JARAMOGI OGINGA ODINGA

UNIVERSITY OF SCIENCE AND TECHNOLOGY

VRIJE UNIVERSITEIT BRUSSEL

Annex 1:

Extended Concept Note developed by Jaramogi Oginga Odinga University of Science and Technology (Kenya) in collaboration with Vrije Universiteit Brussel (Belgium)

Title:

Strengthening Jaramogi Oginga Odinga University of Science and Technology Capacity in Natural Resource Management, Food Security and Health

Submitted to VLIR-UOS

GENERAL INFORMATION

Programme information	
Country and region of the programme	
Kenya	
Programme title (linked to strategic/thematic focus area)	
Strengthening Jaramogi Oginga Odinga University of Science and Technology Capacity in Natural Resource Management, Food Security and Health	
Programme Summary (Focus of proposed strategic area(s) and institutional strengthening activity)	
Jaramogi Oginga Odinga University of Science and Technology (JOOUST) is one of the fastest growing public universities in Kenya having been granted a Charter in 2013. Situated at the shores of Africa's largest fresh water lake, the University is at the heart of efforts to address unprecedented challenges facing the Lake Victoria Basin (LVB), including the growing impact of climate change, degradation of biodiversity, food security, shifting food systems, and rising poverty levels. These challenges require a mix of expertise and multi-skilling not readily available in the University's current training and research methods. It is against this background that JOOUST is seeking to partner with Flemish Higher Education Institutions to strengthen capacity building, research and outreach in five strategic areas, namely: natural resource management, agriculture and food security, human health, ICT and climate change mitigation and adaptation. The proposed programme objectives are to: 1) build capacity for high quality research and training in natural resources management, food security, health, ICT and climate change; 2) promote sustainable use of LVB resources; 3) improve the health and well-being of LVB populations; 4) create synergies in transformative knowledge, technologies and innovations in collaboration with stakeholders; and 5) build the capacity of government agencies in service delivery and sector-wide regulations. The JOOUST VLIR-IUC Programme objectives will be implemented through the following five (5) projects: 1) Management of the Lake Victoria Basin Natural Resources; 2) Transformative Agri-food Systems for Resilience in the Lake Victoria Basin; 3) Management and Control of Communicable and Non-communicable Diseases; 4) ICT; and 5) Climate change Resilience among Communities and Ecosystems in the Lake Victoria Basin. Through Project 1, the Programme will develop and implement a community-driven natural resource conservation strategy. This strategy will be informed by the use of cutting-edge environmental and climate monitoring technology for multi-disciplinary natural resources management research and anchored in policy for sustainability. Project 2 will promote resilient, sustainable, agile and efficient food value chains with special focus on cereals and micro animals food systems. Smallholder-farming households which represent the majority of residents within the Basin will be the biggest beneficiaries in respect to household food and nutrition security and income generation. The programme will strengthen local health systems through a combination of health research and training in the management of communicable and non communicable diseases under Project 3 while Project 4 will strengthen the University's ICT infrastructure and capacity to support technology and data driven research and training. Procedures and protocols will be developed to strengthen climate change resilience and adaptive capacity of communities and ecosystems in the Basin under Project 5. This will require an extensive network of stakeholders to be created through knowledge-based interventions, community participation and collaborations. In partnership with stakeholders, Project 5 will develop standard operating procedures (SOPs) and knowledge-based tools for the assessment of community vulnerability, early warning systems and options for mitigating the impact of climate change.	
Applying partner university (institution and proposed local coordinator)	
Full name of the institution (+ abbreviation)	**Jaramogi Oginga Odinga University of Science and Technology (JOOUST)**
Name of the local IUC coordinator	**Prof. Benson B.A. Estambale**
Name of the authority of the local university (Rector, Vice-Chancellor, President,...)	**Prof. Stephen Gaya Agong'**
Applying Flemish university (institution and proposed Flemish coordinator	
Full name of the institution (+ abbreviation)	**Vrije Universiteit Brussel (VUB)**

Name of Flemish IUC coordinator	**Prof. Ann van Griensven**
Signature of the authority of the local university (Rector, Vice-Chancellor, President,...)	
Signature of the coordinators (Flemish and local IUC coordinator)	
Flemish University Coordinator Prof. Ann van Griensven	
Local University Coordinator Prof. Benson Estambale	

PROGRAMME DESCRIPTION

1. Background & context

How was this extended concept note developed? How did you take into account the comments of the selection commission (selection stage 1 – concept Note South)?
The extended concept note was jointly developed through a participatory process involving University staff and students, researchers, selected external stake holders and the Belgian counterparts. Owing to the ongoing COVID-19 pandemic and national lockdowns in both Belgium and Kenya, consultations and feedback including assignments of tasks, document sharing and editing were done remotely using telephone, email, skype and web-based conferencing. All sections of the extended concept note were developed and updated in accordance with the document entitled *"Formulation Guidelines for the Development of an Extended IUC Concept Note (IUC 2022)"*. The Selection Commission's comments were considered and addressed as follows: Gender issues which the Commission had referred to as general or implicitly applied in the project, have directly been embedded into each project and mainly through capacity building under training. Since capacity building cuts across all the five projects, the Programme's gender mainstreaming strategy will adopt the University's gender-based policy and the country's constitutional requirements of 1:3 gender ratio during the awarding of training opportunities. This policy will ensure equal opportunities for women through allocation and reservation of available positions at all levels. The programme will also conduct gender analysis at institutional, community and government levels across all projects to ensure all programme activities are gender sensitive and have gender-related measurable outcomes. The project objectives were revised to reduce the "over optimistic bias" initially implied. The revision improved the inter-relationship between the five projects as well as integrating the development-oriented objectives of the Lake Victoria Basin and the institution-strengthening objectives. Lack of pre-existing collaborative ventures with Flemish universities was addressed by partnering with Flemish counterparts through the five research projects. In addition, the Flemish team was constituted to bring on board a wealth of experience having participated in several completed and ongoing VLIR-UOS funded projects in other parts of the world. On dissemination of results and extension of benefits to communities, it is important to note that in this extended concept the community is identified as a high impact stakeholder for whom a tailored engagement strategy has been developed and mitigative approaches recommended for community-related risks. Further, the community is expressly catered for within the updated programme's strategy to ensure uptake of new knowledge and its applications. Finally, the Institutional Assessment conducted from 5-13th March 2020 was an insightful experience. It enabled the team to incorporate some of the findings into updates whose additions were made to the background and Programme context.

Provide a local context analysis, highlighting key development problems, their context, importance and underlying causes. Take into account the transversal themes gender and environment in this analysis. Update the local context analysis. If no important changes took place, you may leave this section unchanged.

JOOUST is strategically located at the shores of Lake Victoria, which together with its watershed is a trans-boundary natural asset of global importance. As the world's second largest fresh water lake, with a surface area of about 68,800 km^2, Lake Victoria presents the East Africa region with enormous aquatic resources and opportunities. The Lake lies in a basin, the Lake Victoria Basin (LVB), which occupies an area of 194,000 km^2, jointly shared by Tanzania (44%), Kenya (22%), Uganda (16%), Rwanda (11%) and Burundi (7%) **(Figure 1).**[1] The Basin's rich aquatic and terrestrial biodiversity supports and sustains much of the economy and livelihoods of its 55 million people, about 30% of the entire population of East Africa, settled at a density much higher than the Africa's average. The Basin has a great potential based on its human resource, rich biodiversity, rich agricultural soils, abundant water resources, minerals, fisheries, wetlands, diverse forest resources, wildlife and tourism. The Lake and its tributaries are the main sources of domestic, industrial and irrigation water and support a fishing industry for export and local consumption. The Lake is also a waterway transportation corridor and hydropower generation source

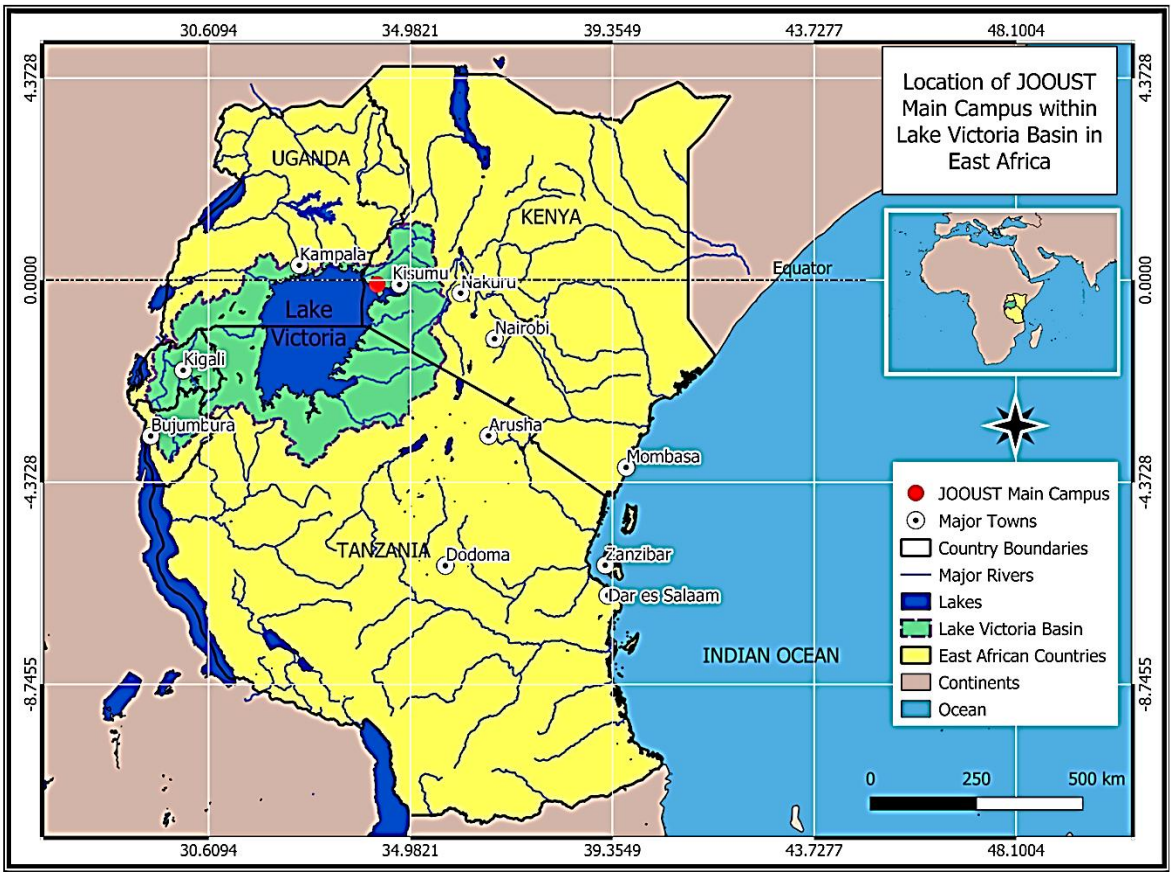

Figure 1: The Lake Victoria Basin in East Africa (in green) with the Location of JOOUST (dotted red)

Over 60% of the population in the LVB is poor, living below the poverty line and earning less than US$ 1.90 a day. Majority of the Basin's population depends directly on their immediate natural resources for their livelihoods and hence there is immense pressure on these resources, a situation that has continued to undermine the sustainability of the natural resource base. Eighty percent (80%) of the population relies on agricultural and livestock activities for their livelihoods and out of this, 60% depend on rain fed agriculture. More than half a million fishermen and their families depend on daily fish catches for their basic living. The dense population, low capital investment, low levels of development and low numbers of trained manpower drive unsustainable use of natural resources and negatively impact on the Basin.[1]

LVB hosts many endemic aquatic and terrestrial species, but has experienced an alarming rate and magnitude of environmental degradation and losses in biodiversity in the last four decades. There is increased water pollution due to unsustainable human activities, dense population and rural subsistence livelihoods. Eutrophication of the water bodies, habitat degradation in the catchment, introduction of exotic species and overfishing have led

to the loss of 80% of the endemic fish species, negatively affecting the basin's economy and livelihoods. High nutrient load in the water is supporting the invasion of aquatic weeds such as water hyacinth which is in turn, inhibiting navigation. Over 70% of the forest and woodland cover in the catchment have been lost due to human settlements, urbanization, commercialization of timber and fish processing industries, expansion of agricultural land, unsustainable agricultural practices, increased energy demand, introduction of terrestrial invasive species and lack of appropriate technologies for forests and woodland conservation.[2] Destruction of forest and woodland resources and the increase in general vegetation loss is associated with loss in catchment endowment values such as soil erosion and sedimentation; enhanced climate variability; reduced surface water quantity; reduced groundwater quality and recharge; and loss of biodiversity. Consequently, the life-support systems of riparian communities are increasingly threatened due to ecological degradation, ignorance, poor policies and low technological investments.

