



**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT
FOR CONSTRUCTION OF PHASE II BUILDING FOR CENTER OF
EXCELLENCE FOR BIOMEDICAL ENGINEERING AND E-HEALTH PROJECT**

2



Developer: UNIVERSITY OF RWANDA

Funders: AFRICAN DEVELOPMENT BANK(AfDB) AND RWANDA GOVERNMENT

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ACKNOWLEDGEMENT

We, the undersigned, hereby declare that this ESIA Report represents the facts pertaining to the Proposed "CEBE – PHASE 2"

ON BEHALF OF THE UNIVERSITY OF RWANDA

Sign: _____

Dated: _____

DETAILS OF EXPERTS WHO CONDUCTED THE ESIA

Name of Consultants.

1. Dr. NDIKUBWIMANA Innocent (PhD), Lead Environmental Expert, RAPEP/EA/360
2. Mr. MUHIRE Jean (Msc), Licensed Environmental Health Practitioner
3. Mr. BARIFASHE Theodomir (Msc), lead Environmental expert, RAPEP/EA/066
4. MINANI Marc, Associate Expert, RAPEP/EA/148
5. TUMWIZERE Remy Patrick, Lead Expert, RAPEP/EA/047

Sign: _____

Dated: _____

CONTENTS

ACKNOWLEDGEMENT.....	2
CONTENTS.....	1
LIST OF TABLES.....	3
LIST OF FIGURES.....	4
LIST OF ACRONYMS.....	4
EXECUTIVE SUMMARY.....	6
Chapter 1: Environment and Social Institutional and Regulatory Framework.....	16
1.1. Policy Framework:.....	17
1.2. Legal framework.....	20
1.3. Institutional Framework.....	28
CHAPTER 2. PROJECT DESCRIPTION.....	35
2.1. Project Background.....	35
2.2.1 Project rationale.....	38
2.2. Project Location.....	41
2.3. Project Components.....	41
2.4. Project phases.....	44
2.5. Description of project activities.....	44
2.5.1. Building Design.....	45
2.6. Material to use for building construction.....	46
2.6.1. Material to use for the building:.....	46
2.6.2. Borrow pits and Dumping sites.....	46
2.7. Brief Description of Gasabo District.....	46
2.7.1. Demography and Poverty.....	47
2.7.2. Topography and Hydrology.....	47
2.7.3. Flora and Fauna.....	48
2.7.4. Climate and topography.....	49
2.7.5. Water and Sanitation.....	49
2.7.6. Education.....	49
2.7.7. Housing and Urbanization.....	50

2.7.8. Agriculture	50
2.8. Description of the site.....	51
2.9. Sanitation and Solid Waste Management	53
Chapter 3: Analysis of Alternatives	55
3.1. General	55
3.2. "Do Nothing"/Without Project Alternative.....	56
3.3. With Project Alternative	56
3.4. Analysis/Evaluation of project Alternatives.....	58
3.5. Alternative Sites	59
3.6. Alternative Technology	59
Chapter 4: Impact Analysis	61
4.1. Baseline data.....	61
4.1.1. Physical environment.....	61
4.1.2. Existing flora and fauna	62
4.1.3. Socio-Economic Baseline	62
4.1.4. Water and sanitation of private households.....	62
4.2. Impact identification.....	63
4.2.1. Introduction.....	63
4.2.2. Impacts classification	63
4.2.3. Evaluation and analysis of the impacts	64
4.3. Monitoring Framework.....	71
Chapter 6: Culturally appropriate and accessible Grievance Redress Mechanisms (GRM).....	76
Chapter 7: Stakeholder Consultations	78
7.1. Stakeholder Engagement Approach.....	78
7.2. Public Consultation Process	80
Chapter 8: Environmental and social management plan (ESMP)	82
8.1. Environmental Management Plan (EMP)	82
CHAPTER 9: DECOMMISSIONING.....	96
CHAPTER 9: CONCLUSION AND RECOMMENDATION.....	98
9.1. Conclusion	98

9.2.Recommendations.....	99
REFERENCES.....	101
Annexes	102
1. Existing Ground Conditions	102
2. AS BUILT Maps	102
3. New Proposed Building.....	104
4. EXISTING DRAINAGE SYSTEM.....	104
5. PERSPECTIVE OF THE PROPOSED BUILDING PROJECT.....	105

LIST OF TABLES

Table 1: Key Policies and Strategies	17
Table 2: Legal Frameworks for CEBE II building	20
Table 3: Institutional frameworks	29
Table 4 identification of negative impacts & proposed mitigation measures	65
Table 5 Monitoring framework	71
Table 7.0:Environmental AND SOCIAL Management Plan (ESMP)	83
Table 8: ESMP for Decommissioning	96

LIST OF FIGURES

Figure 1: illustration of site plan	43
Figure 2.0: Administrative Map of GASABO district	47
Figure 3 Pictures captured during stakeholders engagement.....	82

LIST OF ACRONYMS

AfDB	African Development Bank
CEBE	Center of Excellence in Biomedical Engineering and E-Health
EC	European Commission
EDPRS II	Economic Development Poverty Reduction Strategy Two
EHSB	Environmental, Health and Safety Guidelines
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
ESIA	Environmental Social Impact Assessment
ESMP	Environmental Social Management Plan
GoR	Government of Rwanda
MINALOC	Ministry of Local Government
MINEDUC	Minister of Education
MINICOM	Minister Trade and Industry

MININFRA	Ministry of Infrastructure
NST	National Strategies for Transformation
OSH	Occupational Safety Health
PHC	Population Housing Census
PPE	Personal Protective Equipment
RDB	Rwanda Development Board
REG	Rwanda Energy Group
REMA	Rwanda Environmental Management Authority
RLMUA	Rwanda Land Management Use Authority
SDG'S	Sustainable Development Goals;
SQM	Square Meter
ToR	Terms of Reference
UNDP	United Nations for Development Program
UNEP	United Nations Environmental Program
HSE	Health and safety Environment

EXECUTIVE SUMMARY

The Center of Excellence in Biomedical Engineering (CEBE) aims to strategically cultivate and nurture a substantial and highly skilled workforce, focusing particularly on critical sectors such as biomedical engineering and e-health.

This concerted effort is driven by the overarching goal of addressing both the immediate and long-term labour market demands within the health sector of the East African Community (EAC). By fostering expertise and proficiency in these priority areas, we aim to meet and exceed the evolving requirements of the dynamic and rapidly advancing healthcare landscape in the EAC region. This proactive approach ensures that our workforce is not only just well-qualified, but is also equipped to contribute significantly to the ongoing advancements and challenges in biomedical engineering and e-health, thereby fortifying the overall health infrastructure of the East African Community

The goal of the CEBE Phase II project is to construct the Center of Excellence for Biomedical Engineering to advance research, education, and innovation in biomedical engineering. Phase I of CEBE laid the foundation for improving healthcare technology and education across the East African Community (EAC). However, challenges persist in medical technology availability, the shortage of skilled professionals, and inadequate healthcare infrastructure. Phase II is essential to address these gaps and further strengthen biomedical engineering, e-health, and rehabilitation capacities. It aims to promote home-grown solutions, enhance skill development, and foster innovation in the healthcare sector while continuing to support regional integration goals and improving healthcare access across the EAC.

This project aims to strengthen the capacity for training professionals, foster collaboration with relevant stakeholders, and improve healthcare systems through innovative biomedical technology solutions.

The specific objectives of the project include expanding infrastructure for biomedical engineering education and research, enhancing training for healthcare and engineering professionals, and supporting the development of healthcare technologies. Additionally, the project seeks to create partnerships between academic

institutions, hospitals, and industries to ensure the sustainability and practical application of its outcomes.

The project comprises several key components and activities. These include the construction of modern facilities such as lecture halls, laboratories, workshops, office spaces, and conference rooms tailored for biomedical engineering purposes. The project also involves equipping these facilities with state-of-the-art research tools and technologies to support advanced learning and innovation. Training and capacity-building activities will be undertaken to enhance the skills of students, researchers, and healthcare professionals. Furthermore, the project will promote research and innovation by supporting biomedical research projects, creating collaborative platforms, and addressing challenges in healthcare technology. To ensure long-term sustainability, partnerships with academic institutions, health facilities, and industry stakeholders will be fostered.

The project considered several alternatives. The no-project alternative would mean no construction, leading to continued gaps in biomedical research infrastructure, training opportunities, and innovation. This would result in missed opportunities to strengthen Rwanda's healthcare technology sector. Another alternative was to evaluate different locations for the project site; however, the current site was selected due to its strategic accessibility and proximity to key academic and health institutions. A partial development alternative was also considered, involving scaled-down infrastructure. However, this would significantly limit the project's potential to achieve its intended objectives in terms of training capacity, research, and partnerships

The project site for the construction of the Center of Excellence for Biomedical Engineering (CEBE) Phase II is located in Kigali City, within Gasabo District, Bumbogo Sector, specifically in Kinyaga Cell. This site forms part of the Kigali Innovation City (KIC), situated within the Kigali Special Economic Zone (KSEZ). The location was strategically selected for its proximity to major road networks, which facilitate the transportation of construction materials and ensure accessibility to the center's facilities.

This study assesses the environmental and social impacts associated with the Construction of CEBE's multi-stories building in Kigali Innovation City (KIC).

CEBE Phase II project is expected to bring significant environmental and social benefits, which can also have substantial positive impacts on communities and the natural environment while the negatives ones should be mitigated.

Given the nature, location, proposed construction technology and materials, and also the potential impacts associated with the implementation of the proposed project, it falls under moderate risks projects (Category 2) that must undergo an environmental impact assessment in accordance to the law n°48/2018 of 13/08/2018 on Environment and Ministerial order n° 001/2019 of 15/04/2019 determine the projects that must undergo an environmental impact assessment and its procedure before they obtain authorization for their implementation.

The institutional roles in the project implementation are clearly defined across various key entities: The Ministry of Environment (MoE) is responsible for developing environmental policies, monitoring compliance, and mobilising resources for conservation efforts. Rwanda Environment Management Authority (REMA) will play a crucial role in overseeing environmental protection, ensuring compliance with Environmental Impact Assessments (EIAs) and Environmental and Social Management Plans (ESMPs). The Rwanda Development Board (RDB) facilitates investments, ensures EIA approval, and promotes sustainable development practices. Ministry of Infrastructure (MININFRA) oversees infrastructure projects, ensuring they align with environmental and urban planning standards. The Rwanda Housing Authority (RHA) regulates construction and urban development, ensuring sustainable housing and proper sanitation.

Further, the Rwanda Standards Board (RSB) ensures that building materials and processes comply with safety and environmental standards. The Rwanda Utilities Regulatory Authority (RURA) is responsible for regulating utilities like water and energy, ensuring adherence to environmental safeguards. MIFOTRA, the Ministry of Public Service and Labour in Rwanda, plays a crucial role in ensuring fair labor practices and decent work conditions. The University of Rwanda (UR) provides essential research and technical expertise for monitoring the project's environmental and social impacts. Lastly, local governments implement projects at the community level, ensuring active stakeholder participation and effective grievance management.

The legal framework supporting the project includes Law No. 48/2018 on environmental protection, Law No. 10/2012 governing infrastructure development, Law No. 50/2013 on building quality standards, and Law No. 09/2013 regulating utilities. These laws provide the necessary foundation to ensure the project adheres to environmental and social safeguards throughout its implementation.

To comply with these laws, the Developer have been required to carry out an environmental and social impact assessment to address social and environmental impacts which may arise during projects phases from design, construction and operation activities and provide enhancement measures for positive impacts, and mitigation measures to avoid, prevent, minimize or compensate adverse impacts likely to happen in the course of the project life span. The study examined the project in terms of design, components and extent, and it also considered the zoning parameters.

This study identifies and assesses the environmental and socio-economic impacts of the project, its interaction with socioeconomic environment, recommends mitigation measures and develops an Environmental and Social Management Plan (ESMP) that will guide implementation of the project.

In addition to the study on the sites (stockpile, murrum quarry site, quarry and borrow pits) that were treated as emergency requirements for project commencement, the study endeavoured to present all aspects of the construction of the Building and came up with a more comprehensive ESMP which comes to complete the environmental compliance requirements of the project towards its approval and awarding certification by the Rwanda Development Board (RDB).

Finally, this ESIA will facilitate informed decision-making, including setting environmental terms and conditions for implementing and monitoring the project. This E.S.I.A Study will be used as a planning tool to promote sustainable development by Safeguarding valued resources, natural areas and ecosystem components and protecting human health and safety.

The positive and negative impacts expected include:

Positives Impacts are:

- ✓ There will be the development of more practical skills, Capacity Building in Biomedical Engineering provided in CEBE in Rwanda and in the whole region,
- ✓ Biomedical Equipment management maintenance,
- ✓ Gender promotion due to enhanced level of service to girls & women through inclusive employment opportunities during and after the construction phase
- ✓ Direct and indirect job creation and employment (with the associated multiplier effect) during the implementation of the proposed projects and the operation of the completed projects
- ✓ The demand for labourers will increase as the contractor is expected to employ Hundreds of local labors as workers, drivers, cleaners, Guards, engineers, etc.
- ✓ Increase in the income of the population working for the project which will impact their family member well-being as people have capacity to buy Health Insurance (Mutuel de santé), capacity to pay schools fees for their kids, and being able to buy their family basic needs, briefly this project will play a big role in social-economic transformation of surrounding community.
- ✓ Population living in the vicinity of the project site can benefit through selling food or providing other services.
- ✓ Contribution to the social, economic and institutional development of the communities within the project areas through taxes.
- ✓ Etc.

The project will generate negative impacts & proposed mitigation measure

- **Risk of Monkeypox, HIV/AIDS, and Other STDs:** The increased interaction between workers and the local community due to project activities may lead to a rise in cases of Monkeypox, HIV/AIDS, and other sexually transmitted diseases. To mitigate this, the client will collaborate with health care experts to provide awareness and education to workers on these diseases. Additionally, they will supply preventive items such as hand sanitizers, masks, soap, and condoms. Environmental specialists will be appointed to monitor the daily compliance of environmental and social safeguards, especially in controlling human behavior on-site.

- **Destruction of Fauna, Flora, and Landscape Aesthetics:** The construction activities will result in the destruction of some vegetation, impacting both the biodiversity and aesthetics of the landscape around the site. To reduce these effects, vegetation that is not directly in the way of the project will be spared. After construction, the landscape will be restored by planting grass and trees to prevent erosion. The clearing of the site will be done carefully, conserving the natural terrain and minimizing the degradation of fauna and flora.
- **Safety Risks during Construction:** The construction phase poses safety risks to both workers and third parties, with potential for accidents from equipment or truck traffic incidents. To address these risks, a qualified health and safety officer will be appointed by CEBE to oversee safety measures. Workers will be provided with appropriate personal protective equipment (PPE), including helmets, gloves, masks, and eye protection. Safety measures will include fencing critical construction areas, implementing an emergency preparedness plan, and ensuring that the building design is accessible to people with disabilities during and after construction.
- **Air Pollution from Dust and Gases:** Dust from construction activities and gas emissions from machinery are likely to impact the surrounding population and workforce, causing air pollution. To mitigate this, dust levels will be monitored, and water will be sprayed on stockpiles and work areas to reduce dust during the dry season. Workers in dusty areas will be given dust masks, and machinery idling time will be minimized to reduce emissions. Trucks transporting loose materials will be covered, and equipment will be maintained to lower greenhouse gas emissions.
- **Noise and Vibration Impacts:** Noise and vibrations from construction activities could disturb nearby populations, especially students. To minimize these effects, noisy construction work will be scheduled during daytime hours. Workers exposed to excessive noise will be provided with protective gear such as earplugs and helmets, and machinery like generators will be soundproofed. Additionally, portable barriers will be installed to shield noisy equipment, and signs will be put up to indicate ongoing construction activities.

- **Solid Waste and Equipment Disposal:** The construction project will generate solid waste from stockpiles and equipment, which needs to be properly managed to avoid environmental harm. To ensure proper disposal, the client will coordinate with local authorities and waste collection services to transport waste to designated landfills. The developer will also prioritize recycling and reusing waste materials. Solid waste during the building's operation will be collected in designated places and disposed of following regulatory standards.
- **Site Cleanliness, Hygiene, and Sanitation:** Maintaining cleanliness and proper waste management on the worksite is crucial to prevent hygiene-related issues and waterborne diseases. The client will ensure that proper sanitation facilities are available for workers and that hygiene regulations are strictly followed. Garbage will be periodically disposed of, and waste management practices will follow the 3R principle—reduce, reuse, recycle. Waste collection facilities will be properly maintained, and disposal will follow local standards.
- **Public Utility Destruction:** Construction activities pose a risk to public utilities such as water supply pipes, electricity lines, and internet cables. To prevent unnecessary damage, the contractor will take precautions and avoid disrupting public utilities during construction. If damage is unavoidable, the contractor will proactively inform the relevant utility agencies to relocate or fix the infrastructure. In case of any damage, prompt notification will be made to the appropriate stakeholders to ensure quick repairs.

