communities in the area to enable them access education, health care and clean safe water.	As maximum as possible	OUT	4,000,000
	Induce development	To enhance this positive impact to the community living in the vicinity and area of influence; OUT shall ensure efficient operation of the Science Laboratory Building at the Busomero Mtaa, and good security within the project area and area of influence	As maximum as possible	OUT	3,000,000
	Corporate Responsibility	As part of social corporate responsibility, it is expected for the OUT to establish a separate budget to implement its social commitment in the area. Its priority should focus on the pressing needs in the community such as supporting the community on the ongoing social projects including supporting building dispensaries, classrooms, and water related projects to mention some	As maximum as possible	OUT	4,000,000
Decommissioning	Loss of employment	The proponent shall prepare the workers to be employed anywhere else in the assembly plant through provision of extensive training. Also the project will prepare workers for forced retirement by providing skills for self-employment, wise investment. Further shall	All employees covered	OUT	4,000,000

Phase	Potential Impacts	Management Measure	Target Level/ standard	Responsibility	Estimated Costs (TZS)
		ensure that all employees are members of the Pension Fund and the employees shall ensure that the developer's contributions are made. In time of decommissioning of this project, OUT may consider its employees in development of new projects.			
	Environmental pollution from haphazard disposal of demolished waste	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. 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.	EM (SWM), 2016 No haphazard disposal of waste,	OUT	5,000,000
	Noise pollution	The OUT will coordinate activities that produce the most noise levels. Use of equipment designed with noise control elements will be adopted where necessary and demolition exercise will be limited at day time only. All workers operating in noisy areas or operating noisy equipment will be provided with earpieces to protect against extreme noise.	EM(SCNVP), 2015 not exceed 75 dB(A) daytime or 55 dB(A) at night	OUT	4,000,000
	Air pollution due to dust	The contractor will douse the surface with water to suppress excessive dust and whenever possible, water sprinklers shall be used. Also the contractor will provide protective gear (i.e. breathing masks) to workers working in dusty environment.	EM (AQS), 2007 PM _{2.5} not to exceed 250 mg/Nm ³ (peak readings)	OUT	4,000,000
	Soil and water pollution	Demolished materials shall be kept within planned boundaries and with a clear separation. If it is essential to stockpile materials close to runoff, control measures shall be implemented, such as excavation of a shallow water/ sediment collection ditch around the boundaries of stockpiles to contain run-off water for a sufficient length of time to allow for settlement of solids. Stockpiles or other storage compounds (e.g., demolished material) boundaries shall be clearly marked out with physical boundary markers such as posts.	EM (SQS), 2007; EM (WQS) 2007; Nitrate 30 mg/l, Lead 0.05 mg/l, Sulphate 600 mg/l, Turbidity 30 NTU	OUT	5,000,000
	Occupational health and safety	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. The proponent shall establish safe working procedures/guidelines which will be followed by all employees and any subcontractor working in the facility premises	Tanzania OSHA 2003, Low risk to workers and no exposure	OUT	4,000,000

Notes:

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

EM (SQS), 2007 = The Environmental Management (Soil Quality Standards) Regulation, 2007
EM (WQS) 2007 = The Environmental Management (Water Quality Standards G. N. No. 238) Regulation, 2007
EM(SCNVP), 2015 = The Environmental Management (Standards for Control of Noise and Vibration Pollution) Regulations, 2015
EM (HWCM) R = The Environmental Management (Hazardous Waste Control and Management) Regulations, 2019

9 ENVIRONMENTAL MONITORING PLAN

9.1 INTRODUCTION

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

9.2 OBJECTIVES OF EMP

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

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

9.3 MONITORING RESPONSIBILITY

Implementation of the EMP is the solely the responsibility of the project proponent. The OUT shall supervise and monitor components of the monitoring plan and keep record of monitoring outcome. The OUT has ability to provide the necessary supervisory oversight to ensure the mitigation measures are working and where they are not remedial measures are established. The OUT is committed to protect, and will enhance the environment. Detailed parameters to be monitored have been considered along with responsible institution (s).

The OUT will endeavour to ensure that resources are available to implement the EMP throughout all phases of project development and decommissioning. The EMP will be subject to the principle of continuous improvement. The details of environmental issues, environmental impacts, proposed parameter to be monitored and timing agencies responsible for execution of proposed actions during mobilisation, construction, operation and decommissioning stages are presented in Tables 9.1 below.