Food insecurity and malnutrition are a major challenge in the LVB, with more than 50% of the population being food insecure.[3] The insecurity is largely due to extremely low levels of agricultural productivity caused by fluctuations in rainfall, low levels skills in agricultural value chain and slow uptake of technology. These challenges particularly affect women who constitute the majority of agricultural labor force in addition to barriers such as access to land, markets and finance.[4] Besides low agricultural productivity, essential nutrients are lacking in the daily diets of most households, leading to chronic undernourishment detrimental to the mental and physical development of children.[5] To combat food insecurity, production must increase more than 300 fold.[6] This requires innovative thinking and strategic planning to exploit the hitherto non-conventional and underutilized sources of water and food, community-based seed multiplication and dissemination of more adapted seed systems technology, enhancing production, value addition and marketing among the small holder farmers.

Climate is a critical factor in the Lake Victoria Basin's economy. It affects all sectors of development including food security, biodiversity, water, health, energy and transport/communication. Studies show a general increase in temperature in the region from the 1960s.[7] The Basin has experienced increased intensities and frequencies of severe, climate change-related weather events, causing significant interruptions of economic activities, destruction and losses.[8] The change in climate will be expected to increase the rate of environmental degradation, spread of disease vectors, increase the frequency and severity of floods and droughts and increase food insecurity.

The Lake's location at an elevation of >1000 meters above sea level, the presence of diverse topographical features in the basin and the intense equatorial insolation provide a unique setting for strong mesoscale circulations over the lake and its surrounding regions.[9] The interactions between the mesoscale circulations generated by orography and the lake itself, and the continental weather systems result in uniquely unpredictable climate and weather patterns over the LVB.[9-11] Global Climate Models (GCMs) project a change in climate associated with decrease in rainfall in the LVB.[12-14] Extreme weather events are on the increase and have become more intense[15,16] as evidenced by the prevalent extreme rainfall, frequent flooding and extended dry periods, which are causing loss of lives, livelihoods and economies. Extreme weather is also a major challenge to transport and communication (> 5,000 fatal marine accidents annually[17]). Majority of the population in the basin are therefore vulnerable to climate change and may require integrated strategies in order to build resilience. The lake water by itself is a human health hazard since untreated municipal and industrial waste which is discharged into it increases the spread of communicable diseases and exposes populations to harmful and/or potentially toxic agents for non-communicable diseases. The main water-borne diseases in the Basin, which are influenced by scarcity of clean water, include cholera, typhoid, dysentery and certain intestinal parasites. Weather events, particularly *El Niño*-related flooding, have also been associated with sporadic higher incidences of water-borne diseases. Malaria remains the most important and widespread vector-borne disease in the Basin. High concentrations of mercury in the lake and river waters resulting from gold mining activities in the Basin lead to an increased risk of central nervous system diseases. Disease prevalence and the vulnerability of the inhabitants in the Basin hinge on ignorance, lack of trained manpower, poverty status and livelihood activities.

Due to its location within the LVB, Jaramogi Oginga Odinga University of Science and Technology must play a significant role in finding solutions to the identified challenges facing the Basin. Through its partnerships with the Flemish Interuniversity Council, the University proposes to engage the local, regional and international partners in addressing some of the identified key challenges.

Provide an institutional context analysis, highlighting strengths and capacity constraints / needs of the institution. Take into account the transversal themes gender and environment in this analysis. Describe the position of your university in the national higher education landscape. Update the institutional context analysis. If no important changes took place, you may leave this section unchanged.

JOOUST has a total of 525 employees comprising of 216 academic staff, including professors, lecturers, and research fellows and 309 administrative staff. The University has well-trained human capacity to mount and administer its existing training and research programs. The academic staff are actively involved in research and will provide adequate expertise required to manage the Programme. Presently, the University is compliant with the one third gender rule in Kenya's Constitution in that women make up one third of academic and senior administrative staff and half of low and mid-level administrative staff. However, the consistently low levels of

female participation in leadership, management and academics remains a major source for concern but one that leaves the University open to new strategies to encourage and support women in the work place. The University currently hosts 9,291 students out of which 1,433 (1,022 Masters and 411 are Ph.D.) are graduate students distributed across its eight Schools. Unfortunately, only slightly over one third of the total student population is female with males typically dominating the science and technical courses. To address this JOOUST consistently sensitizes and encourages girls at high school level to take up Science, Technology, Engineering and Mathematics (STEM) subjects. This is through annual outreaches and open days for high schools across the Lake Victoria region of Kenya.

There is an established infrastructure to take care of large numbers of graduate students as well as a model from which the Programme will benefit. In addition, the University is a regional Center of Excellence in food security, hosting one of the three Phase 2 World Bank-funded Africa Center of Excellence (ACE II) for sustainable use of insects for food and feeds (INSEFOODS) project. The two other Centres, also in Kenya, are ACE II Centre of Excellence in Sustainable Agriculture and Agribusiness Management (CESAAM) in Egerton University and ACE II Phytochemicals, Textile and Renewable Energy (ACE II - PTRE) based at Moi University. While the University has developed elaborate local and regional networks, infrastructure and training programs in food security, there is still need to build on this platform and develop new innovative programs that can address evolving challenges and have them accredited.

The university has enough space for setting up modern teaching and research laboratories, a GIS center, ICT center and an engineering workshop to support teaching and research. As part of an ongoing expansion of facilities, the University is currently establishing additional modern laboratories and a library complex to accommodate the expanding student enrollment and changing research needs. These labs will however require equipment for research and training, most of which are expensive and not affordable in the short-term. The University has a Library that subscribes to over 20,000 International e-journals and e-books in addition to the bound material on the shelves. The library supports a repository platform that will support publications of research findings from the Programme for wider dissemination and impact.

The University has 41.6 hectares of farmland for teaching, demonstration and research. There is 7.6 hectares located at Kapiyo, right at the shores of Lake Victoria, earmarked for the establishment of an ecological Botanic Garden and an Ecosystem Flux Monitoring Tower. These new ventures require significant financial and technical support to be realized. Strategically, the University is currently constructing a modern research facility on its 14.8 hectare Miyandhe Campus, also located on the shores of Lake Victoria, which shall mainly focus on lacustrine ecosystems research. Of note is that VUB offers a course in this area and more than half the staff at the Kenya Marine and Fisheries Research Institute (KEMFRI), a major stakeholder for the JOOUST Programme, have undertaken this course. At Muhoroni and Achiego, the university has 2.4 hectares and 16.8 hectares respectively which are earmarked for agriculture, practical training and technology transfer for food and nutrition security.

To spearhead its research, technology and innovation agenda, the University has established a Directorate of Research, Innovation and Partnerships (DRIP). The Directorate coordinates all the research, innovation technology and entrepreneurships as well as partnerships and linkages with the University. The proposed Programme will benefit from this established structure. Furthermore, the University has built strong linkages with industry for student and staff placement, internships, experiential learning and for co-curricular design and teaching. The institution does not only promote basic and applied research but also aims to actively contributes to national development through established programs with a strong focus on the practical application of knowledge and mutually benefiting community engagements.

JOOUST has a Quality Assurance Directorate in place to oversee quality of teaching, learning, research excellence and delivery of other services. The University is **ISO 9001:2015** certified and conducts regular audits. The University has developed procedures in all its areas of operations and objectives according to ISO 9001:2015 requirements. In addition, the university is in the process of attaining certification for the Information Security Management System ISO 27000:2013. Despite these efforts, the University still faces quality related challenges such as inefficient financial management and procurement systems though these have been earmarked for upgrade, weak audit systems (both academic and administrative) and weak curriculum review process resulting in disparity between the curriculum and market needs. There is need first and foremost for capacity building of University's management on leadership and management skills to promote quality service delivery. There is also a further need for enhanced capacity building among academic staff to adopt innovative pedagogical approaches and strengthen the nature of linkages with industry and communities by building stronger outreach capacity.

JOOUST has a Directorate of Gender Mainstreaming and Development headed by a female professor, which champions gender issues and spearheaded the development of a gender-based policy in awarding postgraduate fellowships. To promote female participation and retention in postgraduate degree programs in the faculty and in other trades requiring highly skilled human resources, JOOUST has developed gender and affirmative action; human resource that emphasizes staff gender ratio; code of conduct; and staff development policies. Even with a vibrant gender policy in place, the University still lacks funds to propel women to higher levels of academics through affirmative action on scholarships and research fellowships.

Another key gap area is inadequate staff to supervise PhD and Masters students. Lecturers tend to be overworked, affecting both quantity and quality of research output, which currently stands at 0.23 per staff. Until

recently, PhD programs were mainly by research. With a change in the national policy, the University is striving to implement "PhD by coursework and research". However, there are challenges arising from inadequate numbers of academic staff capable of teaching at PhD level to comply with the changes. Under the JOOUST IUC Programme, we will develop market-oriented PhD programmes in our identified strategic thematic areas in collaboration with Flemish Universities. This is intended to ensure that the implementation of new and existing PhD programmes is compliant with quality assurance standards. At undergraduate level, there is still high student to fulltime academic staff ratio in most schools which is currently mitigated through a high number of Masters level part-time lecturers.

The low levels of research dissemination and knowledge and technology transfer are caused by insufficient research-driven innovation and entrepreneurship, as well as limited administrative and technical capacity for research support. There are also limited linkages between academia, industry and government causing the University to lack an efficient and effective marketing and branding strategy for its innovations and products. The laboratories are few in number, sub-optimally equipped, with limited modern IT infrastructure and academic facilities to cater for the expanding student population further impacting on the overall quality of research and teaching.

2. Strategy of the institution

Briefly describe the overall institutional strategy. Highlight the institution's vision on its role as university and as a driver of change in society. Refer to other relevant internal policy documents. If no important changes took place, you may leave this section unchanged.

Jaramogi Oginga Odinga University of Science and Technology (JOOUST) was established in 2013 following Kenya's adoption of a devolved system of governance. It was envisioned that as many of the newly established 47 Counties (local governments) as possible would host within their jurisdiction a University capable of directly contributing towards addressing local and regional challenges and needs. In this regard, the University is expected to be an active driver of change in society.

Based on the above mandate, the University's **Vision** is to be a beacon of excellence in University education. The University is currently implementing its second, five-year Strategic Plan (2016/17-2020/21), which is aligned to its core **Mission** of providing quality education that nurtures creativity and innovation through integrated training, research and community outreach for sustainable development. This mission is anchored on the University's **Philosophy** of holistic scholarship of service to humanity through wisdom, science and technology, while keeping to its **Core values** of **C**ustomer focus, **I**mpartiality, **P**rofessionalism, **I**ntegrity and **M**eritocracy (corporate values). All University projects and programmes are anchored on five themes **to** which we would want to contribute to through the IUC programme: (i) Capacity Building, (ii) Quality Education and Training, (iii) Research and Consultancy, (iv) Community Outreach and (v) Resource Mobilisation.