The stakeholder consultations for the Center of Excellence for Biomedical Engineering Phase II involved meetings, phone conversations, and workshops with various stakeholders, including the Rwanda Environment Management Authority (REMA), City of Kigali (CoK), Rwanda Governance Board (RGB), Ministry of Health (MoH), and the University of Rwanda. Key discussions included the implementation of Environmental Impact Assessment (EIA) conditions, waste management during construction, ensuring effluent from wastewater systems met national standards, and

aligning the project with the Kigali Innovation City Master Plan. Other concerns focused on building compliance with regulations, stormwater management, and incorporating sustainability measures like rainwater harvesting. Workshops also addressed health sector capacity building, workforce gaps, and integration of medical equipment needs into the project. These consultations ensured that the project's environmental and social impacts were properly managed and that stakeholder concerns were incorporated into the planning and implementation processes.

The project Environmental and Social Management Plan (ESMP) outlined in table 1 below provides a comprehensive framework for managing and mitigating environmental and social impacts during the construction and operation phases of the CEBE Phase II project. This plan details the specific impacts, mitigation measures, implementation responsibilities, and associated costs, ensuring that all activities are aligned with environmental protection and social responsibility. It also includes key performance indicators to monitor the effectiveness of these measures, with an emphasis on continuous improvement and stakeholder engagement.

TABLE 1: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Code	Impacts or risks	Mitigation Measures	Deadline	Implementation Responsibilities	Cost (RWF)	Key Performance Indicators	Monitoring Oversight
1	Accidents and Injuries to Workers	PPE for all workers (helmets, gloves, ear muffs, etc.), prevent forced labor/child labor	Before construction & during	Contractor, Supervision company	500,000	% of workers with PPE, number of accidents, response time	Self-monitoring; Contractor, MINEDUC, UR, RHA, CoK
2	Air Pollution (dust and gases)	Dust monitoring, catalytic converters, water spraying, dust masks, covering stockpiles	Construction & operation	Contractor, MINEDUC	1,000,000	Dust concentration, dust masks distributed, spraying frequency	Self-monitoring; Contractor, MINEDUC, UR, REMA, CoK
3	Soil Erosion and Sediment Particles	Proper drainage, re-vegetation, slope stabilization	During & after construction	Contractor	To include in BOQ	% of drainage systems installed, frequency of re-vegetation	Self-monitoring; Contractor, MINEDUC, UR, RHA
4	Noise and Vibration	Noise control measures (time of works, ear protection, soundproofing generators, barriers)	Construction phase	Construction company	800,000	Number of workers with ear protection, noise complaints	Self-monitoring; Contractor, MINEDUC, REMA, RHA

5	Safety Issues	Health & safety plan, PPE for workers, fencing, emergency preparedness, inclusivity	During & after construction	Construction company, MINEDUC	3,000,000	% of workers trained, safety audits, accessibility	Self-monitoring; Contractor, MINEDUC, UR, RHA
6	Impact on Fauna and Flora	Vegetation restoration, landscaping, preserving natural species	Construction phase	Contractor	500,000	% of vegetation restored, land clearing quality	Self-monitoring; Contractor, MINEDUC, UR, RHA, REMA
7	Site Cleanliness, Hygiene, and Sanitation	Proper sanitation, use of existing toilets, hygiene training, waste management (3R principles)	During & after construction	Contractor	300,000	Availability of sanitation facilities, % staff trained in hygiene	Self-monitoring; Contractor, MINEDUC, UR, RHA, CoK, REMA
8	Effects of Solid Waste	Waste collection, disposal according to REMA guidelines, recycling, reduce/reuse/recycle	Construction & operation phases	Construction company	Included in BOQ	% of waste reused/recycled, waste disposal frequency	Self-monitoring; Contractor, MINEDUC, UR, REMA, CoK
9	Risk of STDs (HIV/AIDS, Mpox) and other communicable diseases	Awareness campaigns, provision of protective items (condoms, masks, sanitizers) and hygiene measures and hand washing facilitated	During construction	Contractor, MINISANTE	500,000	Number of awareness campaigns, % of workers provided with protective items	Self-monitoring; Contractor, MINEDUC, UR, MoH, CoK
10	Impacts on Landscape Aesthetics	Appropriate material handling, site rehabilitation, revegetation of quarries, borrow pits	Decommissioning phase	Contractor	300,000	% of sites rehabilitated post-construction	Self-monitoring; Contractor, MINEDUC, UR, RHA, REMA, CoK
TOTAL COST					8,900,000 RWF		

Therefore, some of the recommendations for construction of this Building are:

Briefly the proposed measures to mitigate identified negative impacts and enhance the positive ones are proposed through an Environmental and Social management and monitoring plan (ESMMP). The latter proposes mitigation measures, monitoring indicators, responsible parties in charge of monitoring the implementation of mitigation measures and the cost of their execution. Based on our technical expertise

this project is feasible, but developer and key stakeholders involved in project should observe the recommendations that are detailed in the ESMP.

Most of adverse impacts will be of a temporary nature during construction phase and other will occur during operation phase.

Most of these impacts (during operation phase) can be managed to acceptable levels with implementation of the recommended mitigation measures for this project such that the overall benefits from the projects will greatly outweigh the few adverse impacts.

- Develop Occupational Health and Safety (OHS) policy and plans of CEBE, taking into consideration its future activities to ensure compliance with international and national standards
- CEBE management and Health, Safety, and Environment (HSE) officer to follow up with Kigali Innovation City (KIC)s management to ensure operational and effective transition between the temporary Waste Treatment System (WTS) and the long term one.
- Integrate rainwater management at CEBE campus in KIC's rainwater management plan.
- Develop and implement a solid waste management plan (including hazardous waste)
- CEBE to develop a long-term hazardous waste management of the campus
- HSE officer and heads of laboratories to ensure that each laboratory comply with relevant international and national standards of laboratories of the same nature to ensure their sustainability.
- HSE officer to organize a meeting with the management of KIC to understand the long-term plans of security in KIC area and what each building is required, to reinforce security at its own premises.

Chapter 1: Environment and Social Institutional and Regulatory Framework

In this chapter, policy, legal and institutional framework within which this EIA was undertaken is discussed. National laws (Environmental Impact Assessment (EIA), National Land Law (Law No. 43/2013), Labour Law (No. 66/2018), Water Law, National Environmental Policy, Rwanda Vision 2050, National Strategy for Transformation (NST1)) are discussed along with relevant multilateral environmental agreements to which Rwanda is a party. In the juridical system of the Republic of Rwanda, the EIA procedure is regulated by No 001/ 2019 of 15/04/2019 Ministerial Order of establishing the list of projects that must undergo environmental impact assessment, instructions, requirements and procedures to conduct environmental impact assessment activities and projects that are required to undertake a mandatory EIA.

This list includes construction large public buildings which house more than a hundred people per day

1.1. Policy Framework:

TABLE 2: KEY POLICIES AND STRATEGIES

Key policies and strategies	Features
Vision 2050	Under its Vision 2050, Rwanda plans to shift to a high income and high living standard for all citizens. To achieve this, environment and climate change will be considered by focusing on key areas such as food security and quality nutrition, universal access to water and modern sanitation, affordable, reliable and clean energy as well as modern housing settlements that are climate resilient and environmentally friendly.
Nationally Determined Contribution (NDC) Climate Action Plan	Rwanda’s recent Nationally Determined Contribution (NDC) showcases the country’s priorities for green and resilient economic growth and are aligned with the Paris Agreement goals. The updated plan will be implemented until 2030 with approximately USD 11 billion, of which USD 5.3 billion cover adaptation, and aims to reduce emissions by 38% during this period.
Green Growth and Climate Resilience Strategy (GGCRS)	In 2011, Rwanda adopted a groundbreaking Green Growth and Climate Resilience Strategy (GGCRS) to guide development and prioritise interventions that drive an economic trajectory in line with Rwanda’s climate action vision.
National Environment and Climate Change Policy	The National Environment and Climate Change Policy showcases Rwanda’s commitment and efforts to address climate change and provide strategic guidance and responses to the emerging hardships and critical challenges that climate change may pose to the country’s sustainable development. This policy outlines strategies and practices to be considered to solve issues such as air and soil pollution, land degradation,

Key policies and strategies	Features
	fossil-fuel dependency, and others.
National Cooling Strategy	Rwanda’s National Cooling Strategy has been developed to promote the adoption of energy efficient and climate friendly cooling solutions. This will reduce greenhouse gases from cooling systems and is a key focus for Rwanda in tackling climate change and achieving the goals of the Kigali Amendment to the Montreal Protocol.
National Land Use and Development Master Plan	To enable Rwanda to reach its target to become a middle-income country in 2035 and reach high-income status in 2050, the country adopted the 2020-2050 National Land Use and Development Master Plan. The plan has set optimal boundaries for cities, urban centres and rural settlement sites for each district as per population target to guide sustainable urbanisation.
National Strategy for Transformation (NST)	To accelerate the country’s transformation and economic growth with the private sector taking a lead, the National Strategy for Transformation (NST) has become a foundation and vehicle towards achieving Vision 2050. Through this strategy, there will be a transformation in different areas such as capacity development, disability and social inclusion, environment and climate change, disaster management, among others.
Land policy	The land policy aims at establishing a land tenure system that guarantees tenure security for all Rwandans and give guidance to the necessary land reforms with a view to good management and rational use of national land resources. Among specific objectives of land policy, the development of actions that protect land resources from the various effects of land degradation, the promotion of conservation and sustainable use of wetlands, and good allocation of land in order to enhance rational use of land resources according to their capacity are the ones focusing on environment protection in Rwanda

Key policies and strategies	Features
National Biodiversity Strategy and Action Plan	<p>This revised NBSAP reflects the country's vision for biodiversity and the broad strategic mechanisms that Rwanda will take to fulfil the objectives of the CBD. This strategy has a long-term vision of ensuring that by 2040, national biodiversity will be restored and conserved and hence contributing to economic prosperity and human well-being through delivering benefits essential for Rwandan society in general. Values of biodiversity and ecosystem services in the country and region, and the contribution of biodiversity.</p>
National Land use planning guidelines	<p>The NLUPG aims at ensuring that land use planning processes and procedures are harmonized at national and local government levels. It has the following specific objectives:</p> <ul style="list-style-type: none"> - To standardize land use planning processes and procedures of the land development operations, regarding efficient and optimal use of land. - To guide land managers, land use planners and practitioners at all levels in the process of land use planning. - To resolve land-use conflicts that may happen among the users. - To enable land users particularly investors, have the same understanding in implementing Rwandan Government Land Policy and development strategies. - To promote sustainable land management. - To provide several tools and resources that could be of practical use by land use planners. - To prevent and mitigate land degradation. - To manage natural and anthropogenic disasters
Sector guidelines for Environmental Impact Assessment (EIA)	<p>The main purpose of EIA in housing projects is to identify the positive and negative impacts of a proposed road project on the natural and human environment and then to formulate appropriate remedial/ mitigation measures to avoid/minimize</p>

Key policies and strategies	Features
for housing projects in Rwanda	<p>adverse negative impacts and to enhance beneficial impacts. The EIA process can help develop more environmentally friendly development projects by reducing negative environmental impacts through alternative approaches, design modifications, and remedial measures.</p> <p>These sector-specific Guidelines for Housing Projects recognise the role that the housing plays in Rwanda’s development process, both in urban and rural areas, and underscore the need to ensure that these developments continue to take place in a manner that not only promotes economic feasibility and social equity but maintains or enhances environmental sustainability and cross-generational equity.</p>

1.2. Legal framework

The following table displays the legal instruments related to the implementation of the project of construction and operation of “CEBE Phase II facility”.

TABLE 3: LEGAL FRAMEWORKS FOR CEBE II BUILDING

Legal document	Features
Rwanda’s Constitution of 2003 with Amendments through 2015	<p>The Constitution of the Republic of Rwanda as promulgated in 2003 makes clear the requirement for equitable and participatory development for all citizens of the country and makes quality and healthy environment as a basic right with every citizen required to protect, safeguard and promote a healthy environment.</p> <p>Article 53 states that every citizen is entitled to a healthy and satisfying environment. Every person has the duty to protect, safeguard and promote the environment. The state shall protect the environment. The law determines the modalities for protecting, conserving and promoting the environment.</p>

Legal document	Features
Law N°48/2018 of 13/08/2018 on Environment	<p>The Law on Environment Protection sets the modalities for protection, conservation and promotion of the environment in Rwanda. The law gives right to every natural or legal person in Rwanda to live in a healthy and balanced environment while obligating each and every citizen to contribute individually or collectively to safeguard country's natural, historical and sociocultural heritage. The framework of the law on the protection and management of natural resources centers on avoiding and reducing the disastrous consequences on environment. It measures result from an environmental evaluation of policies, programs and projects, aimed at preventing the consequences of such activities. It provides for a right to a healthy and productive life in harmony with nature and to equitably meet the needs of the present and future generation in infrastructure development e.g upgrading of roads and construction of drainage channels.</p>
The Ministerial Order N°001/2019 of 15/04/2019 establish the list of projects that must undergo Environmental Impact Assessment, instructions, requirements and procedures to conduct Environmental Impact Assessment	<p>This ministerial order establishes the list of work, activities and projects that have to undertake an environmental impact assessment before being granted prior authorization.</p> <p>According to this Ministerial order, no public institution shall take a decision, to warrant a certificate, approve or authorize the commencement of a project mentioned in the annex of this Order without prior environmental impact assessment.</p> <p>The following activities, work, and projects are subject to the environmental impact assessment:</p> <ul style="list-style-type: none"> - Construction and repair of international roads, national roads, district roads and repair of large markets. - Construction of industries, factories and activities carried out in those industries. - Construction of hydro- dams and electrical lines. - construction of public dams for water conservation,

Legal document	Features
	<p>rainwater harvesting for agricultural activities and artificial lakes.</p> <ul style="list-style-type: none"> - construction of oil pipelines and its products, gases and storage tanks; construction of terminal ports and airports, railways and car parks. - construction of hotels and large public buildings which house more than a hundred people per day. - water distribution activities and sanitation. - construction of public Landfills. - construction of slaughterhouses. - construction of hospitals. - construction of Stadiums and large markets. - initial installation of communication infrastructure. - Agricultural and breeding activities which use chemical fertilizers and pesticides in wetlands and large-scale monoculture agricultural practices such as tea, coffee, flowers and pyrethrum, etc.... - works and Activities that use biotechnology to modify seeds and animals. - works in parks and in its buffer zone, Works of extraction of mines
<p>Law N° 18/2016 of 18/05/2016 governing the preservation of air quality and prevention of air pollution in Rwanda</p>	<p>This Law determines modalities for preservation of air quality and prevention of air pollution in Rwanda. It applies to all measures aimed at the preservation of air quality as well as all elements or activities likely to affect air quality or pollute the atmosphere.</p> <p>This law mainly orders the following:</p> <ul style="list-style-type: none"> • Avery person must comply with the minimum air quality

Legal document	Features
	<p>standards established by the National Authority in charge of setting up regulations for quality standards.</p> <ul style="list-style-type: none"> • A person engaging in any activity is required to comply with the highest permissible emission limits of air pollutants from the atmosphere to the living things in accordance with ambient air quality standards. • Any person transporting or storing construction materials or materials from construction works, or carrying out demolition of a building or part of a building must avoid air pollution by complying with relevant quality standards. • Any person must avoid storing objects in such a way that they may interfere with the air quality. • Any person owning emission sources including power plants, gas extraction, plants, boilers, generators, and furnace must avoid causing emission of air pollutants by complying with the relevant quality standards regulations. • Every person has the obligation to safeguard and preserve the air quality. • The person who has air pollution emission activities to particularly indicate the following: <ul style="list-style-type: none"> a) adequate measures indicating how activities of reduction and elimination of emission of air pollutants are conducted; b) the necessary equipment, facilities and trained personnel for dealing with emission of air pollutants; c) any other measures necessary to respond to other