Table 9.1: Environmental Monitoring Plan

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Methods	Target Level/ standard	Responsibility	Estimated Costs (TZS)
Preparation / Mobilization	Negative environmental impact								
	Damage / loss of valuable vegetation cover	Size of land cleared; type & number of trees planted	Weekly inspection	Project site	M ₂ , Number of affected species	Site inspection, Visual observation	Minimum vegetation clearance to the extent possible	OUT	5,000,000
	Deterioration/impairment of local air quality from equipment's/ vehicular emissions	SO ₂	Weekly inspection	Project site	Mg/l	Detector tubes	average 100 µg/Nm ³ (0.129mg/kg) for 24hour	OUT	6,000,000
		NO ₂	Weekly inspection	Project site	Mg/l	Detector tubes	150 µg/Nm ³ for 24-hours average value		
		CO	Weekly inspection	Project site	ppm	Mini-Vol Sampler	10mg/Nm ³ for 8 hours		
		Black smoke PM ₁₀	Weekly inspection	Project site	ppm	Mini-Vol Sampler	40 to 60 µg/Nm ³		
	Deterioration/impairment of local air quality from dust pollution	Dust level	Weekly inspection	Project site	µg/m ³	Dust level meter/ Mini-Vol Sampler	PM 2.5 not to exceed 250 mg/Nm ³ (peak readings)	OUT	3,000,000
	Disturbance/ nuisance to receptors from increased noise levels	Noise level	Weekly inspection	Transportation route, Project site	dBA	Noise level meter	EM (SCNVP) R, 2015 75 dB(A) daytime or 55 dB(A) at night	OUT	4,000,000
Increased soil erosion of exposed surfaces	Visible erosion	Weekly inspection	Project site	Level of erosions	Site inspection, visual observation	No erosion tendencies	OUT	3,000,000	
Construction	Negative environmental impact								
	Impacts on air quality from construction emissions	TSP, CO ₂ , CO, NO, NO _x & SO ₂	Weekly inspections	Project site	mg/m ³ or mg/Nm ³	Combustion Gas analyser	EM (AQS); EM (AQS), 2007 and WHO standards	OUT	4,000,000
	Nuisance and disturbance on/offsite	Noise level	Weekly inspection	Transportation route,	dBA	Noise level meter	EM (SCNVP) R, 2015 75 dB(A) daytime or 55 dB(A) at night	OUT	4,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Methods	Target Level/ standard	Responsibility	Estimated Costs (TZS)
	receptors from increased noise level			Project site					
	Deteriorated/impaired air quality from dust pollution	Dust level	Weekly inspection	Project site	µg/m ³	Dust level meter/ Mini-Vol Sampler	PM 2.5 not to exceed 250 mg/Nm ³ (peak readings)	OUT	5,000,000
	Nuisances and health hazards due to increased vibrations	Vibration levels/ PPV	Monthly inspection	Project site	mm/s PPV	Vibration meter	Human detection level, <0.15	OUT	3,000,000
	Visual effects during construction	Aesthetics of the area, materials storage site	Monthly inspections	Project site	None	Site inspection, Observation, Quantity analysis	As minimum as possible; no complaints from the local people	OUT	5,000,000
	Deteriorated/impaired water quality (surface and ground) due to accidental spills of hydrocarbons	Fuel & material storage areas, re-fuelling areas	Monthly inspections	Project site	mg/l	Sampling and analysis (Spectrophotometer)	EM (WQS) (hydrocarbons <10mg/l); No leakage/spillage of hydrocarbons	OUT	5,000,000
	Loss of aesthetics due to improper disposal of construction waste	Amount of solid waste generated, disposal records	Monthly inspections	Project site	Volume/weight of waste	Site inspection, Observation, Quantity analysis	Adequate solid waste collection bins and sanitation facilities	OUT	5,000,000
Negative social impacts									
	Traffic accident impacts	Traffic control measures in place	Monthly inspections	Transport routes and project area	Number and duration of the disruption	Visual inspection	No injury and sufficient no of road signs	OUT	5,000,000
	Occupational health and safety impacts during construction	Registered worker Injury/illness, PPE	Monthly inspections	Project site	Number of cases/injuries, PPE	Medical records and site inspection	Tanzania OSHA 2003, Low risk to workers and no exposure	OUT	5,000,000
	Increased incidence of diseases transmission including HIV/AIDS and STDs	Medical reports of HIV/AIDS or other disease,	Monthly inspections	Project site	Number of people infected	HIV blood tests and surveys,	Tanzania AIDS/HIV Policy, No HIV/AIDS victims	OUT	5,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Methods	Target Level/ standard	Responsibility	Estimated Costs (TZS)
	Potential risks and hazards associated with child labour	Recruitment/procurement rules and procedures	Monthly inspections	Project site	Number of children employed	Workers register book	Zero child labour in the construction activities	OUT	4,000,000
	Increased local population due to labour influx	Recruitment/procurement rules and procedures	Monthly inspections	Project site	Number of people coming on the area	Workers register book	High recruitment from local community; no complaints from the local people	OUT	4,000,000
	Potential GBV/SEA/SH related incidences	Assaults/harassment, GBV and VAC cases	Monthly inspections	Project site	Number of women employed	GBV reports/cases	As minimum as possible; No GBV victims	OUT	5,000,000
	Gender inequity in employment	Recruitment/procurement rules and procedures	Monthly inspections	Project site	Number of GBV cases	GBV reports/cases	Increased women opportunities	OUT	5,000,000