JOOUST identifies its niche areas for research and training as: natural resources management, food and nutrition security; health systems strengthening; fresh water sciences; engineering; and renewable energy. As part of the University's strategy to become a beacon of excellence in its niche areas, JOOUST presently offers either fee waivers or subsidized tuition fees to its staff and top students annually to enable them undertake Masters and PhD programmes within the University. The supported students are then bonded to the University to serve for a particular period. The University also offers study leave to staff who are awarded international scholarships thereby guaranteeing their continued employment following completion of their studies. While the number of staff with PhDs remains less than optimal, this strategy has had a significantly positive impact on the calibre of the University's academic staff. For this reason, the proposed JOOUST VLIR-IUC Programme design entirely revolves around capacity building and community empowerment in these niche areas as defined by the purpose for which the University was established and articulated in its policies and strategic plan.

Elaborate on the capacity of the university to network with external actors: Governments, private sector, communities, civil society organisations, external funders, etc. If no important changes took place, you may leave this section unchanged.

JOOUST has developed relevant policies and structures to enable amicable establishment and promotion of partnerships with external actors. Key among them, the establishment of the Directorate of Research, Innovation and Partnerships (DRIP) within the Division of Research, Innovation and Outreach. DRIP coordinates research, innovation and technology transfer, partnerships as well as collaborative linkages and outreach activities of the University. The directorate coordinates the development of policy documents, facilitates joint activities and mediates in areas of conflicts (conflict resolution). It is also instrumental in knowledge transfer between the University and its partners and local communities. It promotes linkages, partnerships and collaborations with industry, research institutions and other institutions of higher learning for purposes of advancing mutual interests, shared goals, ideas and information. This is done through agreements/ Memoranda of Understanding and Memoranda

of Agreement (MOUs and MOAs). The University has invested considerable resources to develop its ICT infrastructure and policy. The ICT center operates a structured local area network (LAN) for rapid communication and well-established video conferencing facilities.

To date the University has successfully managed over 30 multidisciplinary research projects. The following three projects are noteworthy: i) African Centre of Excellence in Sustainable use of Insects as Food and Feed- INSEFOODS (USD 6M, World Bank, 2017-2022), ii) Early warning systems for improved human health and resilience to climate–sensitive vector borne diseases (USD 750,000, World Health Organization, 2013-2018), and iii) Insect Research in Action: The GREEN Insect (USD 250,000, DANIDA, 2014-2018). The University has also successfully transferred technologies to local communities to enhance their livelihoods. In 2018-2019, JOOUST and University of Hohenheim from Stuttgart-Germany rolled out a solar powered milk cooling system that can be operated independently, offering an off-grid solution for remote areas of western Kenya practicing dairy farming. Furthermore, plans are underway to train local farmers on sorghum seed production (including the JOOUST variety) in collaboration with the Kenya Breweries Limited (KBL) who will provide a ready market for the farmers' produce. Lastly, local governments have on occasion utilized the University's expertise through consultancies such as 'Resilience to Climate Change through Building Capacities in spatial data infrastructure (SDI) for Uptake by Selected County Governments in Lake Victoria Region in Kenya' funded by SERVIR Africa and the Regional Centre For Mapping of Resources for Development (RCMRD). The above demonstrate that JOOUST possesses in-house capacity to manage large funded projects.

3. Updated programme strategy

Long term desired change(s): Explain how the proposed IUC programme will contribute to the strategy of the institution. How does this fit with the objectives of institutional university cooperation? What are the ambition(s)/dream(s) of the proposed IUC programme? If there are no important changes compared to the earlier concept note South, you may indicate this and leave this section unchanged.

The long term desired goal of the University is to be a **centre of excellence in training, research and community outreach**, offering practical and desired training in identified strategic thematic areas. The University has focused its limited resources on capacity building to develop the required manpower to drive the desired change. The focus is on PhD students in key programmes to drive the University's long-term agenda. The University is enhancing its research capacity by investing in essential infrastructure, including key laboratories and modern lecture halls to support student training. To further enhance its training and research agenda, JOOUST is currently investing in strategic partnerships both locally and internationally. These strategic partnerships allow students to gain access to funding, training and research opportunities, including modern equipment not yet available at JOOUST. Alongside, the University has been working on fundamental policies and requisite institutional structuring, including establishment of relevant departments/directorates, program development, etc to oversee the implementation of its long term agenda. This internal re-organization and strengthening will allow the University to address major societal challenges in natural resource management, sustainable food systems, health systems strengthening, climate change and information technology.

The IUC programme is complementary to and will **accelerate the University's efforts to realize its long term agenda of institutional strengthening and organization to position itself as a centre of excellence**, and to be able to address challenges in the society. At the end of the program, the University anticipates to train about 30 PhD students in the strategic thematic areas, who will then drive the desired societal changes. The IUC Programme will provide an avenue for exchange of staff and students and for conducting relevant research and field trials in partnership with the Flemish institutions of higher learning. The Programme will also support the requisite, modern infrastructural development in JOOUST, including acquisition of modern scientific equipment, development of modern ICT infrastructure and technology transfer. These will strengthen JOOUST's future capacity for training and research. The IUC Programme will also provide the needed opportunity for long-lasting local and international partnerships, which is a critical ingredient for future growth. The University therefore views this programme as key in achieving its long term desired goal.

JOOUST has a role to bring positive change in the society. The University envisages a society where people are assured of a sustainable environment, secure resources, including food, good health, equity and resilience to perturbations. These objectives will be achieved through the highlighted capacity building in the strategic thematic areas, the established partnerships and the requisite infrastructural developments and institutional reorganization. For instance, being aware of declining land productivity, inadequate supply of seeds, fertilizers and technologies in conservation agriculture, the University proposes to develop research capabilities in high yielding crop varieties and conduct extensive field trials, develop better agricultural production technologies and address water scarcity challenges through novel and integrated water resource management. The food security project aims at doubling the nominal yield of crop farmers in Lake Victoria basin through practical and solution-based agricultural research, technology transfers and creation of an agriculture resource centre for farmers. To this end, the University will revamp its agriculture and food production research capabilities through the expansion

and equipping of its research laboratories in soil science, plant breeding, agronomy, horticulture and tissue culture. Complementary agricultural engineering research on the use of available solar energy and wind power will be incorporated to address water scarcity for common use and for agriculture to reduce the community's dependance on rainfed agricultural practices. Through these activities, the University proposes to empower local populations and provide training at postgraduate levels.

On the population health vulnerability, the Lake Victoria basin is an impoverished region which in addition to poor health indicators is not only medically underserved but health awareness on many conditions especially non-communicable diseases remains low among both healthcare workers and the local population. Through the Programme's health project, high quality disease surveillance systems and molecular laboratories will be established to quantify, monitor and articulate disease burden and quality of care. These infrastructural investments will provide opportunities for training and research, and generate research evidence for translation into policy and practice. In this way, the health project will achieve its long term objective of improving equitable access to basic and specialized healthcare services.

Whereas ICT infrastructure and complementary human resources are the backbone to communication, the University remains constrained as its infrastructure is still nascent and not able to cope with both internal and global connectivity demands and standards. **The long term objective is to therefore, develop integrated databases, assessment tools, monitoring tools, expert systems** for natural resource management, agriculture and food security management, mapping of climate change hotspots and provide a potential for mapping and surveillance of communicable and non-communicable diseases within the next 15 years. The expected change from ICT support will be a variety of portals for translating datasets from the thematic areas into decision-making systems, early warning system on climate change, spatial mapping and planning for Lake Victoria basin. To achieve this long term change, the University desires to upgrade both its ICT infrastructure and human resource to handle the large data sets as well as remotely sensed data.

Domains of change: What are the key challenges (cf. context/institutional analysis and strategy) the programme wants to tackle (can be both internal and external to the institution)? How to translate them into desired changes (i.e. "domains of change")? How does this contribute to the long term objective(s)? If there are no important changes compared to the earlier concept note South, you may indicate this and leave this section unchanged.

JOOUST is a fast growing public university in Kenya. In order to position itself as a leading academic institution and a driver of change nationally and beyond, the University requires greater investments to strengthen its capacity and surmount the challenges in the identified strategic thematic areas. To be able to translate key challenges into desired opportunities, the University has identified four domain areas through which to make the changes:

1. Human Resources

The University lacks adequate relevant human resource to meet the growing public demand for effective changes and impact desired on short or long term basis, especially at the level of PhD holders among early stage and mid-level academic staff. Through this IUC Programme, the Institution will provide early and mid-career training in the proposed strategic thematic areas in order to build capacity needed for the implementation of its objectives. The University has also set up guidelines to incentivize staff towards excelling in their preferred teaching or research career trajectories. These two strategies combined will internally improve the quality of staff as well as increase the numbers of highly trained experts in identified niche areas supported by the Programme. Emphasis will be placed on human capital development which will be given priority in the early years of the IUC Programme in preparation for the long term achievements. In building capacity, the University will develop new curricular and review existing ones to align to emerging needs, as recommended by the Government and dictated by the employment industry. Short courses, seminars and workshops will be embedded into the Programme for those field personnel and eligible community who will not be available or do not qualify for higher degree programmes. This approach will lead to cumulative improvement of quality of human resource available in the community to effectively implement innovations and uptake on research findings.

2. Infrastructural Development

The University is in the process of comprehensively expanding its overall infrastructure to position it as a key driver of change in the region. In order to achieve this, modern learning and research facilities will be set up in the region to cater for the needs of the local populations. It is anticipated that the IUC programme will support such facilities as part of the key infrastructure development. Specific activities to be focussed on will include: i) acquiring appropriate equipment for the upcoming and existing laboratories, classrooms, library and other facilities; ii) The ICT infrastructure will be revamped and expanded by acquiring equipment to increase its capacity and function, including e-resource, automation, fast internet and other interface portals. Expanded functions will enhance ICT connectivity within the university as well as the outside world. It will also provide novel e-platforms for respective strategic project areas to facilitate monitoring and implementing remotely specific project activities. ICT will also improve quality teaching; iii) The University desires to see some of its advanced laboratories being designated as national and regional reference laboratories which have longer term and cross sectoral impact. iv) establishing the disease surveillance for communicable and non-communicable disease is

expected to not only provide learning and research opportunities but also enable public health emergency response as well as disease prevention and control.

3. Strengthening Partnerships and Linkages

Conditions for networking and effective alliances with industry, civil society, NGOs, government (including regulatory and statutory) agencies exist but are still less well established while funding sources are also limited. The program investments will enable the University to strengthen the recently set up a Directorate of Research, Partnership and Linkages, and a grant writing office to enhance capacity for networking as well as sourcing for and tracking of additional project funds. In addition, the University is in the process of fast-tracking operationalization of the communications policy and the program investments in ICT will greatly boost its functions. In addition, strengthening capacity for knowledge translation and approaches for dissemination of research findings will enhance availability and access to information from new research and programs. Partnerships with government statutory and regulatory agencies will benefit the institution in terms of intellectual property rights protection, registration of innovations, marketing and post-market tracking as well as quality control. Additionally, a strong public-private-partnership is envisaged in the context of collaboration with different public and private organizations. Partnerships with industry and governments and other organizations will not only provide expanded opportunities for student attachments and co-creation of knowledge, but also opportunities for cross-investments.

4. Local Communities Empowerment

All proposed solutions to challenges directly facing and/or impacting on individual residents within the Basin will be accompanied by a transfer of knowledge, skills and/or technology. In this way the IUC Programme will transform communities by improving on livelihoods and wellbeing across the five strategic thematic areas.

Programme strategy: Describe how the programme will approach these different challenges or 'domains of change'. Describe how the programme will achieve its objectives through different projects. **This strategy needs to build further on the first programme strategy already developed in the Concept Note South. In addition to a narrative, including a first descriptive overview of projects, also include a visual representation of the Theory of Change at programme level.**

The Programme comprises of five interlinked projects corresponding to the five strategic themes and objectives corresponding to the four domains of change. Individual projects have developed unique strategies to address priority areas but have also identified opportunities for collaboration with each other. While Projects 1 and 5 will jointly tackle environmental issues, climate change and sustainable use of natural resources within the Lake Victoria Basin, Projects 2 and 3 will synergistically improve nutritional health and socio-economic status of local communities through improved food security, value chain addition and agri-business. Project 4 on transformative ICT will facilitate the use of smart technologies for research, teaching and learning across all projects within and outside the University. To be able to coordinate the projects and facilitate their activities, a Programme Support Unit (PSU) will be established whose main functions will be (1) Administrative and logistics support, (2) Financial organization and management and (3) Monitoring & Evaluation.