Legal document	Features
	issues that may arise.
Rwanda Building Control Regulations (2 nd edition)	<p>Buildings and Utilities</p> <p>On any site, water supply, drainage, storm water disposal, electrical or other services connected to used or provided in connection with any building, shall be regarded as part of the building.</p> <p>No building operation, including buildings for which a permit has been issued or for a demolition operation, shall be permitted if it connects to an existing building except where an engineer certifies to the one stop center office that the new building operations shall not affect the structural stability of the existing building.</p> <p>Where an application is made to make alterations or additions to any building, approval for the erection of which was granted before the commencement of these Regulations in the relevant area:</p> <p>a) The alterations shall comply with the requirements of these Regulations and shall require the whole building to comply with the requirements of these Regulations where such deviations exist; and, or</p> <p>b) The additions shall comply with the requirements of these Regulations and the original building shall be brought into compliance as far as practicable, with the requirements of these Regulations where deviations exist</p> <p>Temporary and Minor Buildings</p> <p>No application is necessary to the one stop center office for any repair works.</p> <p>Any building operation defined as minor building work shall comply with those parts of these Regulations specified officially by the one stop center officer in charge of housing and issued upon prior request.</p> <p>Any incremental house shall in any intermediate stage of</p>

Legal document	Features
	<p>erection be regarded as a temporary building for the purpose of assessing compliance with these Regulations.</p> <p>Any building intended to be used for experimental, demonstration, testing or assessment purposes shall be regarded as a temporary building except that:</p> <p>a) Authorization for the erection of such building shall be granted where testing or assessment of the completed building is the only way to demonstrate compliance with the requirements or these regulations; and</p> <p>b) The one stop center office shall grant such authorization for a period of time as applied for the erection of the building and for the performance of any experiment or for the demonstration, testing or assessment of such building.</p> <p>Any stall or other similar building to be erected as part of an exhibition shall be regarded as a temporary building, except that where such stall is to be erected inside an exhibition hall, the owner of the hall shall not be required to submit to the one stop center office any details of the stall, but shall submit a layout plan of all such stalls within the hall showing the location of each individual stall, all escape doors, and all firefighting equipment.</p>
Rwanda Building Code (2019)	<p>The purpose of this code is to establish the minimum requirements to safeguard the public health, safety and general welfare. This is done through regulating, controlling, and monitoring the design, construction, quality of materials, use and occupancy, location, maintenance, sanitation, lighting and ventilation, energy conservation, and safety including measures to protect life and property from fire and other hazards attributed to the built environment, for all buildings</p>

Legal document	Features
	<p>and related non-building structures in Rwanda.</p> <p>.The provisions of this Code apply to site planning, building site operations, materials selection, construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, maintenance, removal and demolition of any building or structure or any appurtenances connected or attached to such buildings or structures in Rwanda.</p>
Rwanda Urban Planning Code	<p>The UPC intends to provide a basis for forward planning, development management and plan implementation with the following overall objectives:</p> <ul style="list-style-type: none"> - Elaborating sustainable physical plans; - Improved living standards in human settlements; - Sustainable development of land for human settlement while allocating valuable land resources and location guidelines for urban land uses and facilities; - Development of housing, socio-economic facilities, and technical infrastructure according to the needs of the people and applying basic standards to site requirements of development; and the - Planning of utilities, facilities and services accordingly, with principles for urban land uses and adequacy of facilities to serve a human settlement.
Law governing the urban Planning and building in Rwanda	<p>The aim of urban planning shall be progressive and provisional development of agglomerations within the framework of economic and social development policy, rural planning and environmental protection.</p> <p>The objective of building planning shall be to promote the harmonization of professional practice in construction. It shall ensure the construction of safe, well maintained, well planned, environmentally sound and fit-for-purpose buildings that conform to economic and social development policies of</p>

Legal document	Features
	Rwanda.
World Bank environment and social safeguards	<p>The current environmental and social policies of the Bank are known as the "Safeguard Policies," the mechanism for addressing environmental and social issues in our project design, implementation and operation, and they provide a framework for consultation with communities and for public disclosure. Examples of these requirements include conducting environmental and social impact assessments, consulting with affected communities about potential project impacts, and restoring the livelihoods of displaced people. In August 2016, the World Bank adopted a new set of environment and social policies called the Environmental and Social Framework (ESF). As of October 1, 2018, the ESF applies to all new World Bank investment project financing. With existing projects continuing to apply the Safeguard Policies, the two systems will run in parallel for an estimated seven years.</p>
AFDB- Environmental and Social Framework	<p>The proposed environmental and social framework (ESF) builds on the IED findings and recommendations and culminates almost 3 years of detailed analytical studies and extensive engagement with stakeholders.</p> <p>The ESF has four parts: (i) Vision, (ii) E&S Policy, (iii) 10 environmental and social standards (ESSs), and (iv) a prohibited investment activities list. The E&S Policy will be supported by an Operation Manual and Staff Instructions for ADB staff to provide detailed business process requirements.</p>
ADB safeguard policy statement	<p>The goal of the SPS is to promote the environmental and social sustainability of ADB supported projects by protecting people and their environment from potential adverse impacts and enhancing the benefits provided. This goal is integral to achieving environmentally sustainable and socially inclusive growth and poverty reduction in Asia and the Pacific, a defining element of ADB's Long-Term Strategic Framework,</p>

Legal document	Features
	<p>Strategy 2020. 3 In this context, the SPS is one of ADB’s key policy instruments for achieving its corporate vision and mission under Strategy 2020.</p> <p>The SPS sets out the policy objectives, scope, triggers, principles and requirements for three key safeguard areas: • environmental safeguards • involuntary resettlement safeguards • Indigenous Peoples safeguards</p> <p>The SPS requirements for environmental safeguards support the integration of environmental considerations into the project decision-making process</p>
<p>Law n° 66/2018 of 30/08/2018 regulating Labour in Rwanda</p>	<p>The Rwandan Labour Law provides a comprehensive framework for employment relations in the country. Key provisions emphasize written employment contracts, outlining terms and conditions of employment, including wages, working hours, and benefits. The Law establishes a minimum wage for all workers, ensuring a basic standard of living. Further, it regulates daily and weekly working hours, overtime pay, and rest periods, mandates safe and healthy working conditions, including provisions for workplace safety measures and employee training. Additionally, the law prohibits the employment of children and prohibits all forms of forced labor, ensures access to social security benefits, including health insurance, pension, and other social protections. Lastly, it provides mechanisms for resolving labor disputes through mediation, conciliation, and arbitration.</p>

1.3. Institutional Framework

A set of institutions, both local and international, play key roles in environment protection and implementation of environmental and social safeguards. The following tables details different responsibilities of institutions involved in development and implementation of environmental and the social safeguards in relation with the project.

TABLE 4: INSTITUTIONAL FRAMEWORKS

Institution	Responsibilities
Ministry of Environment – MoE	- To develop and disseminate the environment and climate change policies, strategies and programs through the development of strategies to promote partnership and enhance capacity of private sector to invest in activities of environment and climate change for sustainable economic development; the development of laws and regulations to ensure protection of the environment and

Institution	Responsibilities
	<p>conservation of natural ecosystems; and the development of develop institutional and human resources capacities in environment and climate change.</p> <ul style="list-style-type: none"> - To monitor and evaluate the implementation and mainstreaming of environment and climate change policies, strategies and programs across all sectors, especially productive sector. - To oversee and evaluate institutions under its supervision by providing guidance on the implementation of specific programs to be realized by the institutions under its supervision and local government; and - To mobilize the necessary resources for the development, protection and conservation of the environment for the climate change adaptation and mitigation.
Rwanda Environment Management Authority – REMA	<p>Under supervision of the Ministry in charge of environment, Presidential Order N° 033/01 Of 06/05/2022 Governing Rwanda Environment Management Authority, REMA reserves the legal mandate for national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment and climate change.</p> <p>The mission of REMA is to supervise and monitor environmental management and ensure that issues relating to environment receive attention in all national development plans.</p>
Rwanda Development Board - RDB	<p>Rwanda Development Board (RDB) is a government institution, mandated to accelerate Rwanda’s economic development by enabling private sector growth.</p> <p>Under the supervision of the Office of the President, RDB is governed by the Board of Directors made up of global entrepreneurs and experts.</p> <p>RDB was established in 2008 out of a merger of 8 government institutions, primarily to create a One Stop Shop for business and</p>

Institution	Responsibilities
	<p>investments. Since then, RDB has been built with global expertise and modelled on international best practice.</p> <p>Currently, RDB's key services are: One Stop Center services (business and investment registration, visa facilitation, EIA, tax incentives management, etc.), Investment Promotion, Investment Deals Negotiation, Export & SEZ Development, Tourism and Conservation, and Private Sector Skills Development.</p> <p>RDB is here to provide support throughout the entire investment journey and to ensure that Rwanda remains one of the most competitive places to do business in Africa and the World.</p> <p>Its mission "Fast tracking economic development in Rwanda by enabling private sector growth.</p>
<p>Ministry of Infrastructure - MININFRA</p>	<p>The Ministry of Infrastructure (MININFRA) has the mission detailed as follows:</p> <ul style="list-style-type: none"> - To initiate programs to develop, rehabilitate and maintain an efficient and integrated national transport infrastructure network, including roads, markets, airports, railways, and water transportation which will contribute towards economic development and regional integration; - To initiate, develop and maintain sustainable power generation facilities to supply clean, cost-effective and uninterrupted energy for the country and the region; - To initiate, develop and facilitate urban development programs with a view to providing affordable shelter with due regard to adequate water and sanitation facilities for the population and promote grouped settlement (Imidugudu); - To initiate programs aimed at increasing access to affordable energy, water and sanitation, and transport infrastructure and related services for the population; - To ensure that the development of policies and strategies concerning national infrastructure are in line with regional

Institution	Responsibilities
	<p>integration and harmonization policies with the EAC;</p> <ul style="list-style-type: none"> - To supervise the implementation of quality standards and norms, cost effectiveness, response to environmental sustainability, safety and cross-cutting issues in infrastructure development; - To supervise activities meant to elaborate, monitor and assess the implementation of national policies and programs on matters relating to habitat and urbanism, transport, energy, water and sanitation; - To support and supervise infrastructure development programs under the decentralized structures under the respective sub-sectors as per the District Development Programs in each district; - To orient and supervise the functioning and management of public institutions, agencies and companies under the Ministry of Infrastructure including existing agencies such as Road Maintenance Fund (RMF), Rwanda Civil Aviation Authority (RCAA), Rwanda Energy Group (Energy Development Company Ltd and Energy Utility Company Ltd), Water and Sanitation Corporation Ltd, Rwanda Transport Development Agency (RTDA), Rwanda Housing Authority (RHA), RwandAir and other agencies to be formed under its sub-sectors; and - To facilitate, promote and engage the private sector to invest in infrastructure;
Rwanda Housing Authority – RHA	<p>Rwanda Housing Authority (RHA) is a public institution established by the Law N°40/2010 of 25/10/2010 overseen by the Ministry of Infrastructure. It was established in a bid to improve the quality of life of Rwandans through planning, organizing and spearheading rural settlement, urban settlement, public building construction, affordable housing; management of public office space and Government Assets; and regulation of the construction industry. The mission of RHA is to improve housing and construction through planning, organizing and monitoring rural settlement, urban</p>

Institution	Responsibilities
	settlement, public building construction, affordable housing; management of public office space and public assets; and regulation of the construction industry.
Rwanda Standards Board – RSB	<p>The mission of RSB is to provide quality and affordable standardization, metrology, quality testing and certification services for sustainable socio-economic development.</p> <p>Rwanda Standards Board to undertakes all activities pertaining to the development of Standards, Conformity Assessment and Metrology services in the country and currently Rwanda Standards Board developed and published more than 2390 Standards covering the areas of food and agriculture, engineering, service, water and environment, chemistry, chemical and consumer products.</p>
Rwanda Utilities and Regulatory Agency – RURA	<p>Rwanda Utilities Regulatory Authority(RURA) was initially created by the Law n° 39/2001 of 13 September 2001 with the mission to regulate certain public Utilities, namely: telecommunications network and/or Telecommunications services, electricity, water, removal of waste products from residential or business premises, extraction and distribution of gas and transport of goods and persons.</p> <p>RURA has the mandate to regulate:</p> <ol style="list-style-type: none"> 1. Telecommunications, information technology, broadcasting and converging electronic technologies including the internet and any other audiovisual information and communication technology; 2. Postal services; 3. Renewable and non-renewable energy, industrial gases, pipelines and storage facilities; 4. Water; 5. Sanitation; 6. Transport of persons and goods; 7. Radiation Protection; and

Institution	Responsibilities
	8. Other public utilities, if deemed necessary.
University of Rwanda – UR	The University of Rwanda has the mission of supporting the development of Rwanda by discovering and advancing knowledge, committed to the highest standards of academic excellence where students are prepared for lives of service, leadership and solutions.

2.1. Project Background

Centre of Excellence in Biomedical Engineering (CEBE) is a medical educational Programme under the initiative of the African Development Bank (AfDB) and East Africa member states. Its main objective is to establish a network of Centres of Excellence within the region.

The proposed Center of Excellence for Biomedical Engineering (CEBE) aligns with national, regional, and international policies and programs aimed at improving healthcare, fostering innovation, and building human capital.

At the national level, the project is closely tied to Rwanda's Vision 2050, which focuses on transforming the country into a knowledge-based economy. The CEBE contributes to this goal by developing highly skilled professionals in biomedical engineering, which is a key area for Rwanda's growth in healthcare and technology. Additionally, the project supports the National Strategy for Transformation (NST1) by improving healthcare access, enhancing the skills of healthcare professionals, and promoting innovation in medical technology.

At the regional level, the project supports the East African Community (EAC) Vision 2050 by promoting regional integration and capacity building in healthcare. It aligns with the EAC Health Sector Strategic Plan and the Regional Pharmaceutical Manufacturing Plan of Action (2017-2027) by developing skilled professionals who can address the healthcare technology needs of East African nations. The EAC Industrialization Policy (2012-2032) also emphasizes reducing reliance on imported medical devices, and the CEBE is designed to develop local capacity for producing and maintaining medical technologies.

Internationally, the project supports the African Development Bank's (AfDB) objectives of fostering sustainable economic development and improving healthcare infrastructure across the continent. The AfDB has supported the establishment of networks of Centers of Excellence to build human capital and strengthen health systems in Africa, with the CEBE being a key part of this initiative. The development objective of the project is to contribute to the development of a relevant and quality

skills work force in Biomedical Engineering and E- health to meet East African Community (EAC) labor market needs.

The specific objective of the project is to provide high quality tertiary care and education through a network of centres of excellence in EAC member countries that will foster social economic development in the region. The Project is also geared around the regional integration strategy in science and technology, service delivery and labour market.

The project has three (3) components and the Focus of this study is Component 1, sub-component C1.3 Rwanda on the establishment of the Centre of Excellence in Biomedical Engineering and E-Health (CEBE).

The Objectives of CEBE will be to:

1. **E-health:** with the mission to establish leadership in developing the ICT capacity and solutions that Rwanda and the region needs, uses and relies on for services delivery and management. CEBE will seek ways to ensure the development on E-Health tools and systems within the region.
2. **Scientific skills for rehabilitation and mobility sciences:** with the objective of provision of cost effective and quality prostheses, orthoses and other mobility aids to the disabled in Rwanda and
3. **Bio-medical equipment management and maintenance:** since the biomedical services sector is increasing dependent on more sophisticated technology, this program is to develop high level technical and management skills in biomedical engineering to support and maintain this technology.

For these objectives proposed under each of the components to be implemented, CEBE plans on constructing a tertiary institute at the Kigali Innovation City (KIC) in the Kigali Special Economic Zone (KSEZ). This involves the construction of a building with seven (7) levels including 2 Basements, ground level, and 4 floors which is expected to provide a range of specialized services that address critical healthcare needs in the region. Key services include:

1. **E-health Solutions:** The center will focus on developing ICT capabilities and e-health solutions tailored for Rwanda and the East African region. This includes creating tools and systems that facilitate healthcare delivery and management.