Operation	Negative environmental impacts								
	Health and safety hazards from chemical handling in the laboratories	Registered worker Injury /illness, Proper use PPE	Quarter inspection	Project site	Number of cases/injuries	Medical records, and site inspection	OSHA 2003, Low risk to workers No exposure	OUT	4,000,000
	Contaminations of land from poor solid wastes management	Record of solid waste generated & disposal records	Quarter inspection	Project site	Number of occurrences	Site inspection	No haphazard disposal of waste; no complaints from the local people	OUT	4,000,000
	Deteriorated/impaired water quality (surface and ground) from wastewater disposal	BODs, faecal coliform, monitoring schedule in place	Quarter inspection	Project site	Number of occurrences	Site inspection	EM (WQS), faecal coliform level of not more than 100 FC per 100ml;	OUT	4,000,000
	Compromise quality of soil, ground water and surface water from laboratory effluents	Containment tanks, piping system, pH, BOD, COD, TSS	Quarter inspection	Project site	Number of occurrences	Site inspection, pH Meter, pH Meter Sampling and analysis	EM (WQS) As minimum as possible; no complaints from the local people	OUT	4,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Methods	Target Level/ standard	Responsibility	Estimated Costs (TZS)
	Public health hazards from reject materials/ expired chemicals	Amount and Contents of reject materials/expired chemicals	Quarter inspection	Project area	Amount /volume	Site inspection	Tanzania OSHA 2003, Low risk to workers and no exposure	OUT	5,000,000
	Health and safety risks due to fire hazards	Number of accidents, fire protection measures	Continuously	Project site	Incidence	Site inspection	Zero accidents, Zero exposure	OUT	5,000,000
	Occupational health and safety hazards due to inadequacies in provisions for working conditions	Registered worker Injury /illness Proper use PPE	Quarter inspection	Work sites	Number of cases/injuries, workers using PPE	Medical records, and site inspection	OSHA 2003, Low risk to workers No exposure	OUT	4,000,000
Negative social impacts									
	Risk of SEA/SH within the OUT Kigoma Regional Centre	Assaults/harassment, GBV and VAC cases	Quarter inspection	Project site	Number of women employed	GBV reports/cases	As minimum as possible; No GBV victims	OUT	5,000,000
	Health Hazards due to social interaction among workers and users	medical reports of HIV/AIDS or other diseases,	Every 6months	Project site	Number of people infected	HIV blood tests and surveys	Tanzania AIDS/ HIV Policy, No HIV/AIDS victims	OUT	5,000,000
	Non-user-friendly buildings for Persons with Disabilities (PWDs)	Ramps and other special facilities such as toilets	First-year of operation	Project site	Number of users	Site inspection, Observation	Easy access to all users	OUT	4,000,000
Enhancement measures for potential positive impacts									
	Employment/Income generation	Local people employed and training conducted	Continuously during operation	Project records	Numbers of local people employed	Numbers of local people employed	As maximum as possible	OUT	4,000,000
	Contributing to local economic growth	Income of local people	During operation	Project records	Amount	Site inspection, Observation	As maximum as possible	OUT	4,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Methods	Target Level/ standard	Responsibility	Estimated Costs (TZS)
	Increased income by utilization of local resources	Procurement records	Continuously during operation	Project records	Amount	Site inspection, Observation	As maximum as possible	OUT	4,000,000
	Support to local social services and livelihood	Records of type and amount of support	Continuously during operation	Project records	Amount and numbers	Numbers of local people benefitted from the project	As maximum as possible	OUT	4,000,000
	Induce development	Type of development	Continuously during operation	Project records	Number	Site inspection, Observation		OUT	4,000,000
	Corporate Responsibility	Records of kind and amount of support	Continuously during operation	Project records	Amount and numbers of support	Numbers of local people benefitted from the project	As maximum as possible	OUT	4,000,000
Decommissioning	Negative social impacts								
	Loss of employment	Pension fund remittance	Monthly inspection	Project site	Employees with pension fund	Workers register book	All workers	OUT	4,000,000
	Negative environmental impacts								
	Environmental pollution from haphazard disposal of demolished waste	Amount of solid waste generated and disposed off	Monthly inspection	Dumpsite, general project area	Volume/ weight of waste	Site inspection, Observation, Quantity analysis	No waste at the site	OUT	5,000,000
	Noise pollution	Noise levels	Monthly inspection	Project site	dBA	Noise level meter	EM(SCNVP), 2015 not exceed 75 dB(A) daytime or 55 dB(A) at night	OUT	4,000,000
	Air pollution due to dust	Dust level	Monthly inspection	Project site	µg/m ³	Dust level meter/ Mini-Vol Sampler	EM (AQS), 2007 PM _{2.5} not to exceed 250 mg/Nm ³ (peak readings)	OUT	4,000,000
	Soil and water pollution	pH, BOD, COD, TSS and monitoring	Monthly inspection	Project site	NTU, mg/l	Sampling and analysis (Spectrophotometer)	EM (SQS), 2007; EM (WQS) 2007; BOD < 30mg/ litre	OUT	5,000,000