To accomplish the overall programme and individual project objectives, the University will continuously build and sustain North-South and South-South partnerships and linkages for knowledge and skill sharing, and infrastructural investments. The programme will also implement a wholistic gender mainstreaming strategy to ensure equal opportunities across the projects. It is anticipated that the proposed programme structure will foster multi-sectoral, multi-institutional and multi-disciplinary research approaches whose outputs are relevant to higher education in Kenya. The programme's emphasis on developing local solutions to local challenges as defined in the domains of change translates to the programme having the capacity to make a contribution towards the attainment of Global Sustainable Development Goals as shown in Figure 2 on Theory of Change.

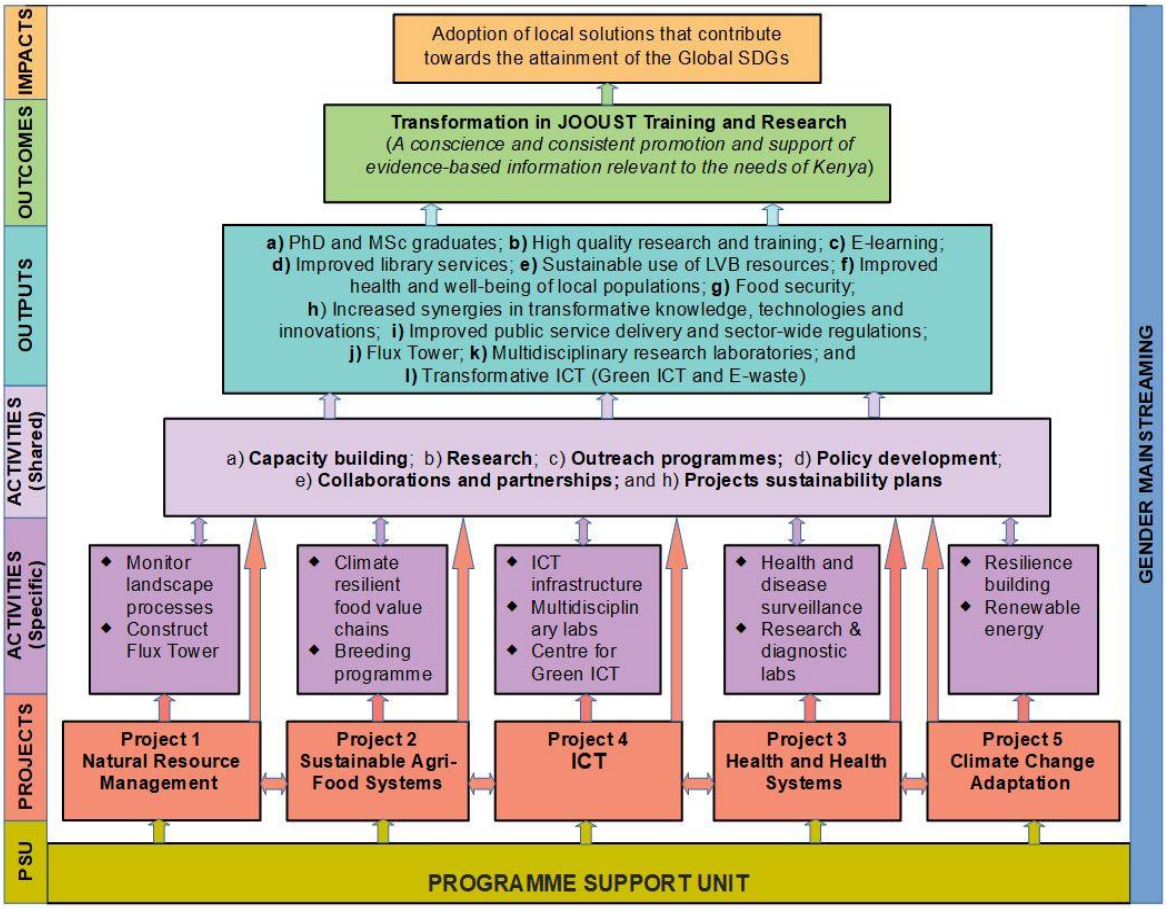

Figure 2: Theory of Change

How will the programme realise organisational and institutional change? How will the programme approach this?

The Programme's research and training activities will utilize modern pedagogies and problem based learning skills, while incorporating use of ICT supported learning systems as well as use of artificial intelligence and internet of things. The Programme recognizes that research is an integral part of learning and teaching and therefore will endeavour to develop JOOUST's research capacity through the acquisition of state of the art facilities to support action research. The transformation will deliver the following: (i) World-Class Learning and Teaching- to transform learning and teaching philosophy to be responsive to changes in technology, labour market needs and national and regional priorities; (ii) Leading Edge Human Capital- to develop highly knowledgeable and skilled experts and professionals by offering programmes that will act as catalysts for student success; (iii) Research with National and Regional Impact- to concentrate on research that will contribute to national and regional priorities in areas such as climate change, renewable energy, water resources management and food security, etc.; and, (iv) Transformative Environment- to transform the University into a modern, inspiring and technology-led hub of research and innovation.

Explain how the programme will create the conditions for the uptake of new knowledge, applications and services outside the Higher Education context.

The Programme will engage with the local community, business community and industry, county and national governments, local and international organizations and funding agencies as well as policy makers. Analysis of the key partnerships required at individual project level has been carried out and confirms an extensive and diverse network of partners and stakeholders that can be mobilized by the Programme to achieve meaningful and lasting impacts.

At the local community level, each project will conduct a comprehensive stakeholder mapping to identify vulnerable, marginalized and/or disadvantaged groups who will greatly benefit from Programme activities including but not limited to women and vulnerable households. Also, a Community Liaison Committee guides the University's interactions with the local community on matters affecting both staff and students. The Committee which draws part of its membership from community leaders and elders is also involved in conflict resolution thus maintaining a cordial and mutually beneficial relationship between the University and the Community. The University will draw from experiences of this Committee and establish others of similar nature for purposes of

entry into communities of the Lake Victoria region of Kenya. In addition, the University has formal collaborative linkages with a number of non-governmental organizations (NGOs) in the region who can be relied upon to collaborate with the Programme for optimal community participation and benefit. To further enhance community participation, the Programme will engage local political leadership which include the county governments' people's assemblies.

At the business community and local industry level, the Programme will partner with strategic industry players to achieve its objectives. Some of the industry partners associated with the University include banking institutions and sister research institutions such as the Kenya Forestry Research Institute (KEFRI), Kenya Medical Research Institute (KEMRI), Kenya Marine and Fisheries Research Institute (KEMFRI), Kenya Agricultural and Livestock Research Organization (KALRO), the Lake Victoria Development Authority (LBDA), and the Lake Victoria Basin Commission (LVBC) all of whom formal collaboration agreements have been signed with the University.

Under governance and public policy, the University has strong and formal relationships with a number of the local county governments of the Lake Victoria region of Kenya. These relationships will be used for collaborative purposes as well as reaching out to target communities to share new knowledge. At the international level, the Programme will leverage on the existing formal collaboration between the University and international and multi-national agencies such as the World Bank, World Health Organization (WHO), UNESCO through the Kenya National Commission for UNESCO (KNATCOM), Food and Agricultural Organization (FAO) and the East African Community's Lake Victoria Basin Commission (LVBC). Finally, dissemination of knowledge through the existing University biannual scientific conferences, seminars and workshops as well as journal publications will be prioritized.

Explain how the programme will integrate the transversal theme of **gender**? Explain how the programme will take the actual gender situation (in the institution and broader context) into account in its strategy and explain the potential impact of the programme strategy on the actual gender situation (in the institution and broader context).

How the Programme will integrate the transversal theme of gender

The Directorate of Gender Mainstreaming and Development is the University's main administrative support structure on gender issues. The Directorate guides management on integration of gender aspects into policies and functions. Consequently, the gender mainstreaming strategy for this Programme will be coordinated and monitored by the Programme Support Unit (PSU) with support from the Directorate and cascaded down into individual projects by team leaders. It will have three (3) levels of impact: institutional (i.e. JOOUST), community and policy making. To facilitate this process, the Directorate and the PSU will jointly (i) hold sensitization and training workshops with project team members and other key members of staff, and (ii) offer technical advice on the gender mainstreaming process and selection of appropriate monitoring and evaluation tools. The Programme further intends engage experts on gender issues to support and strengthen both the Directorate's and the programme's strategies on gender inclusivity.

How the Programme will take the actual gender situation (in the institution and broader context) into account in its strategy

All institutional needs assessments conducted by the Programme will incorporate gender analyses. In the community, the Programme through individual projects will specifically carry out baseline surveys on the socio-economic status of end-user communities with emphasis on the role of women, youth and girl-child using participatory tools. The critical factors in the baseline survey will include: i) access and control of resources within the family unit; ii) community resource mapping; iii) gender roles and functions; iv) assets ownership; v) activity profiles; vi) timelines and trends; and vii) demographic characteristics, among other parameters of interest to the Programme. Additionally, there will be a policy review for each sub-sector in the Programme with respect to gender mainstreaming, advocacy and affirmative action. The existing policy framework on gender inclusivity and profiles will be used in gender-sensitive activities and interventions to address benefit sharing, access and control of natural resources, agri-production, health inequalities and access to useful and suitable information/knowledge on livelihood opportunities. It is therefore expected that examination of the inequalities experienced by women, harmful sociocultural norms, and women's roles will inform: the development and/or revision of institutional policies and gender-sensitive initiatives within the University; the design and implementation of project interventions in the community; and the presentation and packaging of advocacy and technical support offered to policymakers at local and national levels. In appreciation of the fact that capacity building through research and training is a major objective for all five Programme projects, the gender mainstreaming strategy will adopt JOOUST's gender-based policy in awarding postgraduate fellowships in order to attract and retain female postgraduate students. This policy will ensure equal opportunities for women through allocation and reservation of available posts, and contains special considerations for women of child-bearing age. Through monitoring and evaluation the Programme will keep track of the implementation of the gender mainstreaming strategy. Gender consciousness will not be restricted to programme activities but will extend to all Programme communication and be reflected in language and image choices.

The potential impact of the Programme strategy on the actual gender situation

Expected impact of the Gender Mainstreaming strategy include:

1. Expansion of student welfare services to possibly include a lactating room for nursing mothers and greater access to mental health services.
2. Gender balance in admission and completion rates for research training including participation in staff and student exchange programmes.
3. Improved gender balance among University staff resulting from gender-sensitive staff recruitment and retention policies that maintain equal opportunities between the sexes.
4. Women empowerment within end-user communities to promote their participation and enhance their capacity to tackle gender constraints related to agriculture, food security, health, natural resource management and climate change in the Lake Victoria Basin with endorsement at all levels starting from the household all the way up to community leadership.
5. Adoption of gender-sensitive policies and programmes by government authorities with in-built strategies to move towards gender-responsiveness where appropriate.

Explain how the programme will integrate the transversal theme of **environment**? Explain how the programme will take the actual environmental situation (in the institution and broader context) into account in its strategy and explain the potential impact of the programme strategy on the environment.

How the Programme will integrate the transversal theme of environment

The protection of the LVB environment and its natural resources have been addressed by the project at two different levels:

1. Within the design of the Programme's individual projects have incorporated objectives that directly consider different aspects of the LVB environment. For example: Project 1 has objectives that address conservation of biodiversity, water, soils, air, fish and forests within the LVB. Project 5 has integrated objectives that will address climate and climate change, extreme events and renewable energy. Project 2 has incorporated objectives that will address food security, sustainable food value chains and land use and soil conservation. Project 3 will address diseases under varying climatic and environmental changes, while Project 4 has introduced objectives that mainstream ICT into the entire project, supporting implementation of and access to resource efficient technologies.