2. **Rehabilitation and Mobility Sciences:** CEBE will offer services in rehabilitation, including the provision of cost-effective and high-quality prostheses, orthoses, and mobility aids for individuals with disabilities in Rwanda. This aims to improve the quality of life for these individuals through enhanced mobility support.
3. **Biomedical Equipment Management and Maintenance:** As the healthcare sector increasingly relies on sophisticated technology, the center will provide training to develop high-level technical and management skills in biomedical engineering. This will ensure that healthcare facilities can effectively manage and maintain medical equipment.
4. **Education and Training:** The center will serve as a tertiary education institution, offering high-quality training programs in biomedical engineering and related fields. It will prepare graduates to meet the labor market needs within the East African Community (EAC).
5. **Research and Development:** CEBE aims to foster a strong research culture in biomedical engineering, encouraging innovation in medical technology. This includes developing new devices and improving existing healthcare technologies to better serve the community's needs.

To this context, CEBE conducts the feasibility study for the second phase of its construction extension. As part of the entire feasibility, the environmental and social risks assessment must be carried out to ensure project sustainability and compliance with existing national and funder obligations. This Environmental and Social Impact Assessment is prepared as a standalone document and in compliance with provisions of the laws and regulations that govern infrastructure development and environmental and social safeguard instruments in Rwanda while complying also with Integrated Safeguards System of the AfDB.

The Center for Biomedical Engineering (CEBE) acknowledges its corporate responsibility towards the protection of environment, social set up, health and safety of its workers and surrounding communities and accordingly, is committed to the elimination, reduction and control of potential negative environmental and social impacts associated with project activities through implementation of measures contained in this Environmental and Social Impact Assessment report.

This study was conducted with the aim of addressing the social and environmental risks and impacts which may arise during project implementation phases namely design, construction and operation phases and provide enhancement measures for positive impacts, and mitigation measures to prevent, minimize, mitigate or compensate adverse impacts likely to happen in the course of the project life span.

2.2.1 Project rationale

The Center of Excellence for Biomedical Engineering (CEBE) is established to address critical healthcare challenges in East Africa. A significant motivation behind this initiative is the shortage of trained professionals in specialized fields like biomedical engineering. CEBE aims to fill this gap by providing high-quality education and training that equips skilled professionals to design, maintain, and innovate medical technologies, ultimately enhancing service delivery in the region.

Another key aspect of CEBE is its focus on enhancing local capacity for medical technology. The region has historically relied on imported medical devices, which poses challenges. By developing local expertise, CEBE empowers the East African region to produce and manage its medical technologies. This emphasis on self-reliance is particularly relevant in light of the vulnerabilities exposed during the COVID-19 pandemic, which underscored the need for regional health security.

In addition to education, CEBE will promote research and innovation in healthcare technologies, creating a platform for developing solutions tailored to local health challenges. The project also holds economic significance, as it is expected to generate jobs during both the construction and operational phases, contributing to community growth.

Improving healthcare access and quality is a fundamental objective of CEBE. By enhancing the skills of healthcare professionals, the center will ensure better healthcare outcomes, particularly for underserved populations, thereby promoting equity in access. Furthermore, CEBE will act as a hub for collaboration and knowledge-sharing among East African nations, facilitating the exchange of resources and best practices to strengthen regional healthcare systems.

The Centre for Biomedical Engineering (CEBE) is part of a broader initiative led by the African Development Bank (AfDB) and East African member states, aiming to establish a network of Centers of Excellence across the region. The primary objective is to develop a relevant and quality workforce in biomedical sciences and e-health to meet the East African Community (EAC) labor market needs.

The project has three (3) components:

- **Component 1**- Establish a network of Centres of Excellence(COE) in Biomedical Higher education in the East African region under the following sub- components:
 - ✚ C1.1 Kenya- COE in Urology and nephrology sciences (phase I)
 - ✚ C1.2 Uganda- COE in oncology (Phase I)
 - ✚ C1.3 Rwanda- COE in Biomedical Engineering and E-Health (Phase I)
 - ✚ C1.4 Tanzania- COE in Cardiovascular sciences (Phase I)
 - ✚ C1.5 Burundi- COE in laboratory based nutritional Sciences (Phase I)
- **Component 2**- Support EAC regional integration agenda in higher education to respond to labour market needs implemented by the EAC secretariat with its affiliated inter-university council for East Africa.
- **Component 3**- Project management.

The Focus of this study is Component 1, sub-component C1.3 Rwanda on the establishment of the Centre of Excellence in Biomedical Engineering and E-Health (CEBE).The Centre for Biomedical Engineering (CEBE) is a pioneering initiative under the broader framework of the African Development Bank (AfDB) and East African member states, aiming to address the critical need for advanced medical education and innovation in biomedical engineering within the region. This project, part of a

larger effort to establish a network of Centers of Excellence across East Africa, is motivated by several pressing factors that highlight the importance of fostering capacity in biomedical engineering to meet the region's growing healthcare challenges.

East Africa, like many other regions on the African continent, faces significant challenges in providing adequate healthcare services to its rapidly growing population. These challenges include limited access to advanced medical technologies, shortages of skilled healthcare professionals, and underdeveloped healthcare infrastructure. The CEBE is envisioned as a solution to bridge these gaps by developing skilled biomedical engineers who can design, maintain, and innovate medical technologies suited to the specific healthcare needs of the region.

Biomedical engineering plays a crucial role in healthcare systems worldwide, from developing diagnostic tools and prosthetics to improving medical imaging and surgical equipment. Establishing a Centre for Biomedical Engineering in East Africa will provide the region with the expertise needed to develop localized healthcare solutions that address both common and unique health challenges, such as infectious diseases, maternal health issues, and non-communicable diseases, thus improving the quality and accessibility of healthcare.

The CEBE seeks to enhance regional capacity by cultivating a highly skilled workforce of biomedical engineers and researchers. This will not only help alleviate the existing shortage of trained professionals in the medical technology field but also foster innovation in healthcare. By establishing this Centre of Excellence, the project will create an environment conducive to research and development (R&D) in biomedical engineering, supporting the local production of medical devices, improving healthcare delivery, and reducing the reliance on expensive imports.

The creation of a biomedical engineering center also aligns with the growing need for locally manufactured medical equipment, particularly in the wake of the COVID-19 pandemic, which highlighted the vulnerabilities of relying on international supply chains for critical healthcare technologies. The CEBE will help build resilience in the region's healthcare system by promoting self-reliance and innovation in medical technology.

The CEBE project is expected to contribute significantly to the socioeconomic development of East Africa. The project will generate employment opportunities through education and training, while also stimulating the local economy by supporting the development of biomedical start-ups and partnerships with industry. As graduates from the CEBE enter the workforce, they will contribute to the growth of a knowledge-based economy, creating a ripple effect that fosters innovation, research, and entrepreneurship in healthcare technologies.

Additionally, the Centre for Biomedical Engineering will serve as a platform for collaboration among African countries, fostering regional integration and knowledge-sharing. This collaborative approach will help East African nations pool resources and expertise to tackle common healthcare challenges, promoting sustainable development in the region.

2.2. Project Location

The proposed project site is located in Kigali city, Gasabo District, Bumbogo Sector, Kinyaga cell. It is a site located in the Kigali Innovation city (KIC) in the Kigali Special Economic Zone (KSEZ) (refer to annex 1).

2.3. Project Components

The Project will have 7 levels and subdivided as following:

Basement 1: Free space

- Open space

Ground Floor: Rehabilitation and mobility laboratories

- Advanced prosthetics and orthotics
- Bionics
- Neuro rehabilitation
- Pediatric rehabilitation
- Musculoskeletal rehabilitation
- Disability and rehabilitation services management
- Sport rehabilitation
- Store rooms
- Kitchen and restaurant

- Wellness room (Male and Female) +WC
- First aid room
- W&C

1st Floor: Co-working, research and innovation, show case spaces

- Co recreation room
- 2 Incubation rooms
- Prototype display
- 4 Research rooms
- Study room
- Maker space /Design factory
- WC
- Store

2nd floor: E-health Labs (Simulation, Virtual reality, AI, E-Learning)

- E-Health Training and simulation Lab
- E-Learning
- Disaster management secured system and plan for business continuity
- Secured intelligent system for real time students research data analysis and presentation
- Office
- Store
- Coffee corner
- Study room
- Integrated digital smart WHO guideline lab with Rwanda MoH open clinic and AMP,open MRI systems enabled for research development.
- Immersive VR training room
- Digital smart WHO guideline lab for research and development
- W&C

3rd Floor: Strategic Partners and Professional Training spaces

- 5 Research fellow's offices
- Conference hall
- 3 Strategic partner's rooms
- 2 Class rooms
- Stock
- Coffee corner
- W&C

4th and 5th Floor: Offices and high Tech rooms

- Executive training room S
- 9 Executive Offices
- High Tech rooms
- Coffee Corner
- W&C

Roof Top

- Meeting and recreational space

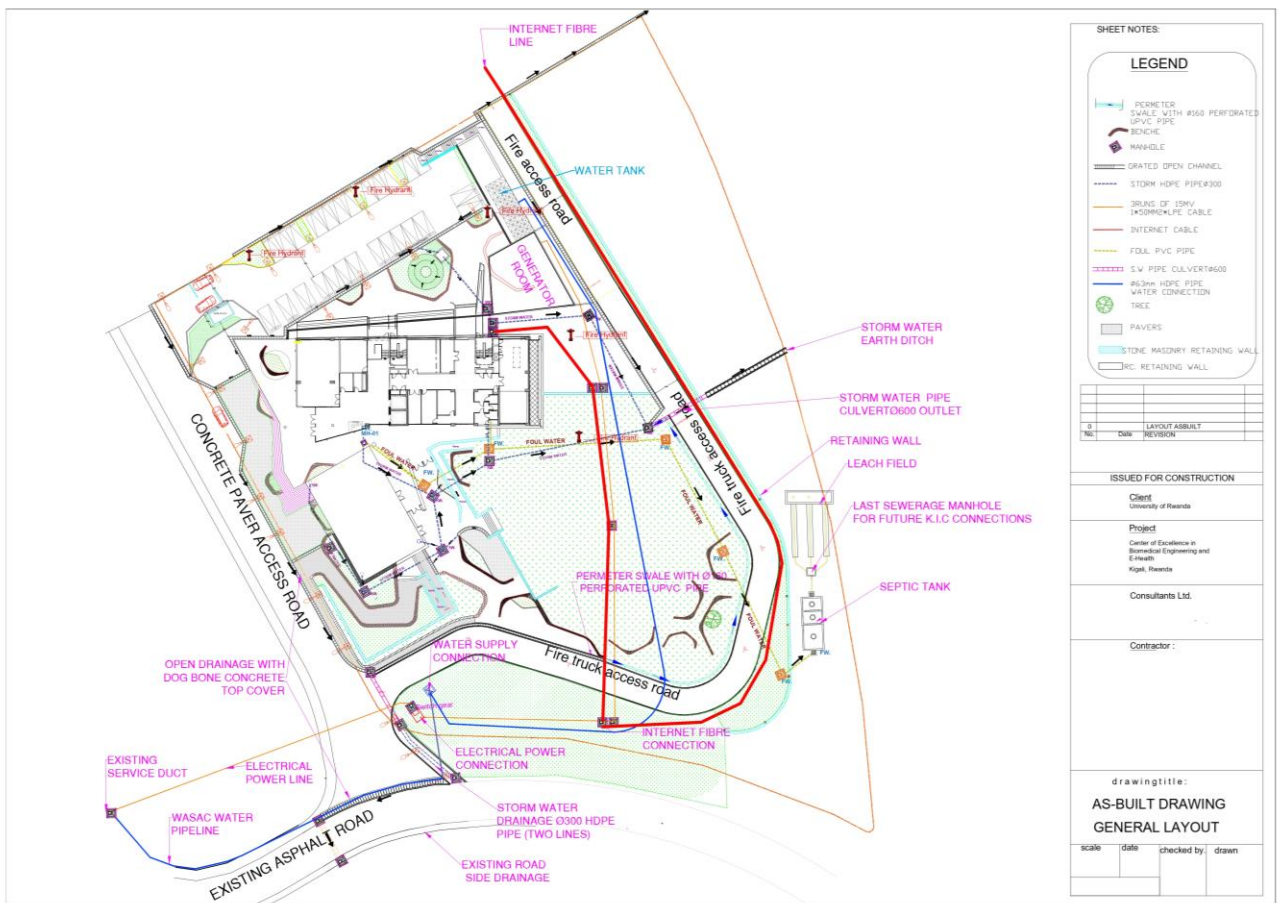


FIGURE 1: ILLUSTRATION OF SITE PLAN



FIGURE 2: PErsPECTIVE OF THE PROPOSED BUILDING

2.4. Project phases

The project is further subdivided into 3 phases for easy impacts identification and mitigation measures as the project progresses. The phases are, pre-construction, construction, operational and decommissioning phases.

2.5. Description of project activities

A. Pre-Construction activities

The site of the CEBE phase II building will be prepared for construction by clearing away only vegetation and topsoil in areas that will become foundations for the building. These will include:

- Earthworks will take place to establish finished levels and falls for the project sites.
- Clearing of vegetation where construction activities will be done
- Topography of the land to know the cut and fill
- Material transportation, stocking and building of temporary offices/site installation....

B. Construction phase

The mobilization of the construction phase will begin with the moving of construction materials to the site using trucks and Lorries. The main activities during this phase will include:

- Excavation of the foundations of the units that will include block work to ground level, backfilling to boundary (some waste generated during construction will be used for construction of foundations and backfilling during development) and compaction;
- Mixing, pouring the slabs will involve mixing and vibrating of concrete;
- Construction of units (detailed below);
- Paved areas and drainage will be constructed by stabilization of the base with the piling, spreading and compaction of gravel and aggregate, followed by the laying of concrete paving slabs;
- Areas prepared for parking will be surfaced with concrete blocks;
- Management of construction waste will take place throughout the construction phase by all contractors; waste will be initially stockpiled and then transported to the registered disposal site.
- The CEBE phase II building will be constructed with concrete block work, roofs will be fixed and services such as plumbing and electricity will be installed. Internal and external walls will be plastered and painted

C. Operational Phase

CEBE Phase II building will serve as hub for strengthening biomedical engineering research, education, and innovation. This will ultimately enhance healthcare systems through the development and implementation of innovative technological solutions.

D. Decommissioning

At this stage, site restoration will be conducted by greening the area and by removing unused materials.

2.5.1. Building Design

Building design will be conducted according to the “Rwanda building code” published in Official Gazette N^o.Special of 16/04/2019 and Rwanda building standard have to be applied.

Referring to RHA building construction guideline, construction of this Building in KIC will comply with building code. For detailed engineering design the consultant shall prepare detailed engineering design and cost estimates.

Each detailed engineering design shall be carried out to a degree of accuracy that will enable quantities of principal items of construction materials to be estimated. Such principal items shall include building structure and its element, drainage, and other building facilities. The consultant will undertake a complete review of the condition of the building and make detailed recommendations for the construction measures considered necessary.

To make such recommendations the consultant shall undertake topographical surveys, geotechnical surveys, identify sources for construction materials and make quantitative and qualitative assessment of them. The works proposed shall be quantified and specified in terms of materials and workmanship quality required and their location clearly identified.

2.6. Material to use for building construction

2.6.1. Material to use for the building:

Course and fine Aggregate, stones, steel, for Construction of building structures will be sourced from certified and authorized quarries with approved materials.

The Contractor will choose the site for aggregate material store and respect to environmental requirements and approved by RDB, environmental department

2.6.2. Borrow pits and Dumping sites

During Construction, the Contractor will carry out laboratory tests for building quality and site where materials for building Construction have been found. The tests that need to be carried out prior to deciding on final acquisition of the borrow pits include Sieve analysis.

2.7. Brief Description of Gasabo District

Geographic location Gasabo district is located in the Northeast of Kigali City Province and bordered by Kicukiro district (South), Nyarugenge (West), Rwamagana (East) and Rulindo and Gicumbi (North). The district's landscape or surface area is 430.30 km² of which 90% (Gasabo DDP, 2007) represent rural zone as indicated in the district graph

below with the green line separating rural and urban areas. The site is located in the urban settings of the district. The aerial image of site location is attached as annex 1.