Phase	Potential Impacts	Parameter to be monitored	Monitoring Frequency	Monitoring Area	Measurement Units	Measuring Methods	Target Level/ standard	Responsibility	Estimated Costs (TZS)
		schedule in place							
	Occupational health and safety	Registered worker Injury / Proper use PPE	Monthly inspection	Project site	Number of injuries, PPE users	Medical records, and site inspection	Tanzania OSHA 2003, Low risk to workers and no exposure	OUT	4,000,000

10 COST BENEFIT ANALYSIS

10.1 INTRODUCTION

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

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

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

10.2 COST STRUCTURE

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

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

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

10.3 FINANCIAL EVALUATION

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

10.4 SOCIAL BENEFITS

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

10.5 COMMUNITIES BENEFITS

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

10.6 POSSIBLE COSTS TO GOVERNMENT

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

10.7 ENVIRONMENTAL AND SOCIAL COST-BENEFIT ANALYSIS

Environmental and social cost-benefit analysis is assessed in the negative versus positive analysis. Furthermore, the analysis considers whether the impacts are mitigatable and the costs of mitigating the impacts are reasonable. The benefits that will be obtained from the implementation of management and monitoring plan include improved air quality, health conditions of workers, and the surrounding environment. As mentioned in Chapters 6 and 7, the benefits of the project, in terms of financial and social benefit, are substantial, the environmental and social impacts are mitigatable and the financial resources needed to mitigate the impacts are relatively small compared with the actual capital investment. This project shall have a significant impact on the economy of Tanzania, especially in the tourism sector.

11 DECOMMISSIONING PLAN

11.1 INTRODUCTION

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

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

11.2 AIM OF THE PRELIMINARY PLAN

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

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

11.3 CONTENT OF THE PRELIMINARY

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

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

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

11.4 PROJECT DECOMMISSIONING METHODOLOGY AND SCHEDULE

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

1. Decommissioning will involve, but not limited to the specified list, because some issues or problems may surface during subsequent monitoring and audits:
 - a) The buildings will continuously be rehabilitated and renovated. While doing that there will be solid wastes which will be disposed of according to the EMP.
 - b) Moreover, during decommissioning the buildings will be demolished accordingly to suit the new activity while doing that the rubble will be disposed of according to the directions of the Municipal Council’s directives.
2. Employees will be terminated from their employments and to them the future will look blunt. Three things will be observed: their contributions to the pension fund will be made monthly as required by law; a training programme will be made to continuously advance them into apt skills and professions; and the termination benefits including transport and disturbance allowances will be made.
3. On decommissioning the proponent will search for experts’ opinions in order to convert the entire area into another or other uses.
4. The restoration plan for the entire premises will be made by proponent (with expertise from environmentalists and economists) and then forwarded to NEMC for approval.
5. Also, proponent Management shall obtain all permits required to undertake decommissioning of the Project. This basically will include Pension Fund, Municipal Council etc.

Project removal will begin six months after closure and continue for twelve months. Within the six months from closure, proponent will inventory all components that need to be removed and or disposed of. This inventory will include building structures, equipment etc. to be demolished/dismantled. Also, mode of disposal will have to be finalized. This information will assist in the preparation of the final decommissioning plan, for approval by NEMC. After the approval of the decommissioning plan the metal parts will be removed first within the first three months (this is important to ensure that they are not vandalized). The second three months of the decommissioning will be used to remove concrete structures and foundations. Debris will be used as road fills for rural roads. All disturbed areas will be landscaped and re-vegetated using indigenous trees.

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

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

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

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

(2) Permitting: Proponent shall obtain all permits required to undertake removal of the Project. This basically will include NEMC, TRA, TANESCO, Pension Fund, Municipal Council etc.