2. As a management policy, the Programme will promote the use of renewable solar energy for most of its energy requirements and upscale the practice to institutional and regional levels. The Programme will minimize the use of print paper and instead promote electronic material and digitalization. A key objective of Project 1 is to increase forest cover. The Programme will partner with County and National governments to earn/gain carbon credits for these conservation efforts. In addition, the Programme will compensate emissions by flying through green miles. During field activities, the Programme will encourage on-field activities, field-stays and also group/joint field travels to reduce frequency of field trips and emissions. During Programme meetings, vegetarian and insect-based diets will be promoted.

How the Programme will take the actual environmental situation (in the institution and broader context) into account in its strategy.

One of the main Programme strategies is capacity building to enhance conservation of the LVB resources, food security and climate resilience to ensure better welfare and wellbeing of the local communities. Through capacity building, the Programme will create a new breed of professionals with a better understanding of environmental processes and linkages to (i) enhance sustainable use of LVB natural resources, (ii) ensure sustainable agricultural practices and agriculture value chains, (iii) minimize disease prevalence, (iv) increase climate resilience, and (v) enhance the use of ICT to innovate resource efficient technologies. By building capacity of the local communities and integrating them into the mainstream conservation activities the Programme will enhance their management capacity of local resources supported by other key stakeholders.

The potential impact of the Programme strategy on the environment

Expected impact of the environment mainstreaming strategy include:

1. Restoration of degraded landscapes, low prevalence of invasive species and increased management and conservation of biodiversity, including the establishment of a nature conservation centre;
2. Enhancement of soil conservation and promotion of sustainable land use practices;
3. Promotion of sustainable use of water resources, including promotion of water harvesting techniques;
4. Enhanced monitoring of water quality and deter practices that lower water quality within the LVB;
5. Increased carbon sequestration within the LVB landscape;
6. Increased climate resilience among the LVB communities and ecosystems; and
7. Promotion of the use of renewable energy and energy efficient technologies

4. Updated stakeholder analysis

In order for a programme to have impact, a thorough understanding of the key stakeholders is essential. Please update the previous stakeholder analysis and focus on stakeholders that are deemed crucial for creating effective uptake of results outside the university and the stakeholders deemed crucial to achieve genuine institutional change.

Stakeholder	Analysis	Engagement strategy
University Community **(Students)**	High impact stakeholders, key beneficiaries of the programme outputs. Benefits include increased quality training and supervision, scholarships, modernized laboratory and lab equipment and incubation centres.	Through lectures and research; Access to student exchange programmes, incubation hubs and ICT resources including e-resources for research and learning.
University Community **(Academic Staff)**	High impact stakeholders expected to benefit from capacity building and key stakeholders in Programme implementation.	Development of new curricular and revision of old curricular; Access to staff exchange programme, intensive short trainings and research projects.
University Community **(Administrative Staff)**	High impact stakeholders expected to provide supportive services to the Programme.	Supporting administration, M&E, financial management and procurement processes, and providing laboratory and ICT technical assistance
Partner universities & university colleges in Flanders **(Belgium)**	High impact stakeholders to be involved in the implementation of Programme and day-to-day management jointly with JOOUST.	Provide linkages to expertise in different disciplines of interest, opportunities for staff and student exchange and use of specialized equipment and/or technologies.
National Government Ministries, departments and agencies **(Policy and Sustainable Development)**	High impact stakeholders providing policies and legal frameworks that enable Programme implementation.	End consumers of the Programme ouputs with regards to registration of patents, intellectual property rights, gender mainstreaming and undertaking evidence-based policy development and revisions.
County governments **(Policy and Sustainable Development)**	High impact stakeholders also providing local policies and legislations governing devolution of services that enable Programme implementation.	End consumers of the Programme ouputs with regards to gender mainstreaming and undertaking evidence-based policy development and revisions.
Local Communities	High impact stakeholders contributing to Programme implementation on a broad range of interventions while influencing decision-making at Programme and policy levels.	Participatory processes during data collection, technology transfer and outreach activities.
Local and Belgian Non- Governmental Organizations **(NGOs)**	Medium impact stakeholders who promote gender mainstreaming and development agenda within the community.	Consultative meetings for purposes of decision-making, intervention design, policy development, provision of internship opportunities for students and staff, piloting and field testing of research outputs.
Business Community and Industry	Medium impact stakeholders and partners for experiential learning and hands-on training for students, industrial attachment and internship positions.	Mentoring innovators and entreprenuers within the University and the community. Providing financing/capital for uptake or commercialization of new technologies.
Farmers around the University	Medium impact stakeholders expected to directly benefit from the Programme.	Participation in field trials, piloting of technologies. Access to funding mechanisms for farmers and new markets using Programme networks.
Other Development Partners, Donors and financiers	Medium impact stakeholders with the ability to support infrastructure development, human resource development, research resources and networking with North institutions.	Provision of financial Support, M&E and advisory services to the Programme

Professional and Regulatory bodies	Medium impact stakeholders responsible for creating regulations that professionally license graduates and inform Programme implementation.	Accreditation of improved and revised programmes, Certification of graduates and provision of regulatory frameworks for compliance.

Synergy and/or complementarity with Belgian development actors: Highlight complementarity or synergy with the actions of other **Belgian organisations** funded by the Belgian development cooperation (*see call: Background documents per country*).

Project 5 is directly linked to the **Climate Extremes in the Lake Victoria Basin (ELVIC) project** (https://ees.kuleuven.be/elvic/), hosted at KU Leuven. The ELVIC project is an internationally coordinated Regional Climate Downscaling Experiment (CORDEX) - Flagship Pilot Study (FPS) initiative, bringing together different research groups that perform simulations with multiple high-resolution, convection-permitting regional climate models. All models share similar set-up and are centred in the Lake Victoria Basin.

The JOOUST programme will benefit from the knowledge, data and networks that are offered through **The Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP)** which is initiated by the Podsdam Institute for Climate Impact Research. Colleagues from VUB) are leading the lake sector as well as contributing to the Soil and Water Assessment Tool (SWAT) for local and global hydrological and water quality impact studies. Funding to attend ISI-MIP related workshops and trainings will be foreseen within the **COST Action PROCLIAS "Process-based models for climate impact attribution across sectors"** (CA19139) lead by colleagues in PIK, Germany and the Belgian Coordinator of this Programme is a partner. A strong link exists between Project 1 and Project 5 and the **EU-ITN project "Inventive forecasting tools for adapting water quality management to a new climate"** (2020-2023) where several doctoral trainings will be offered on simulating the impacts of climate change on the water quality catchments, lakes and rivers considering energy, food and water nexus. VUB will use the Lake Victoria basin as one of the case studies of at least one of the PhD students of the project. There are synergies with the **"Climate information for integrated renewable electricity generation" project (EU-JPI climate funding)** (2017-2020). In this project, the VUB developed the REVUB (Renewable Electricity Variability, Upscaling and Balancing) tool that has been linked to the Soil and Water Assessment Tool (SWAT) model. The same methodology can be applied to the Lake Victoria Basin. There is also a link with Project 1 in the EU funded project **'eMaster in Water Resources Engineering (eMWRE)** (hosted at VUB) with IHE-Delft and Palestinian and Jordan universities as partners.

Project 1 and Project 5 will also be linked with the Belspo-funded research project EVAMAB (http://www.biodiv.be/evamab). University of Antwerp is the lead institution in this project on the economic valuation of ecosystem services in Man and Biosphere reserves (in Uganda-Kenya; Benin; Ethiopia and Tanzania) funded in the framework of a memorandum between Belgian Science Policy and UNESCO. A proposed team member from U.Antwerp is involved in 2 Long-term Policy Supporting Research (PSR) projects, namely Water Nexus and KLIMSEC. Water Nexus, an interuniversity collaboration, aims to develop a water strategy for the Belgian development aid (http://www.waternexusbelgium.org/) while KLIMSEC focuses on climate security, specifically making the link between climate adaptation and peace building. Water Nexus is financed by ARES, while KLIMSEC is financed by VLIR UOS. Both projects are in support of the Belgian development aid.

Synergy and/or complementarity with other actors: Highlight complementarity and/or synergy with initiatives taken in the same domain by other organisations (local, regional, etc.).

There are multiple research institutions, non-governmental organizations (NGOs) and parastatals implementing programmes across the Lake Victoria Basin in Kenya. Some of these institutions have their focus on the environment and its degradation as a result of climate change. Among the institutions based in the region and fighting to restore the environment include: the Kenya Forestry Research Institute (KEFRI), Kenya Marine and Fisheries Research Institute (KEMFRI), Kenya Agricultural and Livestock Research Organization (KALRO), the Lake Victoria Basin Development Authority (LVBDA), and the Lake Victoria Basin Commission, a regional organization under the East African Community and whose headquarters is in the proposed Programme site. Since these institutions majorly focus on the effects of climate and the environment, they will form synergistic and complimentary partnerships with Project 1 (Management of the Lake Victoria Basin Natural Resources), Project 2 (Building Capacity for Transformative Agri-Food Systems for Resilience in the Lake Victoria Basin of Kenya) and Project 5 (Strengthening Climate Change Resilience among Communities and Ecosystems in the Lake Victoria Basin). Project 3 (Building Capacity for Research, Management and Control of Communicable and Non-Communicable Diseases) will greatly benefit from working with the Kenya Medical Research Institute (KEMRI) for which a collaboration already exists with the University. Finally, Project 4 (Strengthening ICT infrastructure to Enhance Research, Teaching and Learning) will be well placed to provide technical support for all Programme partnerships and linkages with local and regional actors. The only Belgian NGO operating in Kenya that demonstrates synergy with JOOUST's Programme is IFSI-ISVI asbl-vsw. This is based on their efforts to improve employment conditions in the engineering, transport, textile and agricultural sectors.They may be engaged for involvement in some of the Programme activities.

Synergy and/or complementarity with other VLIR-UOS activities: Highlight complementarity and/or synergy with other VLIR-UOS funded activities (TEAM projects, Global Minds, ICP's, etc.).
In Kenya, the previous and ongoing VLIR-IUC Programmes at University of Nairobi (1998-2008), Moi University (2005-2018) and Jomo Kenyatta University of Agriculture and Technology (2017-2021) have implemented a combination of project themes including marine science, health, agriculture and/or ICT all of which are incorporated within the proposed JOOUST VLIR-IUC Programme. Of particular interest, the University of Nairobi (UoN) IUC Programme's health project was led by the Local Coordinator, who is also the current Deputy Vice-Chancellor for Research, Innovation and Outreach in JOOUST. A member of staff from UoN who was a beneficiary of the UoN IUC Programme's ICT project will offer technical support and guidance to JOOUST IUC Programme's ICT project. A significant number of trainees under UoN's marine science project were trained in VUB and currently work for Kenya Marine and Fisheries Institute (KEMFRI). KEMFRI is a major stakeholder for the JOOUST Programme and hence the Programme will directly benefit from several achievements of the UoN IUC Programme. Project 1 on natural resources links to several VLIR-UOS funded projects. These include i) the **VLIR-JOINT "Global Open Water Academic Network"** (2019-2021) in VUB , ii) the **ICP Water Resources Engineering**, iii) **VLIR-TEAM Sustainable Management of Natural Resources by Reducing Evapo-Transpiration in cultivated African catchments (SMART-ET) project** (2016-2019), iv) the **VLIR-JOINT "Internet of drops"** (2020-2022) projects at KU Leuven and v) **VLIR-TEAM Improved management for nitrate pollution in the Lake Victoria catchment of Kenya project** (2016-2020). Projects 1, 2 and 5 will benefit from synergies and experiences at the ongoing **VLIR-IUC with Bahir Dar University, Ethiopia** which is implementing projects on natural resource management and food security. Project 2 on transformative agri-food systems will specifically benefit from synergies with two ongoing research projects; i) the VLIR-TEAM project on **'Climate smart options allowing agricultural intensification for smallholders in the dry zones of the Central Highlands of Kenya'** and ii) the VLIR-JOINT project **'Research-Based Education for Sustainable Rural Development'**. Project 3 on health will draw from experiences of the **University of Limpopo VLIR-IUC** (RSA) which established a molecular biology laboratory for the detection of infectious diseases and implemented a VLIR-JOINT HPV research network project. There have also been two projects, one under Global Minds, on non-communicable diseases examining diabetes care and support in Uganda, South Africa and Cambodia.