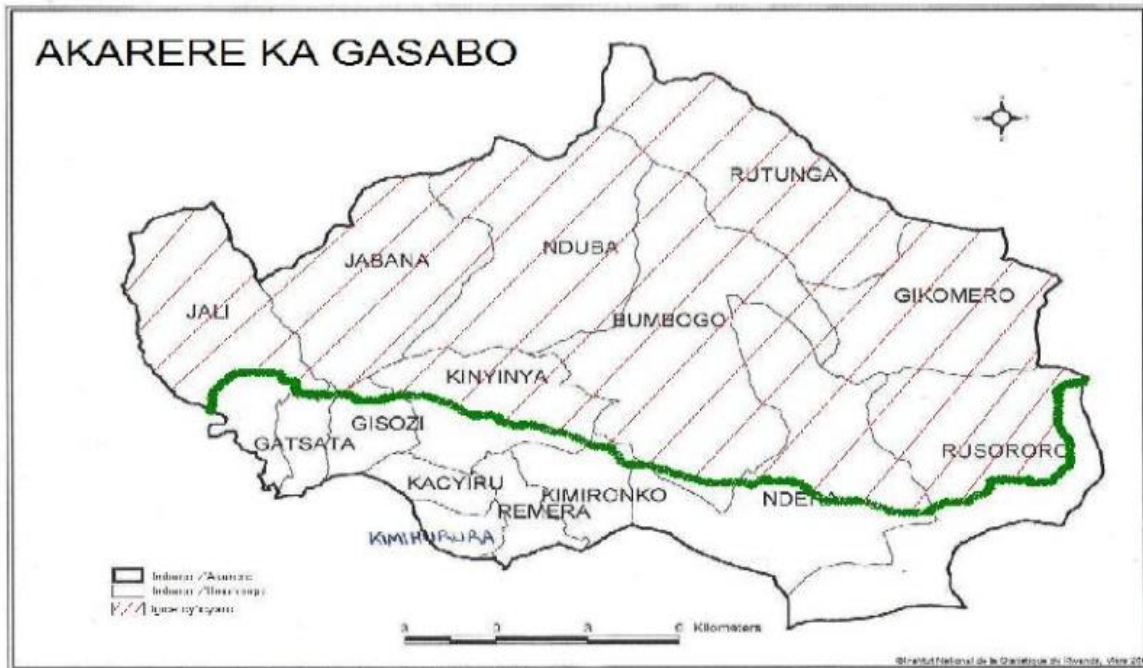


FIGURE 2.0: ADMINISTRATIVE MAP OF GASABO DISTRICT

2.7.1. Demography and Poverty

Gasabo District, located in Kigali City, has a population of around 530,907 (2022 census), with a mix of urban and semi-urban areas. The district benefits from its proximity to Kigali's economic hubs, resulting in a relatively low poverty rate of 12.6%, significantly below the national average of 38.2%, and an extreme poverty rate of 4.4%. Most residents are engaged in informal economic activities and small-scale trade. While urban areas are more developed, rural sectors still face challenges in accessing infrastructure and services. Gasabo's strategic location continues to attract investment, improving economic opportunities and living standards.

2.7.2. Topography and Hydrology

Gasabo district is characterized by the mixture of high mountains with average altitude of 1,800m- mainly located in the rural zone, sloping basins and valleys. The district has over 30 wetlands and small rivers traversing through the valleys. The main unique long Nyabugogo river of about 50Km long and 10m wide is the one that originates from Lake Muhazi and traverses through marshy and boggy valleys before emptying into the Nyabarongo River. Also, Lake Muhazi in the North and part in the East borders Gasabo district.

Similarly, other water sources of importance are: Sumo River in Rugende which ends in Akagera River, Buliza River that traverses through Karuruma, Umilindi and Rusine centers before emptying into Nyabugogo River. These marshlands or wetlands provide potentialities to the district if well reclaimed can enhance or increase agriculture productivity, improve tourism, improve environmental ecological system as well.

2.7.3. Flora and Fauna

Gasabo district has the largest forest cover compared to the other districts in Kigali City and is well linked to large rural zone area. However, the natural flora has been largely depleted and being replaced with artificial vegetation mainly of eucalyptus trees. The few remaining natural vegetation is found in the swamps and in the uncultivated small areas. The natural vegetation type occupying the low plains include papyrus *Typha latifolia* (umuberanya) , *Cyperus latifolius* (urukangaga) while those in stagnant water or slow flowing waters of Lake Muhazi are phragmites (imiseke) and *Nymphaea maculata*(amarebe).

Fauna is characterized by a large diversity of bird species and small wild animals compatible with the existing vegetation cover in the District. Few aquatic animals (fish) are found in Lake Muhazi which includes: tilapia, barbus, clarias galiepunus, common carpe, haprochromis). Therefore, conservation of the District's vegetation is relevant to development of the District through natural disaster management and protecting environment and climate change. Environment and climate is considered as sector vital for the EDPRS2. Protection natural catchments such as watersheds and vegetation have spillover effects to the country's development and there are various empirical evidences in this regard.

2.7.4. Climate and topography

Gasabo District has two major climatic seasons in a year, namely, dry and rain seasons. The major climatic seasons alternate within the year, hence, the district experience two dry seasons and rain seasons. However, important to note is that duration for these seasons is irregular. The average temperature is about 22°C and rain received is between 900 and 1500mm annually.

Gasabo District is characterized by a mixture of high mountains with average altitude of 1,800m mainly located in the rural zone, sloping basins, and valleys. The district has over 30 wetlands and small rivers traversing through the valleys.

2.7.5. Water and Sanitation

Access to clean water and improved sanitation remains a significant challenge in both rural and urban sectors of the project area. Many households must traverse long distances to reach water sources, leading to adverse effects on child education and health. According to EICV3 data, 2.1% of the population lacks toilet facilities, 2.2% relies on boreholes for water, and 28.7% incur expenses between RWF 1 and RWF 20,000 to secure water. These statistics implicate the need for sustainable solutions to improve water accessibility and sanitation infrastructure, aligning with the project's commitment to addressing critical social and environmental issues.

2.7.6. Education

In relation to education- indicators such as gross primary enrolment rate (139.9 %) and gross secondary enrolment rate (66.1 %) position the district below the national rates of 148.4 % (gross primary enrollment) and above the 40.9 % national rate in gross secondary school enrolment. Also, in terms of literacy levels- the district's literacy levels persons of 15 years and older in the district is above the national average rate of 69.7 % at 84.8 %, though, slightly below rates registered in Kicukiro and Nyarugenge at 89.5 % and 86.7 %. Though, the district level is below the country's target of 90 % and 100% as stipulated in the 7YGP and Vision 2020 respectively. The same survey revealed that the computer literacy rate for persons of 15+ years stands at 17.4 %. The district recognizes the need to improve the literacy rates to boost up ICT innovations and private sector-led economy.

In terms of student/ classroom ratio in primary level is at 35.9 below the standard of 46 pupils per classroom while pupil/qualified teacher ratio is 54. However, it is also observed that the district has unqualified, for example, in private, private aided and public primary schools are 5%, 4% and 8% respectively. Usage of computers and internet in primary schools is 4,641 computers and 28 schools have access to internet.

2.7.7. Housing and Urbanization

According to Kigali City Master plan, Gasabo District is planned to be a highly urbanized district and therefore having standardized urbanization, transport and ICT infrastructures are essential for the realization of the district's objective of making Gasabo an administrative center.

Housing status in the district is below the standards of an urbanized city as the district is characterized by people living in unplanned clustered rural housing, isolated rural housing and agglomeration. Housing indicators such as the type of habitat in the districts reveals that the majority people- above 46 % live in unplanned urban housing and 36 % of people live in isolated rural housing. The type of dwelling- shows that the majority people of 69.7 % have a single house dwelling, followed by group of enclosed dwellings with multiple households (17.8 %), multiple household dwelling (8.9 %), group of enclosed dwelling for single household (3.4 %) and multi stored buildings (0.2 % in that order).

2.7.8. Agriculture

There is considerable agriculture carried out in Gasabo district and the main crops cultivated are maize (14.9 %), sorghum (4.7 %) and rice (1.2 %). Similarly, 25.9 % households do manage any farm animal. Also noted is that 61.0 % of agriculture is done on land size of less than 0.1 hectare which reflects the 5 % farm employment (Gasabo,2024).

2.8. Description of the site

The top surface of project site is mainly composed of existing buildings constructed in phase 1, some access roads, some gardens. The project site is accessible Via round about nearby Carnegie Melon University -Rwanda

It is located in a hilly area where infrastructure such as electricity and roads are being developed. The following pictures show the current status of the site.



FIGURE 6.0: EXISTING BUILDING AND ITS VICINITY



FIGURE 7.0: ROUNDABOUT AT THE PROJECT AREA



FIGURE 7.0: EXISTING BUILDING PHASE I

2.9. Sanitation and Solid Waste Management

The water and sanitation sector faces major constraints, including insufficient wastewater and solid waste management systems. Proper waste management is crucial for the economy, social protection, and welfare. The building Phase II waste management plan should be in line with KIC wastewater management for WTS (Water Treatment System), which will be constructed by KIC (Kigali Innovation City).

Poor solid waste management can lead to increased water and soil pollution, resulting in health issues, ozone layer depletion, and climate change. An efficient solid waste management strategy is needed to protect the environment and ensure the health of the population. Access to improved latrines is a priority for the country and is part of the Sustainable Development Goals (SDGs).

Sanitation: In urban areas of Gasabo, modern sanitation systems, including piped sewage networks, serve a portion of the population, particularly in more developed neighbourhoods closer to Kigali's city center. However, in semi-urban and rural areas, sanitation facilities are predominantly decentralized, with households relying on pit latrines and septic tanks. The district, like much of Rwanda, faces challenges in providing widespread access to improved sanitation facilities, especially in less developed zones. Efforts to improve sanitation are aligned with Rwanda's national targets under the National Sanitation Policy, which seeks to ensure safe sanitation access for all by promoting the construction of hygienic latrines, wastewater management, and hygiene education.

Solid Waste Management: Solid waste management in Gasabo is largely handled by a mix of private waste collection services and local government authorities. The City of Kigali, which includes Gasabo, has established waste management systems where licensed companies are contracted to collect household, commercial, and institutional waste. The collected waste is transported to the Nduba Landfill, Kigali's main waste disposal site, located on the outskirts of the district. Efforts are being made to improve waste segregation at the source, encouraging residents to separate organic waste from recyclable materials. Composting of organic waste and recycling are

promoted to reduce the overall volume of waste heading to landfills. However, challenges remain in ensuring consistent waste collection in more remote and semi-urban areas.

Chapter 3: Analysis of Alternatives

3.1. General

A comprehensive environmental and social impact assessment requires not only the evaluation of the impacts resulting from the proposed project at a specific location and resulting from construction process, but also a complete environmental and social impact assessment cycle requires detail assessment of possible alternatives as well.

During this study, consulting key stakeholders preselect the long list of social-economic impact to this project as well as environment impact on building rehabilitation project.

Among social –economic impacts including employment creation, revenue generation, education quality development, capital injection into the economy, infrastructure developments that may result from the project and country to reach its objective.

During the feasibility stage of the proposed construction of Building for Phase II of Center of Excellence in Biomedical Engineering (CEBE), the proposed list is released to Consultant for deep analysis and evaluation as well as prioritization. At the feasibility stage, the building prioritization elements was prepared along with their respective impact weights to gauge the effects (benefits) of the building construction and general negative impact of this project on the environmental degradation.

All options were explored and these options were weighed from all considerations such as cost, environment, and ease of implementation and maximum utilization of available infrastructure. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the adverse impacts. Alternative analysis is also a form of mitigation measures. The two alternatives were considered “Without Project Scenario” and “With Project Scenario”.

In each project scenario, different considerations involved in the project implementation also are discussed below. The following sections provide descriptions of the project alternatives and analysis of the same with respect to environmental, social and economic features.

3.2. “Do Nothing”/Without Project Alternative

The “Do nothing”/ without project alternative option in respect to the proposed construction of Phase II Building for Center of Excellence in Biomedical Engineering (CEBE) project implies that the status is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference of impacts with the existing Environmental conditions.

This option will however, involve several losses on socio-economic condition both to the local population and the nation as a whole.

The “**Do Nothing**” Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The socio-economic development of country would be very slow.
- CEBE will not achieve its objective and targets as infrastructures are not enough, which will be a loss to University of Rwanda, CEBE, Rwanda and Region in general,
- The local skills would remain under-utilized as no employment opportunities will be created for local population who would have otherwise been employed by the construction of this building.
- Therefore, the “Do nothing/ without project” alternative is not preferable to project implementation
- As this option omitted the project will follow all laws and regulation for Environmental protection during all phases of the project

3.3. With Project Alternative

The implementation of the project will contribute to socio-economic improvement and will have positive impacts on a country in terms of Education, Research, Health and achieving Rwanda Vision 2050. This alternative will have positive impacts on Rwandans life quality and has the following advantage:

- Improvement of level of knowledge and skills research, Capacity Building in Biomedical Engineering
- Project will create both permanent and temporary jobs for local population and for skilled and unskilled labors

This option will have also negative moderate and temporal impacts such as on ecosystem like flora, noise and air pollution during construction and operation phases.

Impact on Flora: the vegetation coverage around building will be destroyed within project site.

Noise and air pollution: noise and air pollution will be generated during construction and operation phase due to dust from construction material, gases emulsion and unwanted sound will be produced by machinery.

However, the implementation of the project will take adequate consideration to avoid/minimize and mitigate the anticipated impacts through implementation of the following measures:

- Appoint Environmental specialist on both side of contractor & supervision company to assist in implementation and monitoring of ESMP and in daily environmental & social safeguard compliance;
- During construction & operation, the developer will take care of existing vegetation around site and impacted vegetative cover (sods) will be replanted after building completion
- Landscape the site by installation of rain water tank to capture the water from the roof, planting grass and trees at all areas around the site.
- Ensure that all site clearing is done properly by conserving the natural shape and minimizing degradation of natural species (Flora);
- At the end of the construction works, ensure that all measures of building construction; borrow pits used for the extraction of materials (Like fine and coarse aggregate) for this infrastructure are restored in accordance with the ESMP;
- Proper disposal of wastes, provision of adequate sanitation facilities, provision with protective equipment to workers, use machinery in good condition during daytime, regular watering of dust generation area on site, etc. to ensure the implementation of the project to be environmental friendly and socially acceptable.

- Contractor & consultant and other Key stakeholders are supposed to ensure protection of flora and fauna during construction & operation phase;
- Building construction materials like aggregates are supposed to be obtained from local borrow pit near working area to minimize transport costs and to also create local employment.

In addition, for socio-economic development, contractor & project developer will ensure that most of labors are local population, ensure safety & health compliance during construction and operation. The developer will ensure that waste is not left in stockpiles along the project site but used in management of borrow pit areas and landscaping along the site project. During construction & Operation avail public dust bin to collect solid waste, which later will be collected and disposed at designed place. CEBE will be in charge of routine cleaning of building after handover.

3.4. Analysis/Evaluation of project Alternatives

The consideration of alternatives to a proposal is a requirement of many ESIA system. It lies at the heart of the E.S.I.A process and methodology. During the scoping process, alternatives to a proposal can be generated or refined, either directly or by reference to the key issues identified. A comparison of alternatives will help to determine the best method of achieving project objectives while minimizing environmental impacts or, more creatively, indicate the most environmentally friendly or best practicable environmental option.

From an environmental perspective, not carrying out this development may be the best option. Without the development, the area would remain a relatively undisturbed area providing a habitat for the varied flora and fauna presently observed. This area will continue to be impacted, although minimally, by anthropogenic and natural factors.

From a socio-economic perspective the “no action” alternative may not be the best alternative as the numerous benefits to be gained from the development both locally and nationally would not be realized and the resources in the area would continue to be underutilized. By analyzing both scenarios, With Project Alternative and “Do Nothing”/Without Project Alternative; the without project Alternative has been rejected, and with Project alternative is adopted.

This “Without Project Alternative” means forfeiting the proposed development avoiding all its impact both positive and negative. The only benefit of this option

would be negative impacts would be avoided such as losses in flora & faunal habitats, waste generation and pressure on infrastructure. However positive gains from the project on the economy would also be lost such as employment creation, revenue generation, education quality development, and capital injection into the economy, infrastructure developments that may result from the project and country decision of providing the qualified workforce needed to reach its objective.

The “With Project Alternative” adoption decision is based on its socio-economic benefits and the alternative measures that will be developed to avoid, minimize and mitigate any active and residual environmental and social impacts from the project implementation. Therefore, the benefits from the adopted alternative outweigh and selected from the without project alternative.

In fact, based on our technical expertise this project is feasible, but developer and key stakeholders involved in project should observe the recommendations that are detailed in ESMP. Briefly most of adverse impacts will be of a temporary nature during site rehabilitation phase and other will be occurred during operation phase.

Most of these impacts can be managed to acceptable levels with implementation of the recommended mitigation measures for this project such that the overall benefits from the projects will greatly outweigh the few adverse impacts.