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

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

(5) Post-Removal Activities: Post-Project removal monitoring will continue for one year

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

12 SUMMARY AND CONCLUSION

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

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

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

This report concludes that the proposed project is in appropriate location as far as land use and interactions with human social and economic setting is concerned. Most of the environmental and social impacts identified and assessed; none of these are considered to be that severe after mitigation to prevent the further planning, design, and development of the proposed construction of the Two Storey Science Laboratory Building at Plot No 17, Block A, Busomero Mtaa, Kasimbu Ward. Thus, the project in the area can be considered suitable subject to implementing the mitigation measures as indicated in the Environmental and Social Management Plan. Further, to further sustainability of the project in the area, it is recommended that the proposed Monitoring Plan should be implemented accordingly for consistent efficacy of mitigation measures or timely corrective measures before significant impacts to the environment and social components.

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APPENDICIES

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

Appendix 4.1: Average noise levels (in dBA) recorded for the proposed project site

Station	Location	Daytime Noise in (dBA)
AQMS1	Northern side of the plot	48.12
AQMS2	Western side of the plot	40.51
AQMS3	Eastern side of the plot (Close to the access road)	52.26
AQMS4	Southern side of the plot	41.30
TBS-NES Limits		<70
WB/IFC Guideline		<70

Sampling date: October, 2023

Source: Field measurements

Appendix 4.2: Average ambient particulate matter values measured at the project site

Station	Location	TSP (mg/m ³)	PM ₁₀ (mg/m ³)	PM _{2.5} (mg/m ³)
AQMS1	Northern side of the plot	0.010	0.004	0.002
AQMS2	Western side of the plot	0.015	0.008	0.005
AQMS3	Eastern side (Close to the access road)	0.021	0.0011	0.005
AQMS4	Southern side of the plot	0.012	0.006	0.003
TBS LIMITS [TZS845:2005]		-	0.15	-
IFC (2007) and WHO AQG 2006		0.23	0.05	0.025
US OSHA Standard Limit for Inert or Nuisance Dust		15	-	-

Sampling date: October, 2023 Source: Field measurements

Appendix 4.3: Ground Vibrations (in mm/s PPV) recorded at four monitoring stations

Code	Measured Air Quality Monitoring Stations	Vibrations (mm/s PPV)
AQMS1	Northern side of the plot	0.09
AQMS2	Western side of the plot	0.02
AQMS3	Eastern side (Close to the access road)	0.10
AQMS4	Southern side of the plot	0.05
Human & Animal detection level		0.15
British Standard (BS 5228 -2:2009)		0.30

Sampling date: October, 2023

Source: Field measurements

APPENDIX 2: DETAILED STAKEHOLDERS VIEWS AND CONCERNS

Name of Stakeholder	Views/Comments
Occupational Safety and Health Authority	<ul style="list-style-type: none"> • Before starting construction work the contractor should register with OSHA. OSHA is currently online and all applications can be made online and this is meant to reduce logistics of our client towards compliance issues. • As part of OHS procedure OUT should undertake Risk Assessment of the project and the contractor also should undertake risk assessment of the involved work to identify associated risks and formulate the mitigation measures against identified risks. • Further contractor should comply to basic OHS requirements Act to include training of the workers on risks associated with the work to include those identified during risk assessment. • Contractor should have Health and Safety policy in place • Also, should provide staff welfare facilities to conducive sanitary facilities, safe drinking water, first aid kit, appropriate PPEs in line with identified hazards during the risk assessment. • The contractor also should have trained health and safety representatives to guide and supervise the OHS issues at site. • During operation the OUT/operator should register the workplace for operation <ul style="list-style-type: none"> ○ Should also conduct required medical examinations in three categories i.e. pre-employment medical checks, medical surveillance at least once per year during employment period and exit-medical checks.
Lake Tanganyika Basin Water Board-Director office.	<ul style="list-style-type: none"> • Stakeholder pointed out that there are impacts associated with pollution of land and waters due to effluents and chemical discharges from the laboratory operations; generation of odors and noise from the equipment and machinery operating in the area; health and nuisance problems resulting from dust and air pollution from moving trucks, etc. Therefore the proponent should <ul style="list-style-type: none"> ○ examine and determine the source of water for project operations and domestic uses. Any alternatives should be suggested; ○ Identify likely impacts of the resources and services (i.e., building materials, fire services, etc.) to the community and the surrounding environment and evaluate the significance; ○ Recommend acceptable procedures for the project to access the resources and services available/procedure to establish/acquire them; ○ examine the handling, storage and use of any chemical in laboratory operations. This will enable evaluation of the impacts that may result from pollution of land and waters due to effluents and chemical discharges from the laboratory and recommend mitigation measures.
Government Chemist Laboratory Authority (GCLA) Central Zonal office	<ul style="list-style-type: none"> • GCLA provided that the proposed project should provide quality and cost-effective laboratory services to all targeted beneficiaries through provision of excellence analytical services in effective, efficient, and