5. Risk analysis

Risks + potential impact	**Probability (1-4)**	**Potential impact (1-5)**	**Response**
Sustainability Risks			
Changes in regulatory requirements leading to noncompliance and possible prosecution	3	5	Consultative meetings with representatives from the regulating authority for guidance on necessary adjustments to be made.
Inadequate data sharing and intellectual property agreements and protocols leading to conflicts	2	5	Expectations of all parties will be expressly captured in MOUs prior to the start of the Programme.
Inadequate staffing and expertise in some disciplines for curriculum review resulting in low enhancement of capacity in strategic areas	2	4	The Programme intends to build capacity in a variety of fields related to JOOUST's niche areas hence this risk should reduce considerably over time. The University is also diversifying its income generation and will improve staffing over time.
Inadequate investment by farmers leading to low production and investment in new technologies	3	5	Negotiate financing packages for farmers from agricultural financing and microfinance institutions and offer financial management training to farmers.
Inadequate land holding resulting into inability to conduct field trials	3	4	Design agricultural interventions with small-scale farmers in mind as they are the majority.
Low recognition by policy makers resulting in a poor policy framework	2	5	Engage policy makers during Programme design for adequate buy in and support.
Inadequate student enrollment into postgraduate programmes resulting in low capacity	1	1	Low risk owing to consistent demand for JOOUST courses. However, an enhanced marketing strategy will be used to boost enrollment.

Lack of ownership by stakeholders resulting in low stakeholders involvement	2	5	Involve all relevant stakeholders from the stage of Programme design so that there is adequate buy in and support.
Delay in implementations due to administrative constraints thereby resulting in slow progress.	1	4	JOOUST will constitute an M&E team within the PSU with strategic membership from Programme implementing units.
Inability to retain non-staff sponsored for PhD studies.	2	4	The University will ensure that the number of non-staff sponsored for PhDs is commensurate with its overall academic staff recruitment plan. Also, all beneficiaries of PhD training will be bonded for a specified amount of time.
Unsupportive gender based social structures limiting participation of vulnerable groups	3	5	Undertake gender analysis prior to Programme inception to ensure challenges are identified in advance and factored into Programme design with participation of end-user representatives.
Unwillingness of suitable farmers to participate in Participatory Research and Learning (PRL) and hence low uptake of technologies	2	5	Hold focus group discussions to identify the reasons for this reluctance and jointly work on resolutions. JOOUST will publicize the programme widely among stakeholders through various media.
Weak synergies between NGOs mandate and the programme resulting in uncoordinated interventions	2	3	Consultative meetings with NGOs during Programme design will create strong synergies
Financial Risks			
Challenges with cash flow at both local level and with partners that may delay the Programme implementation	2	5	The Programme will strictly adhere to its budget lines and allow the University Management Board resolve institutional level financial constraints.
Changes in exchange rates and inflation resulting in both high costs/budget deficits	2	5	Programme budgeting will incorporate a modest annual inflation in costs to cater for fluctuations in exchange rates and inflation.
Inability to share information due to copyright restrictions leading to no dissemination	3	5	Proposed technologies will be thoroughly researched with regard to legality, copyrights, patents, accessibility and information use.
Inadequate financial resources at county level	3	5	Fundraising through proposal writing and enhance the existing MoUs to strategic partnerships
Inadequate financing mechanism resulting into weak activities and production in agro-food system	3	5	Involve Agricultural Financing Institutions (AFIs) and Microfinance Institutions (MFIs) in Programme design and discuss creating a revolving fund.
Inadequate matching grants resulting into low synergy in activities with partners	2	5	Budgeting will be done as per the stipulated period. The Programme will continuously seek funds to expand the Programme scope and sustain it.
Limited access and control of financial resources by women youth and girlchild resulting in gender imbalance	3	5	Affirmative action and mobilization of disadvantaged groups into action groups with formal registration, and sensitize communities to improve gender dynamics.
Low economic returns and abandonment of Programme activities by stakeholders	2	5	Properly conducted feasibility studies will significantly lower this risk as challenges can be identified and mitigated.
Operational Risks			
Adverse environmental conditions leading to economic loss and low productivity	2	5	Utilize the Project 1 and 5 databases for early warning on potential shocks, including draught, floods, pests and rainfall patterns
Breakdown in communication leading to delay in Programme implementation	2	5	JOOUST will put in place adequate procedures to assist staff deliver on their mandate. Conflict resolutions mechanisms will also be put in place.
Donor funding dependency resulting into non sustainability of the Programme	3	5	Promotion of value chain addition and entrepreneurship for additional income to the University and households in the community.
Failure of equipment, breakdown and downtime, cyber attack leading to loss of	2	2	Upgrading the University's ICT infrastructure will likely eliminate this risk. Purchase of major Programme equipment will be budget for

data, information and programme outputs			including scheduled maintenance. This will be further supplemented by the institutional budget.
Inadequate physical access and access points leading to poor access to e-resources and inability to address gaps in knowledge and capacity	2	4	Comprehensive needs assessment to articulate and plan for immediate and future demand.
Staff sponsored for PhD not completing their studies on time.	1	3	Selection based on assessment of students' suitability and availability. The University will provide sponsored staff adequate time off to complete their studies.
Poor adaptability of improved varieties resulting in low performance of the programme	2	4	Agricultural sector stakeholders will advise on new varieties and suggest adoption of existing varieties/alternative crops where appropriate.
Delays in procurement resulting in delayed implementation	2	5	The procurement office will be involved in programme design and will be represented in the Programme's M&E team.
Unplanned university closure resulting in delayed capacity building, research and outputs	2	5	The University Management demonstrates good will towards union representatives enabling quick resolution of problems.
An outbreak of COVID-19 infections within JOOUST and the surrounding environment.	3	5	Active monitoring of government status updates on the COVID-19 pandemic. Adoption and adherance to national guidelines on COVID-19 control and protocols for institutions of higher learning.
Compliance Risks			
Breach in MoUs and agreements resulting into conflicts among partners	2	5	Ensure that an appropriate conflict resolution mechanism is agreed upon with partners.
Failure to achieve the two third gender rule in public institutions may lead to litigations and possible nullifications	1	4	The Programme aims to surpass this target using its enhanced Gender Mainstreaming Strategy.
Failure to comply by regulatory guidelines leading to prosecution	2	4	Regulatory guidelines will be consulted and adhered to as and when needed.
Flouting of national and international labour laws that may lead to prosecution	1	5	The University's HR office is knowledgeable and experienced in this area and will provide guidance.
Non-compliance with financial and public procurement regulations and prosecution	1	5	Strict controls and checks have been implemented to guarantee compliance.

6. Institutional embeddedness

Link with university management: explain how the programme will assure a continuous link with and involvement of the university management.

The Programme will be fully integrated within the University's existing governance and administrative structures as follows; JOOUST has a Division of Research, Innovation and Outreach (RIO), headed by a Deputy Vice Chancellor, in which the Programme will be domiciled. It is important to note that the Local Coordinator is also the University's Deputy Vice Chancellor- Research, Innovation and Outreach (DVC RIO) and is expected to head the Programme Support Unit (PSU). In his capacity, the Local Coordinator also sits in the University Management Board and the University Senate, which are the top management and academic organs of the University. Furthermore, several team leaders and team members are members of the Senate and Deans' Committee. This means that the JOOUST VLIR-IUC Programme will always have adequate representation in University management and decision-making.

Flemish support: explain the programme's vision/approach on creating broad Flemish support (inter-institutional cooperation) at the level of the Flemish universities and university colleges.

The Flemish consortium will provide administrative, managerial, technical, scientific and dissemination related support.

Administrative: The Flemish Programme Coordinator, Prof. Ann van Griensven, will together with the International Office, provide support on budgets, VLIR regulations, yearly planning and reporting.

Management issues: The Flemish Coordinator will encourage the teams, both local and Flemish to act as one team. She will also help to solve problems and conflict resolution.

Technical: Flemish project members will support the implementation of libraries, ICT infrastructure and experimental equipment (eg Flux Tower/Meteor station).

Scientific: Project partners from VUB, KU Leuven, Ghent University, Hasselt University and University of Antwerp will provide scientific guidance covering the 5 project domains. Their main role is to guide the PhD researchers towards graduation at their university. They will host the PhD researchers in their research team for a number of months per year and they will support the publications of papers and encourage interdisciplinary collaborations within and between the different projects.

Dissemination: The project members will share their specific scientific and social networks to support the dissemination, including international scientific societies.

Educational: The Flemish project members will share e-learning materials and other educational materials of relevant MSc programmes. They will also encourage collaborations and joint MSc supervision especially engaging students from VLIR-ICP programmes.

Positioning of Programme Support Unit (PSU): explain how (where in the organisation) the PSU will be organised and any particular focus areas / accents regarding the PSU the programme wants to realise.

The Program Support Unit (PSU) will be established within the University's Division of Research, Innovation and Outreach. It will be headed by the Local Coordinator who will be supported by a programme manager to oversee the day to day activities of the PSU. It is envisioned that different cadres of support staff will be either purposely recruited or seconded to the PSU from other University departments. These include but are not limited to administrative assistants, grant accountant, M&E officer and drivers.
The PSU is expected to perform four key functions;

1) **Administrative and logistics support:** Coordination of PSU and individual project operations such as scheduling meetings, event planning e.g. trainings, workshops and seminars, procurement and travel arrangements.
2) **Monitoring and evaluation:** Assess and audit progress towards achieving both programme and individual project objectives.
3) **Grant management:** Ensure financial accountability and timely reporting as per funders' requirements.
4) **Resource mobilization:** Support project team members in fundraising and grant writing to secure additional funds for sustaining and expanding programme projects.

If the Programme is selected it will utilize funding available in Year 0 to set up the PSU including undertaking necessary renovations and installing basic ICT infrastructure in the Unit's designated office space.Operations of the PSU will be carried out in full compliance with the University's governance and administrative structures, policies and guidelines.

7. Project identification

7.1. Project 1: Management of the Lake Victoria Basin Natural Resources

Objectives: State the objectives of the project. What do you want to realise through the project (medium-term (5 year) objectives). To what long term objectives will the project contribute (can be both internal and external to the university)

The Project's medium-term (5 year) objectives

1. To characterize land cover changes, land uses and climate within the Lake Victoria Basin (LVB) in Kenya;
2. To quantify landscape processes, identify linkages and feedback loops and develop integrated data base for sustainable management;
3. To enhance data integration and prediction through modelling.

The Project's long-term (10-12 year) objectives

4. To build competencies for environmental monitoring and natural resource management.
5. To strengthen JOOUST's capacity as a reservoir of knowledge and a pinnacle for capacity building in natural resource management.

Explain the link with the context analysis, the programme objectives and the other projects. Detail the context analysis if needed (e.g. the specific theme, specific challenges of the departments involved, the local/sectoral context, etc.).