3.5. Alternative Sites

The choice of the site was integrated with appropriate mitigation measures for impacts related to noise, waste management, storm water management and emissions and made the site one of the best alternatives for this particular project. The site location in the special economic zone is ideal because of its closeness to the main road that will aid in transporting through the different products described in the project description and the site is compatible with the proposed physical planning master plan of Kigali City that shows that the general area is zoned for industrial activities and facilities.

3.6. Alternative Technology

Alternatives open to this project include the equipment that is in use, the project components design and the materials in use. The equipment in use is more generic of

infrastructure projects with heavy equipment retained for heavy earth movement activities and transportation of building materials. For waste water and sewage management, KIC waste water management plan will be followed.

Chapter 4: Impact Analysis

4.1. Baseline data

The baseline data for environmental and socio-economic factors is crucial in understanding the existing conditions before the commencement of the project. It helps assess the project's potential impacts on both natural resources and the local community. This section includes data on climate, topography, air and water quality, biodiversity, land use, population demographics, and socio-economic activities in the CEBE phase II project area.

4.1.1. Physical environment

Physical environmental survey involves understanding the actual status of the area, in regard to; Climate (temperature, rainfall), relief, hydrology, vegetation, soil, water and air quality. Physical parameters discussed hereafter are directed to Gasabo District, where CEBE is located.

Climate

The climate data focuses on the temperature, precipitation, humidity, and wind patterns in the project region. This is particularly important for understanding the potential impacts of construction activities on air quality and water resources. The project area is characterized by:

- Annual Temperature: Average temperatures range between 20°C and 25°C.
- Rainfall: The area experiences two rainy seasons, with an annual average rainfall of approximately 1,200mm.
- Humidity: High relative humidity during the wet seasons, decreasing during the dry periods.

Topography and Geology

The project site is located on a gently undulating terrain, with slopes ranging from 2% to 10%. The geological features consist predominantly of granitic rock which is under weathering stage, the mother rock for the project area is being transformed into gravelly soil. The second geological proportion is composed of quarts which results into the gravelly soil and sandy-silty soil. .

Air Quality

Air quality in the project area is currently within acceptable limits, with minimal sources of pollution. The primary contributors to air pollution in the region are dust from unpaved roads and agricultural activities. The baseline measurements indicate

low levels of particulate matter (PM10 and PM2.5), carbon monoxide (CO), and nitrogen oxides (NOx).

Noise Levels

Baseline noise measurements in the area are low, primarily attributed to the rural and undeveloped nature of the site. The noise levels range between 40-50 decibels (dB) during the daytime and drop to 30-40 dB at night.

4.1.2. Existing flora and fauna

The project area had no indigenous plants or animal species. It is covered in damped soils, dry weed, shrub and scatted bushes as seen in the annexed site picture This is likely to have been a result of site clearing of the project area as part of Phase I expansion of the Kigali Special Economic Zone (KSEZ), damping of soil spoils from neighbouring road networks, stormwater drainages and other project construction works from industries in the KSEZ.

4.1.3. Socio-Economic Baseline

According to the 2022 NISR survey, the average household size in Gasabo District has decreased to 3.5 persons per household. In Bumbogo Sector, there are approximately 10,200 households with a population of 37,800. 74% of households are headed by males and 26% by females. Housing distribution includes 3.5% in clustered rural settlements, 45% in isolated housing, 15% in planned urban housing, and 30% in squatter housing. In terms of energy use, 45% of households use electricity for lighting, 28% rely on kerosene lamps, and 14% use candles, while 83% still rely on charcoal for cooking, 4.5% use firewood, and 10% have switched to LPG or biogas. The data reflects increasing electrification and urbanization, though challenges remain in energy access and housing quality.

4.1.4. Water and sanitation of private households

In Gasabo District, around 78.1% of households have access to improved water sources, such as piped water, either within their dwelling, compound, or through public taps. In urban areas of Gasabo, the majority of households benefit from piped

water services, while in peri-urban and rural areas, residents often rely on public standpipes, boreholes, or rainwater harvesting systems. Regarding sanitation, 84% of households use improved sanitation facilities, such as flush toilets connected to septic tanks or sewer systems. However, 16% of households, primarily in informal settlements or rural areas, still use unimproved facilities, including basic pit latrines without proper sanitation management. Despite progress, there are still gaps in equitable access to clean water and improved sanitation in some parts of the district.

4.2. Impact identification

4.2.1. Introduction

The purpose of this ESIA is to improve decision making and to ensure that the project under consideration is environmentally and socially sound and sustainable. The ESIA identifies ways of improving the project environmentally and socially by preventing, minimizing, mitigating, or compensating adverse impacts. The following environmental and social components that are likely to be affected are:

- ✓ Water resources
- ✓ Environment
- ✓ Agriculture and Forestry
- ✓ Geology, geomorphology, and soils resources
- ✓ Waste management
- ✓ Socio-economic Environment (noise, health damages, etc.)
- ✓ labors
- ✓ community health and their property
- ✓ biodiversity (fauna and flora)
- ✓ Indigenous people and local tradition
- ✓ culture heritage

It is necessary to note that it is not only the project that will have impacts on the environment, but also the environment will have some risks on the project. These impacts and risks can also be positive or negative, direct or indirect, local or national or short/long term.

4.2.2. Impacts classification

The impacts are classified and their range varies in space and time. The intensity of these impacts is classified according to the following criteria:

- ✓ Effects on the health species
- ✓ Reduction of the diversity of species
- ✓ Loss of habitats
- ✓ Transformation of natural landscapes
- ✓ Impacts on the human health
- ✓ Effects on the present use of available natural resources
- ✓ Abandonment of either use or future production of natural resources

The criteria of classification of the impacts as being important, middle or weak are according to:

- ✓ Size and geographical extent
- ✓ Duration and Frequency
- ✓ Irreversibility
- ✓ Ecological context

4.2.3. Evaluation and analysis of the impacts

In this section, the impacts of the project activities on the different components of the social and environment are evaluated and analyzed.

Positive Impacts

- ✓ There will be development of more practical skills, Capacity Building, Masters and PhDs Degree in area of Biomedical Engineering,
- ✓ Maintenance and management of Biomedical Products which implies job creation and time & cost efficiency,
- ✓ Providing all services related to Biomedical Engineering in Rwanda and in Region at reasonable costs,
- ✓ Gender promotion due to enhanced level of service to girls & women through inclusive employment opportunity during and after construction phase
- ✓ Direct and indirect job creation and employment (with the associated multiplier effect) during the implementation of construction of the building and the operation of the completed projects

- ✓ The demand for laborers will increase as the contractor is expected to employ Hundreds of local labors as workers, drivers, cleaners, Guards, engineers, etc.
- ✓ Increase in the income of the population working for the project which will impact their family member well-being as people we have capacity to buy Health Insurance (Mituel de santé), capacity to pay schools fees for their kids, and being able to buy their family basic needs, briefly this project will play a big role in social-economic transformation of surrounding community.
- ✓ The community will benefit from the project through selling food or providing other services during construction activities.
- ✓ Contribution to the social, economic and institutional development of the communities within the project areas; and
- ✓ Enhanced accessibility to education and improved infrastructure for learning
Provision of high-quality education
- ✓ Long-term economic benefits
- ✓ Access to improved health services

TABLE 5: IDENTIFICATION OF RISKS AND NEGATIVE IMPACTS & PROPOSED MITIGATION MEASURES

Sn	Risks/Impacts	Assessment	Mitigation measures
A. Construction phase			
1	Risk of increase of Mpox, Murburg ,HIV/AIDS and other Transmitted Diseases	Increase in activities and interaction of workers and communities may lead to the increase of Mpox & HIV/AIDS and other Transmitted Diseases in the project area	<ul style="list-style-type: none"> ✓ The client will collaborate with a Health Care insitution to provide awareness and education on Mpox, STDs and HIV/AIDs and other transmissible diseases to workers. ✓ collaborate with Health care institution to ensure the provision of Hand sanitizer, masks, Hand Washfacilities, soap and water, condoms to project workers at all times; ✓ Appoint Environmental specialist on both side of contractor & Supervision Company to assist in implementation and monitoring

Sn	Risks/Impacts	Assessment	Mitigation measures
			of ESMP and in daily environmental & social safeguard compliance especially controlling human misbehavior during road construction.
2	Risk of Destruction of fauna and flora and Impacts on landscape aesthetics during operation phase.	<ul style="list-style-type: none"> ✓ Some of the vegetation coverage will be removed and destroyed, around construction site. ✓ The soil will be disturbed during site cleaning 	<ul style="list-style-type: none"> ✓ During construction & operation, the developer will take care of vegetation and will be restored after construction around the building to avoid erosion. ✓ Spare vegetation such sods that don't stand in the way of the project; ✓ Landscape the site by planting grass and trees at all disturbed areas around project site. ✓ Ensure that all site clearing is done properly by conserving the natural shape and minimizing degradation of natural species (Fauna & Flora).
3	Safety issues during construction and operation phase Including Accidents and injuries to workers or third party.	<ul style="list-style-type: none"> ✓ Some of the workforce on this project or third party may face accident. ✓ Equipment accidents are most likely to occur, or Truck traffic incidents; ✓ Public Health 	<ul style="list-style-type: none"> ✓ Appoint qualified staff in charge of health & safety and implementation of ESMP; ✓ The workers will be fitted with appropriate personnel Protecting Equipment (PPE) such as Ear muffs, Gloves, Helmets, Dust masks, Safety boots, Eye goggles; ✓ Engage workers to be self-control. ✓ Enclosed iron fencing to the critical construction site etc. ✓ Provide Occupational Health and Safety Plan; ✓ Emergency preparedness and response plan; ✓ Accessible to people with disability;

Sn	Risks/Impacts	Assessment	Mitigation measures
		<p>and building use Safety</p> <ul style="list-style-type: none"> ✓ Accident caused by machine during operation phase 	<ul style="list-style-type: none"> ✓ Provide suitable safety gear (PPE) for all personnel during construction; ✓ Display clear signage indicating construction zones and potential hazards. ✓ Designate specific entry and exit points for construction-related vehicles. ✓ Provide first aid kit at construction site.
4	Air pollution by dust and gases during construction and Operation Phase	<ul style="list-style-type: none"> ✓ Workers & population in Kinyaga cell and CEBE1 & CMU occupants may be affected by dust due to building construction site and during operation due to gas emission. ✓ Machinery and vehicle will cause air pollution by the emission of carbon dioxide and other greenhouse gases; 	<ul style="list-style-type: none"> ✓ Monitoring of the dust levels and loading activities and spray water when necessary throughout working hours; ✓ Provide dust masks for the personnel in dust generation areas. ✓ In case of Stockpiles should be sprayed with water or cover during dry seasons. ✓ Engage self-control to workers; ✓ Machinery idling time shall be minimized. ✓ Equipment shall be properly tuned and maintained; ✓ Cover all trucks hauling soil, sand and other loose materials; ✓ Provide dust screen where necessary; ✓ Proper ventilation will be provide at working hall
5	Noise and vibration impact during construction as	<ul style="list-style-type: none"> ✓ The increase of noise and vibration level would be site 	<ul style="list-style-type: none"> ✓ Works especially those that produce noise and excessive vibrations should be executed during the day hours expect one which can't cause noise to the vicinity population.

Sn	Risks/Impacts	Assessment	Mitigation measures
	well as during operation	specific and will impact the population living and working close to the project especially student.	<ul style="list-style-type: none"> ✓ The Developer will ensure that workers working in the vicinity of excessive noise are provided with protective wear such as helmets and ear plugs, protective gear and the generators are sound proofed. ✓ Install portable barriers to shield compressors and other small stationary equipment where necessary; ✓ Put up signs indicating the construction site activities;
6	Effects of generated solid wastes and used equipment	Solid waste from the sites, stockpiles, and material handling equipment will be generated during construction & operations	<ul style="list-style-type: none"> ✓ In case of solid waste caused by the construction project, the client will contact the local administration to allocate where are designated sites in line with National waste management regulations; ✓ The developer will ensure that waste is not left in stockpiles along the project site but used in management of borrow pit in area and landscaping along the site project. ✓ During operation of building solid has to be collected at specified place such dustbins then transported to designated sites in line with National waste management regulations; ✓ Re-cycling and re-use of solid waste during construction and after must be first priority.
7	Site cleanness, hygiene and sanitation	Risk of solid waste on worksite which can lead to safety &	<ul style="list-style-type: none"> ✓ The client should provide proper sanitation for the staff, and make sure that the hygiene & sanitation rules and regulations are well

Sn	Risks/Impacts	Assessment	Mitigation measures
	<p>facilities; effects of generated sewage.</p> <p>Solid waste at working site</p>	<p>hygiene issue.</p> <p>Risk of waste to affect the worker & surround area.</p>	<p>followed to avoid waterborne diseases due to poor hygiene;</p> <ul style="list-style-type: none"> ✓ Preferably existing toilets should be used. ✓ Ensure proper solid waste disposal and collection facilities; ✓ Garbage shall be disposed of periodically; ✓ Promote 3R (reduce, reuse and recycle) waste management Principles; ✓ Disposal the waste should follow the standard and district regulation. ✓ Ensure proper solid waste disposal and collection facilities;
8	waste water at working site	Risk of waste water generated during operation phase to affect the worker, neighbors of the project & surround area	<ul style="list-style-type: none"> ✓ Waste water is managed using Septic tanks at but later after a Centralized Sewerage System ✓ The developer will ensure that the black water, yellow water and grey water will not have mixed.
9	Public Utility destruction	Risk of damaging public Utility like Water supply pipe, electricity line, Fiber optic etc. during building construction.	<ul style="list-style-type: none"> ✓ Contractor should be careful during construction avoid unnecessary public utility destruction; ✓ Whenever possible contractor should protect water, electricity line, internet line etc. ✓ Contractor should be proactive to inform concerned agency to remove the utility infrastructure on time. ✓ In case of any damage contractor should inform the concerned Key stakeholder to remove it or fix it.

Sn	Risks/Impacts	Assessment	Mitigation measures
10	Soil erosion	Risk of soil erosion around the project site during construction and operation phase	<ul style="list-style-type: none"> ✓ Sustainable drainage measures that connect to the normal drainage system of water to prevent increasing run-off to high levels as result of the development. These methods include using materials that allow water percolation in making paved surfaces such as the parking lot; using green roofs where possible or water catchment ✓ Floor linings of adequate design, incorporating a surface concrete layer, usually underlying a sand layer and a final layer. ✓ Limit soil disturbance by using lighter equipment, reducing the number of passes made on the soil, avoiding working in wet soil conditions and clearing vegetation in phases. ✓ -Clear vegetation in phases so that only those areas required for immediate development are cleared. ✓ -Silt fencing to be installed at the base of mounds. ✓ -Install suitable soak pits in different areas of the site to capture runoff and enable it to gradually penetrate into the ground. ✓ Remove or treat unstable fill slopes as necessary to improve stability. ✓ Stabilize slopes with appropriate retaining walls or other structures. ✓ Regularly maintain and inspect erosion control and stormwater management features.

Sn	Risks/Impacts	Assessment	Mitigation measures
			<ul style="list-style-type: none"> ✓ Stockpile topsoil and replace it after construction is complete. ✓ Maintain vegetation cover during and after construction. ✓ Limit construction activities as much as possible to the dry season.

4.3. Monitoring Framework

A detailed environmental monitoring plan has been developed to verify that predictions of environmental impacts are accurate and that unforeseen impacts are detected at an early stage and allow corrective measures to be implemented, if need be.

During the construction phase the plan provides for soil erosion, dust, noise and safety monitoring.

During the operation period, monitoring is planned in terms of routine inspection of project activities and management, the health and safety of the workers. The Monitoring Plan is developed and presented on the Table 5 below.

TABLE 6 MONITORING FRAMEWORK

Impacts	Indicators	Targets	Comments
A. Construction Phase			
Air pollution	<ul style="list-style-type: none"> -Installation of dust screens -access routes are watered to reducedust (how often) -Regular check of filter systems and dedusting equipment 	<ul style="list-style-type: none"> -Retain or reduce dust amounts by period of operation to current amounts. 	The impact will be cumulative as the project is located in an industrial zone

Impacts	Indicators	Targets	Comments
Noise Pollution	-Number of equipment with mufflers -Amount of noise from traffic and heavy machinery -Number of workers with ear muffs -Number of hours for Workers and personnel operating equipments and machines	Noise levels of below 45-55dB immediately outside the project site	The impact will be cumulative as the project is located in an industrial zone and where construction activities are taking place
Solid waste	Number of Refuse pits where all solidwaste will be deposited Quantity of solid waste collected versus no collected. Quantity of solid waste on site Quantity of solid waste reused or recycled. Quantity of non reusable waste	All construction solid waste collected and disposed at an appropriate site for recycling, reuse or treatment.	Solid wastes generation shall be cumulative
Removal of Vegetation	-Planted indigenous trees	Maximum vegetation at all open areas.	Non-cummulative as the site will be rehabilitated
Fire Hazards	-Fires encountered -Number of employees trained to firefighting	No risk for fire. Fire fighting system well installed on site	
Soil Erosion	Soil movement and erosion rills	Improved soil conservation within site and along access road.	