	<p>sustainable manner for the purpose of protecting human health, environment and for execution of justice.</p> <ul style="list-style-type: none"> • GCLA expectation that the proposed laboratory shall be built in such a way that is able to be accessed by the physically challenged persons and will have the capacity to provide the quality services required by the OUT students and lectures. GCLA expect that the laboratory design must take care of issues of waste management so as to protect human health and general public. • The laboratory design should take into consideration current requirements of laboratory set ups in line with Government Chemist Laboratory Authority Act (GCLA) No. 8 of 2016 and its regulations. • GCLA concerns are that; care of laboratory waste management (solid waste, liquid effluents, gaseous waste through exhaust from fume hoods and other chimneys) that could be releasing such as environmentally friendly gases could potentially have effects on OUT employees and students if to well managed
<p>Fire and Rescue Force - Kigoma Ujiji office</p>	<ul style="list-style-type: none"> • The officers noted that the proponent should ensure the project complies with the Fire and Rescue Force Act of 2007 and its principal regulations of 2015. The regulations gives fire precaution measures requirements on building based on nature of uses. • First the design of the buildings/structures drawings should be submitted to the Fire for scrutiny and recommendation for improvements. Issues to be looked at include occupancy load, doors, evacuation procedure, safety and risk zone distance as well as setting fire mechanism. This is important to avoid costs involved with alteration after construction of the buildings/structures. • During construction there are fire related risks that are required to be considered for instance, on site debris management, oil and fuels management, and disposal of debris in a manner not to cause fire. • After construction, installation of fire appliances as approved in the drawings will follow and fire officers will inspect after construction to check if construction has been done as per approved drawings and before operation to ensure fire installations have been done as per approved drawings.
<p>Municipal Director Office</p>	<ul style="list-style-type: none"> • The stakeholder pointed out that the community normally want to be involved fully on the project and feedback on the issues discussed. They would want to know how are they going to be benefitted on the project and this ensures brings about ownership and the sustainability of the project in the area. • Ensure that the contractor carries out the construction works as per the rules, regulations and standards of the NEMC. • During the construction phase of the laboratory, either the main contractor or his sub contractors should follow all related laws and regulation in the employment of construction workers, ensuring labour standards, on time settling of payments and the like. To follow such measures allows the contractor and his sub contractors to have peaceful working environment.

	<ul style="list-style-type: none"> • The project contractor is expected to follow standard occupational health and safety standards during the construction phase of the project. • Stakeholder emphasized that during construction and operation phases dispose of both solid and liquid waste should be carried out in proper manner so that will not affect the nearby communities. • It was advised that during construction work, the contractor should avoid storing construction materials, parking of construction machineries and trucks on vehicular and pedestrian walkways. • It was added that the proponent should support awareness raising and information communication initiatives on matters relating to health (HIV/AIDS, hygiene), security and safety etc • To maintain harmony and good neighbourliness the project proponent should request the good will of the coresidents and community leadership to help in the protection of the project facilities and properties from vandalism and encroachment. • The land use of the plot is compatible and allow for the construction of the laboratory.
Ward Development Committee	<ul style="list-style-type: none"> • The Ward representative explained that they have no objection to construction of the laboratory adding that it is a new development coming to the area that will increase employment to local communities. • The stakeholders were of concern with how people, environment and machinery will be handled during construction. They provided that the project of construction nature starts from ground breaking, manual handling and use of protective equipment. • Further they were of concern with the kind/type of tests that will be conducted in the laboratory and if there will be radioactive chemicals, how will it be disposed off. They insisted on the proper disposal of failed products at the laboratory. They were also concerned with noise pollution during construction. The commented that during construction; some machines will make a lot of noise and advise that OUT should properly handle the noise generated during construction and operation. • Establish mechanisms that will allow Ward leaders to carry out follow up and monitoring of the project activities • On the positive side, they expect the creation of employment to local people through direct and indirect employment that is for majority of unskilled manpower being drawn from the surrounding communities during and after construction when the laboratory would be functional. • The construction phase is likely to uplift women as worker would spend their disposable income through buying filters, groundnuts and restaurants. They also expect women to be employed both as unskilled and skilled workers at the construction site. • Stakeholder suggested that the designs must be equally environmentally friendly, socio economically friendly and employ competent human resource.
Busomelo Mtaa Chairman, MEO, Mtaa Council members -	<ul style="list-style-type: none"> • Busomelo Mtaa are happy to receive the news of the proposed development in their area • There should be involvement of at least one member from the mtaa government that will participate on regular site meetings during