The natural resources in the Lake Victoria Basin (LVB) are facing numerous threats and stresses, with significant consequences on the services and functions of the ecosystems.[18,19] Agricultural/grazing lands are being degraded, water quality is declining, affecting its use and the aquatic biodiversity, wetlands and forests are being lost, over exploitation of natural resources is prevalent, pollution from point and nonpoint sources is increasing and negative impacts of floods and droughts is intensifying. These threats represent a barrier for sustainable

development in the Basin. The local population here, particularly the vulnerable members of the community, including women and vulnerable households are the most affected by degredation since they directly and almost entirely depend on the resources derived from their immediate surrounding.[2] This is evidenced by the increasing poverty levels, deteriorating health and wellbeing of the communities living in the Basin. Unfortunately, data are scanty on the magnitude of degradation in the Basin. The linkages among poverty levels, human health, land uses, climate and resource degradation are less understood. Sustainable management of LVB Basin resources requires involvement at all levels, yet men and women here have different and often unequal roles in management and utilization of natural resources. For example, women are still largely absent at all levels of policy formulation and decision-making in natural resource management. The project will therefore address some of these issues, through the identified short term (5-year) and long term (10-12year) objectives as follows: **Objective 1** to characterize past land cover changes, land uses and climate in order to draw clear hypotheses related to the ongoing changes. The University's capacity to acquire and process large, remotely sensed data is limited, hence the need to partner with our Flemish partners through capacity building. The project will colaborate with **Project 4 (ICT)** to establish an appropriate infrastructure for data management, modelling and data archiving. To draw linkages between processes, there is need for quantification and analysis of mechanisms that drive them. **Objective 2** to quantify landscape processes, analyze and draw linkages between mechanisms and processes in order to identify drivers of change. **Objective 3** to enhance data integration and prediction through adoption of data integration approaches, including process models to link complex process with resource conservation, regional climate and human wellbeing as well as predictions. The University lacks adequate infrastructure and technical capacity to conduct ecosystem flux measurements and modelling. This will require support from the Flemish partners. O**bjective 4** to address longterm monitoring of the ecosystems and natural resource conservation, supporting the establishement of inclusive resource governance systems that ensure access rights of women and other vulnerable groups. The University's agenda is to become a regional hub for the management of Lake Victoria Basin natural resources. This will be addressed through the long term goal of establishing a Regional Centre for Natural Resource Management which will be responsible for capacity building, monitoring and policy formulation addressed through **Objective 5**.

Describe the strategy of the project: how will it reach its objective(s)?

Objective 1 will be achieved through surveys and remote sensing/geospatial technology. Capacity building of male and female PhD and MSc students in this area is key, prior to application and dissemination of remote sensing technology. Field measurements are planned under **Objective 2**, which include, biodiversity assessment, measurement of ecosystem fluxes and microclimate with eddy flux/micrometeorology tower, hydrology mapping of the target basin and analysis of water quality in selected points within the Basin. The main activities planned in **objective 3** are data intergration and modelling to develop clear hypotheses and for prediction. **Objective 4** will involve gender inclusive capacity building of the end users and adoption. O**bjective 5** will address the establishment of a **Flagship Centre** for natural resource conservation, capacity building, knowledge dissemination and policy formulation (advisory) to address emerging sustainability/research needs in the Basin.

Analysis of end-users / final beneficiaries: identity the end-users of the project results and describe the uptake strategy of the project (incl. structural barriers for end-users).

(a) University community: The project will provide training, research and funding opportunities for JOOUST staff and students to engage in cutting-edge multi-disciplinary research.

(b) County and National Governments within the LVB: Sustainable management of the LVB is a key agenda for the local County Governments and the East African member states. Finding a lasting solution to the degradation process will benefit all these stakeholders. This project will generate valuable data and key information, which through partnerships with the local governments and member states will generate relevant policies for implementation and sustainable management of LVB.

(c) Local Communities in the Lake Victoria Region: Communities in the LVB are poor and derive their livelihoods directly from their immediate environment. They are the major beneficiaries when natural resources in LVB are sustainably managed. This project proposes a community-driven natural resource conservation strategy, in which local communities are at the centre of the whole process. Promotion of women and other vulnerable members of the community in the management of LVB resources is key.

(d) **Natural resource management agencies:** They will benefit from the generated data, policy briefs and joint activities.

Uptake strategy

As part of the larger project, testing of strategies and tools will be designed as a range of transferable solutions to the challenge of natural resource management at community level for each natural resource (water, fisheries, biodiversity). The project will design and implement experiential learning and innovative pedagogies for natural resource management particularly use of approaches such as the problem-based learning (PBL). Strategies will be developed for engaging end users at every level, taking into account gender, age, etc.

The project will rely on ICT as a channel for dissemination. At institutional level, the project will regularly engage stakeholders to develop agreeable strategies and institutional framework for engagement in the management of natural resources (for each natural resource area). Regular policy briefs for natural resource management challenges will be developed and shared with the stakeholders.	
Presentation of the project team: present the project team, the available expertise and the expertise sought for.	
Proposed local project leader	**Prof. Dennis Otieno Ochuodho**
Local project team *(Other involved staff: professors, assistants, (administrative) collaborators, etc,). Also mention involved departments/faculties/universities.*	**Prof. Maurice Nyadawa:** Water Engineer, School of Engineering and Technology; **Prof. Bernard Muok** and **Dr. Richard Magwanga** (Directorate of Research, Innovation & Partnership, JOOUST), **Prof. Regina Nyunja** and **Dr. Angeline Ochung** (School of Biological & Physical Sciences JOOUST); **Prof. Julius Manyala, Dr. Lorna Okoto** and **Mr. Samuel Nyangweso (**School of Spatial Planning & Natural Resource Management, JOOUST).
Overview of available domains of expertise in the project team	Hydrology-water engineer, Aquatic and terrestrial Biodiversity monitoring and evaluation (Taxonomist and marine biologist); Landscape processes monitoring and evaluation (Plant ecologist); Remote sensing and digital data analysis (geospatial planner); Natural resource management, policy formulation and community participation-social scientist (Natural resource scientist); Water chemist for water quality analysis (Chemist)
Comments on the expertise sought for at level of the Flemish HEIs	Data integration and prediction (Modelling), Ecosystem flux measurements (Eddy covariance CO_2, H_2O, NOx and CH_4 gasses), hydrology, remote sensing and aquatic resources conservation.

7.2. Project 2: Building Capacity for Transformative Agri-Food Systems for Resilience in the Lake Victoria Basin of Kenya

Objectives: State the objectives of the project. What do you want to realise through the project (medium-term (5 year) objectives). To what long term objectives will the project contribute (can be both internal and external to the university)

The Project's medium-term (5 year) objectives are:

1. To develop and promote climate resilient food value chains and practices;
2. To strengthen collaborative learning, exchange programmes and outreach.

The Project's long-term (10-12 year) objectives will be as follows:

3. To promote gender- based resilient and diversified livelihoods;
4. To establish a dynamic and responsive breeding programme

Explain the link with the context analysis, the programme objectives and the other projects. Detail the context analysis if needed (e.g. the specific theme, specific challenges of the departments involved, the local/sectoral context, etc.).

The impact of climate change is projected to reduce global average yields.[20-23] At the same time the environmental footprint of crop as well as of livestock production has to be reduced to improve sustainability.[24-27] Emergencies occur as a result of different shocks in the livelihood systems of affected communities. The consequences of these shocks are more dire among the poor households, particularly those dependent on agriculture for livelihood.[28]

There are several hypothetical and real challenges to attaining food security in the Lake Victoria Basin (LVB). In 2019/2020, we are witnessing the SARS Cov2 (COVID-19) pandemic and desert locust invasions in the horn of Africa and its surroundings, where agriculture has been seriously impacted and crop fields have been destroyed at scale. In emergency scenarios, crop production is halted, and agricultural assets are destroyed to varying degrees. Besides, smallholder-farming households are unable to access farm inputs, especially seeds, and hence are unable to produce food for their own subsistence or surplus for markets that contribute to urban food security. There is need to develop medium to long-term initiatives that build food secure and resilient communities. This can be achieved in part by adopting intensified and diversified agri-food systems that reduce risks of catastrophic farm-wide losses, thus increasing household resilience.

This Project proposes to collaboratively work with other projects in this Extended Concept Note to minimize postharvest food losses and enable smallholder farming communities produce enough for their subsistence and

surplus for the market. Project 1 titled Management of the Lake Victoria Basin Natural Resources, will address natural resources in the Basin, project 3 on management and control of communicable and non-communicable diseases will address health and nutrition in relation to agri-food systems, while project 5 on climate change resilience and ecosystems will provide evidence on the effect of climate change on agri-food systems. Project 4 on ICT will provide the necessary infrastructure and support required for data collection and management of this project.

Describe the strategy of the project: how will it reach its objective(s)?

The project will develop resilient agri-food systems and design pathways to promote climate smart practices, thus making transition to resilient, sustainable, agile and efficient food value chains. This will be achieved through:

Development of climate resilient value chains. The project will characterize identified smart cereal crops across different environments and geographical zones, develop ICT supported inclusive and innovative extension and information system, study (dis-)adoption patterns of technologies across mega- environments and analyse economics of different cereal and micro animal value chains.

Promotion of climate smart agronomic practices- The project will support Integrated Crop Management (ICM), Integrated Pest Management (IPM) and Integrated Soil Fertility Management (ISFM) and design and deploy appropriate models in cereals and micro animals food systems.

Strengthen collaborative learning, exchange programmes and outreach-The project will establish collaborative learning of value chain actors and decision-makers, develop relevant academic and research programs in agri-food systems at post graduate and post-doctoral levels, promote exchange programmes for young researchers, faculty members and design outreach programs for farmers and communities.

Pomote gender- based resilient and diversified livelihoods-The project will apply a gender-responsive or gender-transformative approach by simultaneously addressing the interconnected challenges of gender inequality. The project will support agricultural transformation that creates an enabling environment for women and men farmers to exercise their rights and make women's economic empowerment in agriculture a development priority.The project will promote social farming,micro-animals, traditional vegetables and value addition.

Establish of dynamic and responsive breeding program-The strategy will involve targeting and supporting replacement of cereal varieties as they get susceptible to biotic and abiotic stresses.This will include germplasm collection and conservation, evaluation of promising lines, production of breeder and foundation seeds, seed multiplication and distribution for sustainable development.

Analysis of end-users / final beneficiaries: identity the end-users of the project results and describe the uptake strategy of the project (incl. structural barriers for end-users).

Project 2 will mostly benefit the resource-limited rural communities residing within the Lake Victoria basin of Kenya whose standard of living and livelihoods are tied to improved agricultural productivity. Specific beneficiaries of the project will include :

i) **Farmers**- Knowledge and experience on technologies and development interventions on food and nutrition security, poverty reduction and resource outcomes.

ii) **Seed companies**- Access to breeder and foundation seeds.

iii) **Young researchers-** Extensive knowledge and experience in approaches and toolkits for sustainable agriculture.

iv) **Non-Governmental Organizations**-Skills to support building the capacity of smallholder farmers including linkages to markets.

v) **Knowledge Institutions-** Sharing experiences, skills and technologies.

vi) **Policy Makers-**Access to policy brief from research output for policy development.

vii) **Cottage industries** – incubation of promising innovations and ideas particularly by youth, encourage partnerships with private sector, collaborative entrepreneurship programs with other communities of practice including other institutions of higher learning and skills in value addition.

viii) **Faculty members and students**- Exchange programs and training.

The uptake strategy of the project will involve development of ICT supported inclusive and innovative extension and information system.

Presentation of the project team: present the project team, the available expertise and the expertise sought for.