Impacts	Indicators	Targets	Comments
B. Operational Phase			
Use of generator	-Power generator in enclosed soundproofed room.	Use of generators only when there is electricity shortage from REG/EDCL	Minor impact to the environment
Increased runoff	-Roof catchment (volume of water) -Open areas paved and not paved(m2)	Maximum water stored	Should comply with KIC water and waste management plan, water management plan
Materials handling	-Regular maintenance and service of all equipment for material handling -Number of employees trained on safe handling, storage, labeling, disposition and acceptance practices of stored products. -Surface of covered and non storage to prevent exposure to either precipitation or runoff will be provided on site.	Project manager/Bollere Transport and Logistics Rwanda Ltd	Number of skilled personel trained to be increased
Solid waste	Solid waste generation rates, Waste stream analysis, waste collection	Minimize environmental impact and	Should comply with KIC solid waste management plan.

Impacts	Indicators	Targets	Comments
	<p>and disposal and Recycling and waste reduction efforts are indicators from which building managers will gain better understanding of waste generation patterns, identify areas for improvement, and implement effective waste management strategies.</p>	<p>reduce costs</p>	
<p>OHS risks</p>	<ul style="list-style-type: none"> - Physical Hazards (Structural Integrity, fire Safety, electrical Safety) - Environmental Hazards (Indoor Air Quality, Noise Levels, Lighting, Temperature and Humidity) - Chemical Hazards (Identification and proper storage of hazardous chemicals, Availability of Material Safety Data Sheets (MSDS), Compliance with chemical safety regulations). - Biological Hazards - Behavioral Hazards (Compliance with safety rules, and 	<p>Identify and address OHS risks, ensuring a safe and healthy working environment.</p>	

Impacts	Indicators	Targets	Comments
	Emergency preparedness - Availability and implementation of an OHS management system		

Chapter 6: Culturally appropriate and accessible Grievance Redress Mechanisms (GRM)

Implementing a culturally appropriate and accessible Grievance Redress Mechanism (GRM) for the CEBE phase II building in Kigali, Rwanda is essential to address concerns from stakeholders, including local communities, promptly and effectively. Drawing from successful GRM implementations in Rwanda, the following steps will be incorporated:

1. Establish a Grievance Redress Committee (GRC)

Form a committee comprising representatives from the local community, project staff, and local authorities. This inclusive approach will ensure that the committee is trusted and respected by all stakeholders. The GRC will operate within existing legal and cultural frameworks to maintain legitimacy and effectiveness.

2. Develop Clear Procedures

Define procedures for submitting grievances, including multiple channels such as in-person submissions, written forms, telephone hotlines, and digital platforms. Ensure these procedures are communicated clearly to all stakeholders, considering local languages and literacy levels to enhance accessibility.

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3. Ensure Accessibility and Inclusivity

Make the GRM accessible to all community members, including vulnerable people. This may involve providing information in local languages, ensuring physical accessibility for individuals with disabilities, and conducting outreach to inform the community about the GRM's existence and procedures.

4. Implement a Transparent Process:

Establish a transparent process for receiving, assessing, and resolving grievances. This includes setting clear timelines for each stage of the process and keeping complainants informed about the status of their grievances. Transparency builds trust and encourages community members to engage with the GRM.

5. Provide Training for GRC Members:

Offer training to GRC members on effective grievance handling, cultural sensitivity, and communication skills. This ensures that grievances are addressed respectfully and efficiently, fostering positive relationships between the project and the community.

6. Monitor and Evaluate the GRM

Regularly monitor the GRM's performance by tracking the number and types of grievances received, the time taken to resolve them, and stakeholder satisfaction with the outcomes. Use this data to make continuous improvements to the mechanism.

7. Foster Community Participation

Encourage community involvement in the project's planning and implementation phases. Active participation can reduce the number of grievances by ensuring that the project aligns with community needs and expectations. In Rwanda, community participation has been recognized as a cornerstone for the success of development projects.

Chapter 7: Stakeholder Consultations

The public consultation and stakeholder engagement section of the Environmental and Social Impact Assessment (ESIA) Report for the Construction of the Center of Excellence for Biomedical Engineering Phase II outlines a well-structured approach to engaging various groups to ensure that their concerns, suggestions, and expectations were addressed. Below is an elaboration on the process, roles of different stakeholders, and examples:

7.1. Stakeholder Engagement Approach

The stakeholder engagement process aimed to foster meaningful dialogue between the project developers and all affected or interested parties. The focus was on identifying stakeholders whose interests, livelihoods, or environments would be impacted by the construction and operation of the Center of Excellence. It was also meant to build a constructive relationship by ensuring their views were considered in decision-making. Stakeholders were engaged through physical meetings and workshops.

- **Local Communities:** Residents around the project site, who might experience environmental or social impacts such as noise, pollution, or employment opportunities.

- **Government Bodies:** Local and national authorities, including the Rwanda Environment Management Authority (REMA), the Ministry of Health, the Ministry of Infrastructure (MININFRA), RDB, and MINEDUC played a regulatory role in ensuring compliance with national laws and environmental standards.
- **Educational Institutions:** The University of Rwanda/CEBE, as the project developer, was a key stakeholder ensuring the alignment of the project with its educational objectives and the broader mission of capacity building in biomedical engineering.
- **Funding Partners:** African Development Bank (AfDB) contributed to setting benchmarks for environmental and social safeguards based on international standards.

TABLE 7: STAKEHOLDERS CONSULTED

Date	Stakeholder	Methods	Discussion/Point discussed
15 th November 2024	REMA/Department of Inspection	Physical meeting	<ul style="list-style-type: none"> • Implementation of EIA Condition of Approval and any unpredicted negative impacts including prevention of communicable diseases during the project implementation. • Special attention should be paid on the management of the generated waste during the construction works and during operation. • The effluent from the proposed temporary wastewater management system should meet the national standards • The facility should be well design to function until the connection of KIC sewer

Date	Stakeholder	Methods	Discussion/Point discussed
			system
20 th March 2024	CoK/Department of Inspection	Physical meeting	<ul style="list-style-type: none"> • Building should comply with issued license and comply with master plan • Waste management should be included in the project implementation activities • Stormwater and wastewater management • Some principles of Global Green Growth Institute should be implemented • Rainwater harvesting and not paving in the plot (permeable pavement) and organisation of garden should be promoted to reduce stormwater
25 th October 2024	RGB/KIC	Phone Conversation	<ul style="list-style-type: none"> • The Kigali Innovation City Master Plan and planned infrastructures which include social amenities (restaurants, sports infrastructures, and Centralized WTP) • Ensure the technical specification and timeframe of the implementation of the project are respected
7 th January 2025	MoH/RBC	Workshop	<ul style="list-style-type: none"> • The needs for capacity building in Health sector • Gaps in workforce in health sector • Challenged in medical equipment and the planned for integration in Phase II of the project.

7.2. Public Consultation Process

Public consultations were a key part of the ESIA process. These consultations were designed to allow stakeholders to express their views on the project's environmental and social impacts, both positive and negative. Examples of Consultation Methods:

- **Community Meetings:** Open discussions were held with local residents to inform them of the project, its objectives, and its potential impacts. Local leaders helped facilitate these meetings to ensure broad participation.
- **Workshops with Key Stakeholders:** Sessions were organized with technical experts, project managers, and local authorities to discuss the technical aspects of the project and its alignment with national development goals.
- **Surveys and Interviews:** These were conducted to gather more in-depth perspectives from specific groups, such as business owners or vulnerable populations (e.g., those at risk of displacement).





FIGURE 3 PICTURES CAPTURED DURING STAKEHOLDERS ENGAGEMENT

Chapter 8: Environmental and social management plan (ESMP)

8.1. Environmental and Social Management Plan (ESMP)

The ESMP which contains the ESMP consists of mitigation, management, monitoring and institutional measures to be taken during implementation and operation of the project in order to eliminate or offset adverse impacts or reduce them to acceptable levels.

This ESMP is also developed to help every stakeholder in the project finds his/her role and responsibility in preservation of the environment. The ESMP comes to complete the information given for the environmental impacts and the mitigation measures proposed in the previous chapters. It proposes the institutional responsibilities for the

mitigation measures implementation, the implementation indicators, the time frame for monitoring and follow-up and also the estimated cost to implement it.

Table 8.0:Environmental AND SOCIAL Management Plan (ESMP)

Code	Impacts or Risks	Mitigation measures	Deadline for completion	Implementation responsibilities	Cost (RWF)	Key performance indicators	Monitoring oversight
1	Accidents and injuries to workers	<p>☐ The workers will be fitted with appropriate Personnel Protecting Equipment (PPE);</p> <p>☐ Proposed safety equipment: Ear muffs, Gloves, Helmets, Dust masks, Safety boots, Eye goggles</p> <p>☐ Protect project workers with emphasis on vulnerable workers prevent the use of all forms of forced labor and child labor;</p>	Before commencement of construction works and during Construction phase	Contractor and Supervision company	500,000	<ul style="list-style-type: none"> - Percentage of workers wearing appropriate PPE (e.g., earmuffs, helmets, gloves, dust masks, safety boots, eye goggles). - Number of accidents and injuries reported. - Response time to address accidents and injuries. 	Self Monitoring; Contractor, MINEDUC, UR, RHA, CoK
2	Air pollution by dust and gases during	☐ Monitoring of the dust levels and	During construction	Contractor, MINEDUC CEBE	1,000,000	- Dust concentration levels in	Self-Monitoring; Contractor,

<p>construction and Operation Phase</p>	<p>loading activities and spray water when necessary throughout working hours;</p> <ul style="list-style-type: none"> ☐ Aggregate plant and equipment are fitted with catalytic converters to reduce air pollution; ☐ Provide dust masks for the personnel in dust generation areas. ☐ In case of Stockpiles should be sprayed with water or cover during dry seasons. ☐ Engage self-control to workers; ☐ Machinery idling time shall be minimized. ☐ Equipment shall be properly tuned and 	<p>and operation phases</p>			<p>construction areas (measured in $\mu\text{g}/\text{m}^3$).</p> <ul style="list-style-type: none"> - Number of dust masks distributed to workers. - Frequency of water spraying on dust-generating areas. 	<p>MINEDUC, UR, RHA, REMA, CoK</p>
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		<p>maintained;</p> <ul style="list-style-type: none"> ☐ Cover all trucks hauling soil, sand and other loose materials; ☐ Provide dust screen where necessary; 					
3	Risk of soil erosion and increased sediment particles	<ul style="list-style-type: none"> ☐ Proper drainage, regular maintenance and planting of grasses and ornamental trees for slope stabilization around building. ☐ The Contractor should ensure that running water coming from the roof and drainage channel is not directed in the fields of the populations; 	During Construction and operation phases	Contractor CEBE	To include in BOQ	<ul style="list-style-type: none"> - Percentage of proper drainage systems installed and maintained. - Frequency of maintenance of site re-vegetation after construction activities 	Self-Monitoring; Contractor, MINEDUC, UR RHA

		<p>☒ Surrounding areas must be re-vegetated and well maintained</p>					
4	Noise and vibration impact during construction as well as during operation	<p>✓ Works especially those that produce noise and excessive vibrations e.g. welding works, concrete mixing and concrete vibrating should be executed during the day hours;</p> <p>✓ Contractor should ensure regular maintenance of machinery to keep noise to minimum;</p> <p>✓ The Contractor to ensure workers working in the vicinity of excessive noise are provided</p>	Construction and operation phases	Construction Company CEBE	800,000	Number of workers provided with ear protection (ear plugs)	Self-Monitoring; Contractor, CEBE, MINEDUC, REMA, RHA

		<p>with protective wear such as helmets and ear plugs and the generators are sound proofed</p> <ul style="list-style-type: none"> ✓ The Contractor shall ensure that generators are soundproofed ✓ Install portable barriers to shield compressors and other small stationary equipment where necessary; ✓ Put up signs to indicating the construction site activities; 					
5	Safety issues during construction and building	<ul style="list-style-type: none"> ✓ Appoint qualified staff in charge of health & safety and 	During construction and operation	Construction Company, CEBE,	3,000,000	-Percentage of workers with up-to-	Self-Monitoring; Contractor, MINEDUC,

<p>Operation. Including Accidents and injuries to workers, occupants or third party.</p>	<p>implementation of ESMP;</p> <ul style="list-style-type: none"> ✓ The workers/occupants will be fitted with appropriate personnel Protecting Equipment (PPE) such as Ear muffs, Gloves, Helmets, Dust masks, Safety boots, Eye goggles; ✓ Engage workers/students to be self-control. ✓ Enclosed iron fencing to the critical construction site etc. ✓ Develop and implement an Occupational Health and Safety Plan; ✓ Develop and implement an 	<p>phases</p>	<p>MINEDUC</p>		<p>date Occupational Health and Safety training. - Number of safety audits conducted during the construction phase</p>	<p>UR, RHA</p>
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		<p>Emergency preparedness and response plan;</p> <ul style="list-style-type: none"> ✓ Ensure that this building construction project is inclusive and user friendly; ✓ Accessible to people with disability; ✓ Provide suitable safety gear (PPE) for all personnel during construction and to occupants during operation phase; 					
6	Impact on fauna and flora	<ul style="list-style-type: none"> ✓ During construction & operation, the developer will take care of vegetation and will be restored and well maintained after construction around the building 	Construction and operation phases	Contractor CEBE	500,000	- Percentage of vegetation restored around the building site.	Self-Monitoring; Contractor, CEBE MINEDUC, UR, RHA, REMA .