<p>religious, teachers, traditional chiefs, elders, etc</p>	<p>construction phase; so as to obtain the views and concerns from the external project surroundings and the community as whole as part of environmental and social monitoring.</p> <ul style="list-style-type: none"> • The construction activities will possibly generate wastewater and also contribute to increase of uncontrolled dust around the area. There should be proper management of generated dust during construction phase as well as during operation of the facilities. • The local people expect that the project will generate a good number of employment opportunities to youths of the area. They emphasized that the project contractor and the OUT management should consider the employees especially youth from the local area for casual and permanent employments. Jobs that do not require professions/skills; priority shall be given to local residents of Busomelo Community. • The influx of labour due to the project should be controlled to avoid gender-based violence (GBV), sexual harassment and spreading sexually transmitted diseases (STDs) • The health and safety of the project workers and neighboring community should be given priority and enhanced • The Community is happy to be involved at these very early stages and before project implementation. They asked the project proponent to speed up the project implementation. • The proposed project will create good environment for local Community's entrepreneurs and will benefit by selling their goods to workers and students during construction and operation phases. Therefore, the Proponent should construct booths /kiosk /shops/ vibanda/ compartments /stalls for them especially women's groups. • The proposed project will boost the socio-economic status of the area. • The project will also stimulate and/or motivate students to opt for or like science subjects • OUT management should continue maintaining good relationship with the local Authorities particularly Busomelo Community offices as well as the neighbouring communities. • The project will possibly attract many people outside the area coming for opportunities such as Job and petty trades; this will contribute to behavioural change of the children of the nearby residents especially during construction phase (e.g., construction workers shouting with insults). However, this is expected to last for short time of construction phase • The influx of people during construction and students during operation phase may result to spread of sexual transmitted diseases (STDs) in the area. The contractor and proponent should find the way to address this impact. • Construction activities will undoubtedly generate large volume of solid wastes. There should be proper handling and storage of these waste. They should not haphazardly dump outside the compound. The solid waste contractor should be consulted and come to the construction site routinely and possibly on weekly basis to haul the waste to the landfill.
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APPENDIX 3: LAND OWNERSHIP DOCUMENTS

TITLE NO. 7073
 REGISTERED 07.06.2018
 AT 10:00 AM

LAND REGISTRY
TANGANYIKA

[Signature]
Asst. Registrar of Titles

TANGANYIKA STAMP DUTY ACT.
 Stamp Duty Shs 240/= Paid
 on original Receipt No. 9900066402
 of 20.11.2017 Issued

[Signature]
Stamp Duty Office

TANGANYIKA STAMP DUTY ACT.
 Stamp Duty Shs 100/= Paid
 Receipt No. 99000664023
 of 20.11.2017 Issued

[Signature]
Stamp Duty Office

THE UNITED REPUBLIC OF TANZANIA

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

CERTIFICATE OF OCCUPANCY
(Under section 29)

The 28th day of May

Title No. 7073 **LRTabora**
 L.O. No. 497631
 L.D. No. KUMC/LD/77575
 two thousand and ~~seventeen~~ Eighteen

[Signature]
ISRAEL

THIS IS TO CERTIFY that **THE OPEN UNIVERSITY OF TANZANIA** established under the Open University of Tanzania Act, 1992 of P.O.BOX 23409 Dar es salaam (hereinafter called "the Occupiers") is entitled to the Right of Occupancy (hereinafter called "the Right") in and over the land described in the Schedule hereto (hereinafter called "the Land") for a term of **Ninety nine** years from the first day of first **October, Two Thousand and seventeen** according to the true intent and meaning of the Land Act and subject to the provisions thereof and to any regulations made thereunder and to any enactment in substitution thereof or amendment thereof and to the following special conditions:-

1. The Occupier having paid rent up to the thirtieth day of June, 2018 shall thereafter pay rent of shillings Five thousand (5,000/=) only a year in advance on the first day of July in every year of the term without deduction **PROVIDED** that the rent may be revised by the Commissioner for Lands.
2. The Occupier shall:-
 - (i) Be responsible for the protection of all beacons on the land throughout the term of the Right. Missing beacons will have to be re-established at any time at the Occupier's expenses as assessed by the Director responsible for Surveys and Mapping.