		<p>to avoid erosion.</p> <ul style="list-style-type: none"> ✓ Spare vegetation such sods that don't stand in the way of the project; ✓ Landscape the site by planting grass and trees at all disturbed areas around project site. ✓ Ensure that all site clearing is done properly by conserving the natural shape and minimizing degradation of natural species (Fauna & Flora); 					
7	Site cleanness, hygiene and sanitation facilities; effects of generated	☒ The client should provide proper sanitation for the staff and students,	During Construction and operation phases	Contractor CEBE	300,000	- Availability and cleanliness of sanitation	Self-Monitoring; Contractor, MINEDUC, CEBE, UR, RHA, CoK,

	sewage.	<p>and make sure that the hygiene & sanitation rules and regulations are well followed to avoid waterborne diseases due to poor hygiene;</p> <p>☐ Preferably existing toilets should be used.</p> <p>☐ Promote 3R (reduce, reuse and recycle) waste management Principles;</p>				<p>facilities for workers</p> <ul style="list-style-type: none"> - Percentage of staff trained in hygiene and sanitation protocols 	REMA
8	Effects of generated solid wastes and used equipment	<p>☐ Contractor will sign a contract with a local company in charge of solid waste collection to ensure that waste containers and other waste generated during construction and</p>	During construction Phase and operational phases	Construction Company CEBE	<ul style="list-style-type: none"> - Covered in project BOQ 	<ul style="list-style-type: none"> - Percentage of construction/operation waste reused or recycled - Frequency of waste disposal to designated sites 	Self-Monitoring; Contractor, MINEDUC, CEBE, UR, RHA REMA, CoK

		<p>operation phases are collected and disposed of at designated sites in line with REMA guidelines for waste management.</p> <p>☐ The company will ensure construction and operation wastes are not left in stock piles along the site but reused where necessary</p> <p>☐ Disposal the waste should follow the standard and district regulation.</p> <p>☐ Ensure proper solid waste (including hazardous wastes) disposal and collection facilities;</p>					
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		<ul style="list-style-type: none"> ☐ Promote 3R (reduce, reuse and recycle) waste management Principles; ☐ Garbage shall be disposed of periodically; 					
9	Risk of increase of Mpox, and HIV/AIDS and other Sexually Transmitted Diseases and other communicable diseases	<ul style="list-style-type: none"> ☐ The contractor in collaboration with the Ministry of Health will organize awareness campaigns on STDs and HIV/AIDS and Covid-19 ☐ To workers where significant social interaction between them and local communities is envisaged. ☐ Contractor in collaboration with District Health 	During construction phase	Contractor and MINISANTE	500,000	Number of awareness campaigns held regarding STDs, HIV/AIDS, and COVID-19.	Self-Monitoring; Contractor, MINEDUC, UR MoH, CoK

		Centers should ensure provision of condoms to project workers at all times, masks, sanitizers, and more water to wash hands, and soaps.					
TOTAL COST					8,900,000 RWF		

8.2. ESMP during decommissioning

Decommissioning is an important phase in the project cycle and comes last to wind up the operational activities of a particular project. It refers to the final disposal of the project and associated materials at the expiry of the project lifespan. If such a stage is reached, the proponent needs to remove all materials resulting from the demolition/ decommissioning from the site. The following should be undertaken to restore the environment:

- Remove all underground facilities from the site;
- The site should be well landscaped by flattening the mounds of soil and planting indigenous trees and flowers;
- All the equipment should be removed from the site;
- Fence and signpost unsafe areas until natural stabilization occurs;
- Backfill surface openings if practical

TABLE 9: ESMP FOR DECOMMISSIONING

S/N	Expected Risks and Impacts	Recommended Measures	Responsible Party	Time Frame
Construction Machinery/Structure & Wastes				
1	Scraps material and other debris	<ul style="list-style-type: none"> • Use of an integrated solid waste management system i.e. through a hierarchy of options; • Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures; • The contractor will work with waste management 	Project Contractor	During decommissioning

S/N	Expected Risks and Impacts	Recommended Measures	Responsible Party	Time Frame
		<p>companies for disposal locations and the local council based on the properties of the particular waste generated;</p> <ul style="list-style-type: none"> • All buildings, machinery, equipment, structures and partitions that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers; structures and other waste materials is not possible the materials should be taken to approved dumpsites. 		
2	Vegetation disturbance Land deformation: soil erosion,	<ul style="list-style-type: none"> • Implement an appropriate revegetation programme to restore the site to its original status; • During the vegetation period, appropriate surface water runoff 	Project Manager & Contractor	During decommissioning
3	Water drainage/risk of erosion	<ul style="list-style-type: none"> • Controls will be taken to prevent surface erosion; • Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences; • Fencing and signs restricting access will be posted to minimize disturbance to 		

S/N	Expected Risks and Impacts	Recommended Measures	Responsible Party	Time Frame
		newly-vegetated areas;		
4	Impacts on landscape aesthetics	<ul style="list-style-type: none"> Contractor shall use appropriate equipment in handling materials during site decommissioning Quarries, borrow pits and other site will be rehabilitated and revegetated 	Contractor	During decommissioning

CHAPTER 9: CONCLUSION AND RECOMMENDATION

9.1. Conclusion

In conclusion, the proposed project will have several positive economic impacts during its different phases that include: the creation of employment; stimulating development through education, research and Capacity building in Biomedical Engineering, providing qualified workers, and creating business opportunities for various companies and individuals. These will contribute to the achievement of country vision contribute to making CEBE regional and Excellent.

However, the project will present environmental and OSH risks similar to most building and infrastructure projects, which include: generation of wastes (construction and demolition wastes); emission of air pollutants, amongst others. These risks can be adequately managed and monitored through the proposed mitigation measures and ESMP that includes frameworks for developing waste management plans and OSH plans.

The Environmental and Social Impact assessment has been carried out for this project to find out and assess environmental and social impacts. Measures to mitigate the negative impacts and to strengthen the positive ones, and have been

proposed as well as institutional arrangements and collaboration to implement proposed mitigation measures.

This ESMP recommends feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels. A monitoring system on key environmental and social issues for this project has been proposed and this will be achieved and recorded through quarterly reporting system.

9.2. Recommendations

The following recommendations have been proposed to ensure that proposed mitigation measures are implemented.

a. During the Construction phase, the Contractor will ensure that:

- ✓ Monitoring of the dust levels and loading activities and spray water when necessary throughout working hours;
- ✓ Aggregate plant and equipment are fitted with catalytic converters to reduce air pollution;
- ✓ Provide dust masks for the personnel in dust generation areas.
- ✓ In case of Stockpiles should be sprayed with water or cover during dry seasons.
- ✓ Engage self-control to workers;
- ✓ Machinery idling time shall be minimized.
- ✓ Equipment shall be properly tuned and main
- ✓ trained;
- ✓ Cover all trucks hauling soil, sand and other loose materials;
- ✓ Provide dust screen where necessary;

In addition, the Contractor is recommended to do the followings:

Implement safety measures:

- ✓ The workers should be fitted with appropriate Personnel Protecting Equipment (PPE);

- ✓ Protect project workers, with emphasis on vulnerable workers prevent the use of all forms of forced labor and child labor;
- ✓ Works especially those that produce noise and excessive vibrations should be executed during the day hours;
- ✓ Regular maintenance of machinery to keep noise to minimum level;
- ✓ Workers working in the vicinity of excessive noise are provided with protective wear such as helmets and ear plugs and generators are sound proofed;
- ✓ Sign a contract with a local company in charge of waste collection to ensure that waste containers and other waste generated during Construction are collected and disposed of at designated sites in line with REMA waste management guidelines;
- ✓ Ensure that Construction waste are not left in stock around construction site but used in rehabilitation of borrow areas and landscaping around site;
- ✓ Organize awareness campaigns on Mpox, STDs and HIV/AIDS to local communities and workers in collaboration with the Ministry of Health;
- ✓ In collaboration with the District Health Centers ensure provision of condoms, masks, sanitizers, water, and soaps to wash hands for project workers at all times;
- ✓ Promote 3R (reduce, reuse and recycle) waste management Principles.

b. During Operational Phase

- ✓ Promote 3R (reduce, reuse and recycle) waste management Principles;
- ✓ CEBE and other concerned institutions shall ensure periodic maintenance and cleanliness of its facilities.
- ✓ The hygiene & sanitation rules and regulations should be followed to avoid waterborne diseases due to poor hygiene at the CEBE campus;
- ✓ Develop and implement an Occupational Health and Safety Plan;
- ✓ Develop and implement an Emergency preparedness and response plan;

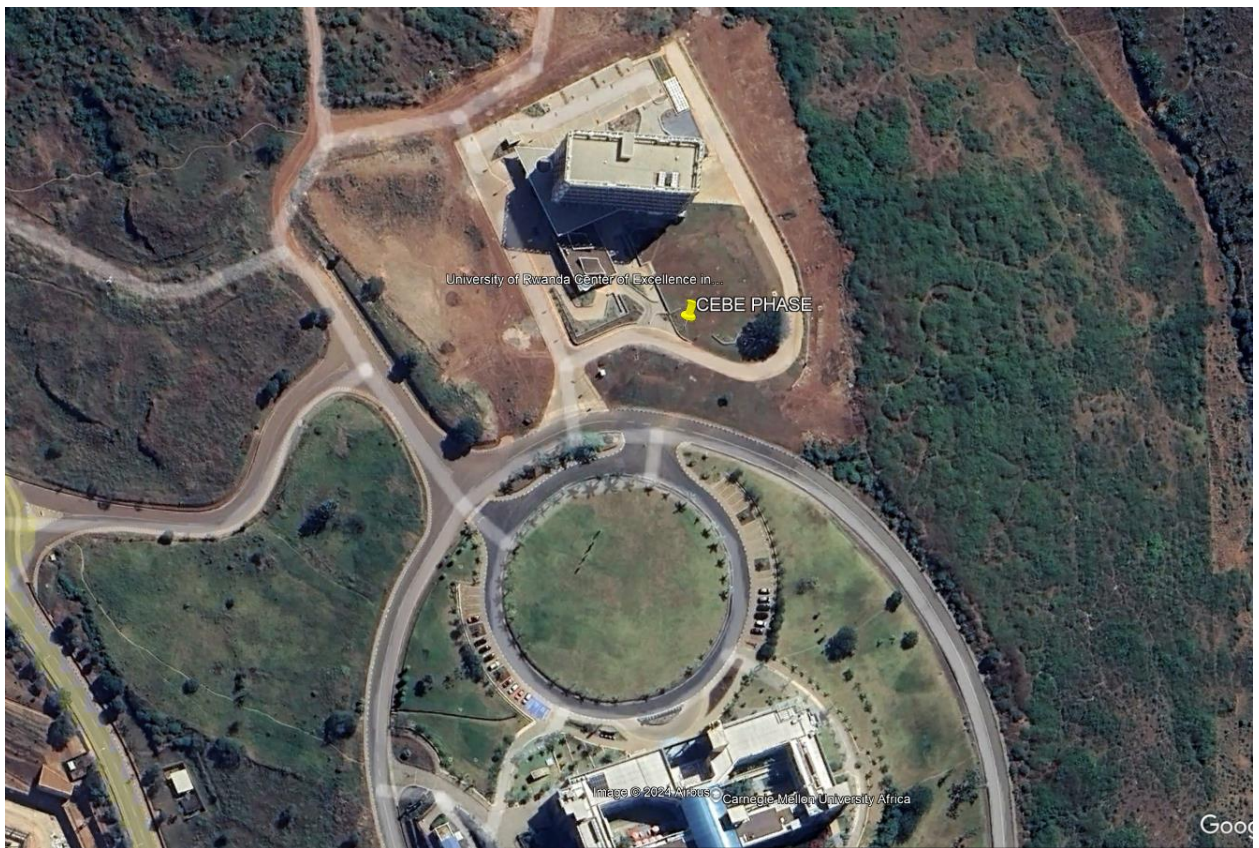
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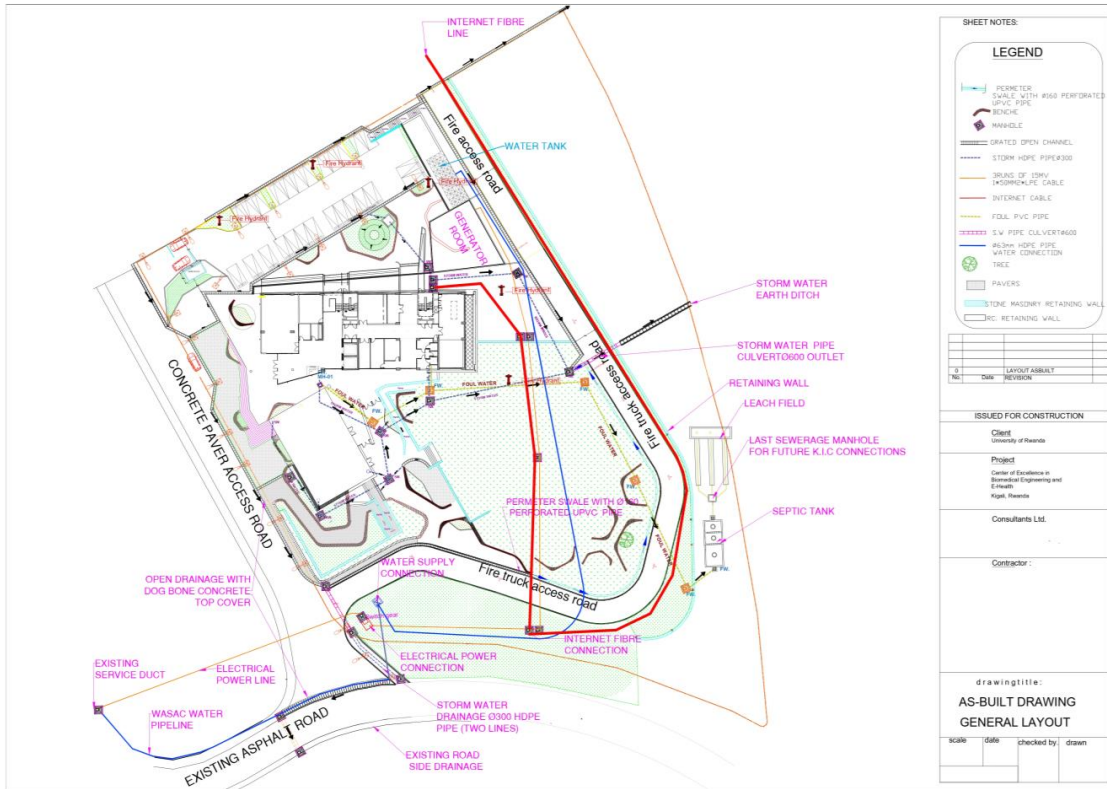
Annexes

1. Existing Ground Conditions

- The site is generally gently sloping.
- The highest point on the site is located at x,y:(517544.58;4786255.41)with an elevation of 1516.00 meters.
- The lowest point is located at x,y:(517600.47;4786152.43), with an elevation of 1507.50 meters.
- The average slope of the terrain is approximately 20%.



2. AS-BUILT Maps



SHEET NOTES:

LEGEND

- PERIMETER SWALE WITH #66 PERFORATED UPVC PIPE
- MANHOLE
- GRATED OPEN CHANNEL
- STORM HDPE PIPE 300
- SPRING OF HDPE DRAINAGE PIPE
- INTERNET CABLE
- FIDU PVC PIPE
- E.V PIPE CULVERT 600
- ALPHA HDPE PIPE WATER CONNECTION
- TREE
- PAVEMENT
- STONE MASONRY RETAINING WALL
- RC RETAINING WALL

No.	Date	LAYOUT/ASBUILT	REVISION

ISSUED FOR CONSTRUCTION

Client
University of Rwanda

Project
Centre of Excellence in
Biomedical Engineering and
E-Health
Kigali, Rwanda

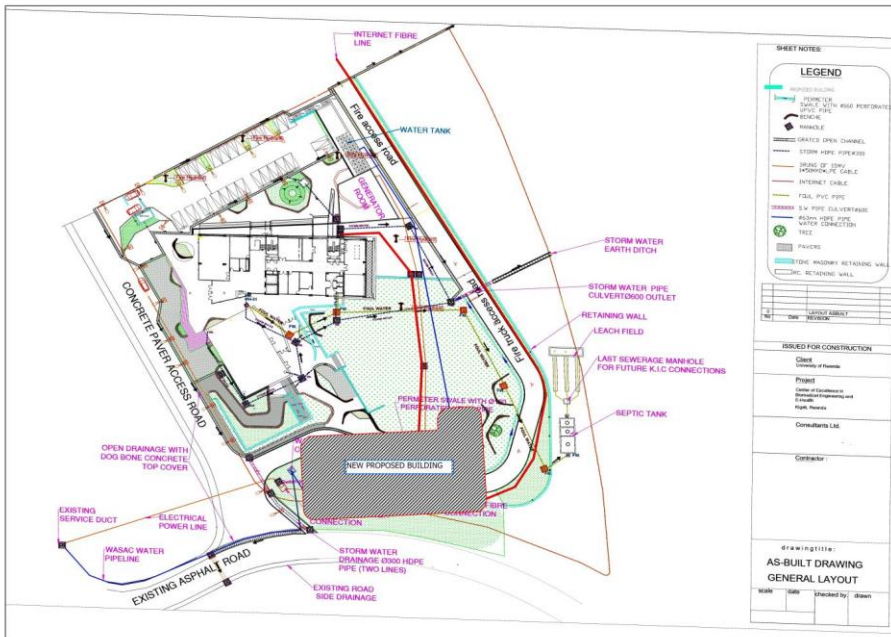
Consultants Ltd.

Contractor:

drawing title:
**AS-BUILT DRAWING
GENERAL LAYOUT**

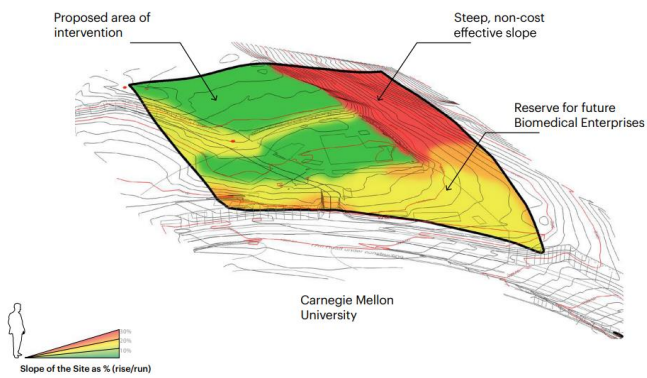
Scale	Date	Checked by	Drawn

3. New Proposed Building Plan



4. EXISTING DRAINAGE SYSTEM

CEBE | Design Narrative | Slope Analysis



5. PERSPECTIVE OF THE PROPOSED BUILDING PROJECT





6. Estimated project emissions and measures to reduce gas emissions



Emissions_Biomedical Equipment