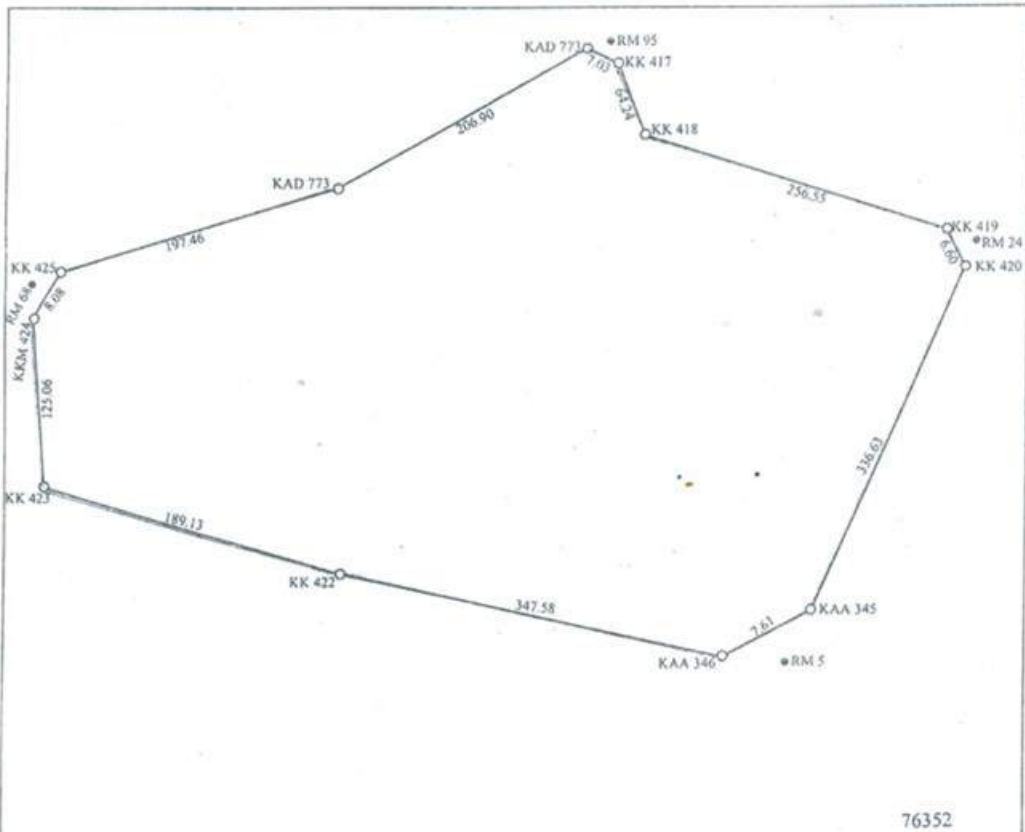
- (ii) Do everything necessary to preserve the environment and protect the soil and prevent soil erosion on the land and do all things which may be required by the authorities responsible for environment and to achieve such objective.
 - (iii) Maintain on the land buildings (hereinafter called "the buildings") in permanent materials designed for use in accordance with the conditions of the Right and which conform to the building line (if any) decided by the **Kigoma/Ujiji Municipal Council** (hereinafter called "the Authority").
 - (iv) At all times during the term of the Right have on the land buildings as approved by the Authority and maintain them in good order and repair to the satisfaction of the Commissioner for Lands (hereinafter called "the Commissioner").
 - (v) Not erect or commence to erect on the land buildings except in accordance with building plans and specifications which shall have been first approved the Authority.
 - (vi) Approval of Plans of any buildings erected thereon shall not imply that the construction of such a building will satisfy the occupier's obligation under the conditions of the Right and shall not imply waiver or modification of any condition in the Right.
3. **USER:** The land and the buildings to be erected thereon shall be used for Educational buildings purposes, only. Use Group "K" use classes (b) as defined in the Town and Country Planning (Use Classes) Regulations, 1960 as amended in 1993.
 4. The occupier shall not assign the Right within three years of the date hereof without the prior approval of the Commissioner.
 5. The Occupier shall deliver to the Commissioner notification of disposition in prescribed form before or at the time the disposition is carried out together with the payment of all premia, taxes and dues prescribed in connection with that disposition.
 6. The President may revoke the right for good cause or in public interest.

KIGOMA/UJIJI MUNICIPALITY



INSET SHOWING DETAIL OF PLOT

Location. KASIMBU
 Block. 'A'
 Plot No. 17
 L.O No. 497631
 Area. 178,727 Sqm



This plan prepared in accordance with Registered Plan no. **78881**

is approved for the purpose of Land Registration Ordinance.

For Director of Surveys and Mapping..... *K. G. S. J.*

Date..... *22nd May 2017*

Ministry of Lands, Housing and Human Settlements Development DSM.

The issue of this plan implies no guarantee or admission of the title by the government