Proposed local project leader	**Dr. Calleb Olweny** -School of Agricultural and Food Sciences (SAFS)
Local project team *(Other involved staff: professors, assistants, (administrative) collaborators, etc,). Also mention involved departments/faculties/universities.*	**Prof. Benard Muok (**Directorate of Research Innovation and Partnership); **Dr. Walter Akuno** (Division of Academic Affairs); **Dr. Peter Bulli**, **Dr. Mary Orinda**, **Prof. Darius Andika** and **Prof. Reuben Mosi** (All from SAFS); **Prof. Chris Ojiewo** (ICRISAT/SAFS), **Dr. Solomon Ogara (**School of Informatics and Innovative Systems).
Overview of available domains of expertise in the project team	Plant breeding, Biotechnology, Climate Change, renewable energy, Genetics, Horticulture, Soil Science, Tropical Agriculture, Socio-economics and ICT
Comments on the expertise sought for at level of the Flemish HEIs	Gender expert, Process Engineer, Policy Analyst, Entrepreneur and seed system specialist

7.3. Project 3: Building Capacity for Research, Management and Control of Communicable and Non-Communicable Diseases

Objectives: State the objectives of the project. What do you want to realise through the project (medium-term (5 year) objectives). To what long term objectives will the project contribute (can be both internal and external to the university)

The Project's medium-term (5 year) objectives are:

1. To determine the overall disease burden in the Lake Victoria Basin of Kenya;
2. To establish a health and demographic surveillance system (HDSS) and a cancer registry for monitoring of targeted communicable and non-communicable diseases;
3. To establish state-of-the-art research and diagnostic molecular laboratories for communicable and non-communicable diseases;
4. To build capacity for early-stage researchers and mid-career professionals for communicable and non-communicable diseases through short courses, post-graduate training and post-doctoral programmes.

The Project's long-term (10-12 year) objectives will be as follows:

5. To build competencies of core healthcare workers for early recognition, diagnosis and management of targeted communicable and non-communicable diseases.
6. To build capacity of county governments to have sustainable and resilient health systems that are readily prepared to control disease epidemics and other emerging public health threats.

Explain the link with the context analysis, the programme objectives and the other projects. Detail the context analysis if needed (e.g. the specific theme, specific challenges of the departments involved, the local/sectoral context, etc.).

Communicable diseases (CDs) and non-communicable diseases (NCDs) form an integral part of life of the 14 million people living in the Lake Victoria Basin of Kenya. Available evidences have shown that NCDs especially cancers, diabetes and hypertension are rapidly taking over from CDs as main causes of mortality and morbidity in Kenya. National statistical projections show that by 2030, NCDs will be contributing about 47% of Kenya's mortality rates taking over from CDs (39%). The increase in NCD burden alongside endemic and chronic communicable conditions (Malaria, Tuberculosis and HIV/AIDS) pose considerable health system challenges. Furthermore, some of the NCDs such as cervical cancers exemplify health-related vulnerabilities as they disproportionately affect women, more so, younger women (30s and 40s)[29] especially those who are HIV infected and those of low socio-economic status. The ongoing SARS-Cov2 (COVID-19) pandemic complicates the situation and requires urgent measures to be put in place to address these issues. This Project will aim at building capacity in health research and investing in appropriate disease surveillance systems and molecular diagnostics to help stem the rising effects of CDs and NCDs in the Lake Victoria Basin region of Kenya. The Project's outputs will contribute to its long term goals of strengthening health systems in focussed counties in the Lake Basin. The Project will collaboratively work with **Project 1** (**Management of the LVB Natural Resources)** on environmental and behavioural determinants of health and disease; **Project 2 (Sustainable Agri-food Systems)** on food production and storage in relation to nutrition and health; **Project 5 (Climate Change Resilience and Ecosystems)** on climatic and environmental challenges influencing disease patterns in the Basin; and **Project 4 (ICT)** on ICT resources for research and data collection and management.

Describe the strategy of the project: how will it reach its objective(s)?

A comprehensive baseline survey will be conducted to accomplish medium-term objectives 1 and 2. The baseline studies will articulate; (i) gender segregated disease burden and how this affects vulnerable groups in the society, (ii) the status of disease prevention and control programmes, iii) the knowledge and skills gaps of health care managers and workers, and iv) disaster or health system preparedness for infectious disease outbreaks, such as the COVID-19 pandemic. The baseline survey will be conducted in 3 purposively selected counties: Siaya, Kisumu and Homa Bay. The results of which will facilitate identification of health priorities for the resident population and consequently inform the project's research, training and outreach activities.

In Objective 2 the project will establish two disease surveillance systems for monitoring disease burden over time. The first system will be a health and demographic surveillance system (HDSS) which will cover households and health facilities in three sub-counties of Siaya. The second system is a population-based cancer registry for Siaya County. Both surveillance systems will employ electronic data collection with tools developed using appropriate open source software and incorporating geographic information systems (GIS). In addition, under objective 3, the project will establish state-of-the-art high quality research and diagnostic molecular laboratories at the University. It is envisioned that the surveillance systems and the molecular laboratories will jointly support epidemiological, clinical and biomedical research for a broad range of communicable and non-communicable diseases. Studies of interest will include: i) the human papilloma virus and its causal relationship with cervical cancers in vulnerable women and young girls; ii) quality of care and survival for NCDs; and iii) chronic care organization at all health system levels in the community.

For sustainability, the established research platforms will serve as training facilities for postgraduate students in a broad range of health research fields as per objective 4. All training programmes will incorporate 'gap analyses' aimed at identifying soft skills to be enhanced alongside technical training. These include but are not limited to grant proposal writing, systematic reviews and meta analyses, basic statistics and reference management. Exchange programmes will see PhD students access study sites, hospitals and laboratories in Kenya and Belgium for periods of 3-6 months annually and allow for Flemish academics to visit JOOUST to facilitate research and training and vice versa. The project expects to train 10 PhDs and 20 Masters in the first five years and a total of 20 PhDs and 40 Masters by the end of the project. Also, in collaboration with existing training programmes, approximately 450 trainees will benefit from the project's short courses, Continuous Medical Education (CMEs) and on-the-job trainings (OJTs) during the course of the project. The combination of disease surveillance systems, molecular studies and postgraduate training will likely create interlinked research units.

High quality data generated from this project's research activities and technical support from beneficiaries of capacity building will enable partnerships with local county governments and other key stakeholders in the Lake Victoria region to improve health workers' capacity and strengthen local health systems thereby fulfilling the long-term objectives 5 and 6.

Analysis of end-users / final beneficiaries: identity the end-users of the project results and describe the uptake strategy of the project (incl. structural barriers for end-users).

Project 3 will directly benefit both the University and the populations residing within the Lake Victoria region of Kenya as follows;

(a) **The University:** Through establishment of dedicated health research units for continuous research and training at post graduate levels, and exchange programmes with collaborating Flemish and local universities.

(b) **County Governments:** Generation of high quality evidence will facilitate development of appropriate policies and strategies, and inform health care investments.

(c) **Hospital Administrators and Core Health Workers:** Improving health workers' knowledge and skills will result in a higher quality of health services offered within participating counties.

(d) **Local Communities:** Through community-based health promotion using Community Health Units (CHUs), communities will be empowered to make healthier choices and exhibit improved health seeking behaviour.

(e) **NCD Patients:** High quality research evidence the project aims to influence policy and local government health care investments towards the upgrade or establishment of specialized health services.

Presentation of the project team: present the project team, the available expertise and the expertise sought for.

Proposed local project leader	**Ms. Damar Osok (**Public Health & Epidemiology)
Local project team *(Other involved staff: professors, assistants, (administrative) collaborators, etc,). Also mention involved departments/faculties/universities.*	**Prof. Benson Estambale (**Division of Research, Innovation & Outreach; Local Coordinator); **Dr. Dickens Omondi, Dr. Elizabeth Omondi**, **Dr. Dan Onguru and Dr. George Ayodo** (all from the School of Health Sciences); **Dr. Elijah Museve** (School of Business and Economics); **Dr. Amos Otedo** (Kisumu County Referral Hospital)

Overview of available domains of expertise in the project team	Epidemiology, Medical Microbiology, Infectious Disease Surveillance, NCD/Cancer Surveillance, Public Health, Bioethics, Clinical Medicine, Hospital Administration and Management, Health System Strengthening, Health Services Management, Health Policy, Finance, IT and Geographic Information System (GIS).
Comments on the expertise sought for at level of the Flemish HEIs	Epidemiology, Biostatistics, Clinical and Biomedical Sciences, Biostatistics, Molecular Biology and (Histo)pathology Laboratory Science, Health Systems and Chronic Care Organization, Bioinformatics, Health Informatics, Geographic Information System (GIS), Health Economics, Health Policy, Internal medicine specialists and Oncologists.

7.4. Project 4: Strengthening ICT infrastructure to Enhance Research, Teaching and Learning

Objectives: State the objectives of the project. What do you want to realise through the project (medium-term (5 year) objectives). To what long term objectives will the project contribute (can be both internal and external to the university)

Project's Medium-term (5 year) objectives are:

1. To strengthen ICT infrastructure including security provisions supportive of integrated Information, Information Systems and Data architectures respectively and attendant community communication networks.
2. To strengthen service delivery in teaching and research through: (a) improved centre of e-learning, (b) improved library Services,
3. To strengthen capacity building through: (a) PhD supervision, (b) Curriculum development, (c) Staff exchange, (d) Workshops and conferences, and (e) Training

Project's Long term (10 year) objectives include:

4. To establish multidisciplinary laboratories through: (a) open source resources e.g. Python, (b) Data analytics (c) Artificial Intelligence and IoT, (d) Cyber security and Forensic, (e) GIS, and (f) System dynamics.
5. To strengthen outreach through digital literacy for gender empowerment
6. To establish a Centre for e-waste and Green ICT.

Explain the link with the context analysis, the programme objectives and the other projects. Detail the context analysis if needed (e.g. the specific theme, specific challenges of the departments involved, the local/sectoral context, etc.).

ICT is the backbone of Kenya's digital economy and has a strong potential to hasten economic growth and improve people's livelihood. ICT represents a key driving force in the achievement of the Kenya government's big four agenda (drawn from Kenya Vision 2030[30]) and which are: food security, affordable housing, universal health care and manufacturing. The Government of Kenya has also produced a blueprint that identifies the five pillars of the digital economy as follows: Digital Government, Digital Business, Infrastructure, Innovation-Driven Entrepreneurship and Digital Skills and Values. Adoption of digital economy is hinged on the growth of the five pillars. However, these pillars are faced with several challenges that must be realized if the country is to attain digital economy. Jaramogi Oginga Odinga University of Science and Technology (JOOUST) with its core mandate of capacity building, research and community service is well positioned to lead in technological advancement in order to produce a work-force with relevant knowledge and skills to address these pillars. Activities of this project will traverse across all the other five projects as follows: **Project 1 (Management of the Lake Victoria Basin Natural Resources)** by supporting in 1) mapping out land cover changes, land uses and Climate within the LVB, 2) Carry out mapping, inventory and classification and valuation of LVB biodiversity, 3) Application of ICT in establishing biodiversity monitoring and surveillance system, 4) Application of Soil & Water Assessment Tool (SWAT) to simulate the quality and quantity of surface and ground water and predict the environmental impact of land use, land management practices, and climate change, 5) Setting up of hydrologic based early warning system to mitigate water related disaster losses and 6) Setting up of institutional repository where they can share and disseminate their research findings; **Project 2 (Technical support for a sustainable food security and resilience building in Lake Victoria Basin).** ICT will be useful in setting up smart agriculture. It will also be applied in promoting collaborative learning, exchange programmes and outreach through e-learning; **Project 3 (Building Capacity for Research, Management and Control of Communicable and Non-Communicable Diseases).** ICT will support this project in mapping out the CD and NCD epidemics in the LVB to ensure they are not under reported or misunderstood. The data centre proposed in ICT project will help this project in analyzing biostatistical data; and **Project 5 (Strengthening Climate Change Resilience among**

Communities and Ecosystems in Lake Victoria Basin). ICT will work together with project 5 in the following ways; assist in developing ICT driven early warning systems in the basin, GIS and remote sensing. An institutional repository developed by ICT will also assist in disseminating reports and findings from this project.

Describe the strategy of the project: how will it reach its objective(s)?

Strengthen ICT infrastructure including security provisions supportive of integrated Information, Information Systems and Data Architectures respectively and attendant community communication networks: The ICT Infrastructure component will focus on the Connectivity Infrastructure, Infrastructure Security and Management Information Systems. Main activities for this project will include: a) Developing a full-fledged data centre at the Main Campus in Bondo hosting ERP system, email servers, file servers, web conferencing system, databases for research data, automated tools for online data collection, different data analysis software for quantitative and qualitative research, Knowledge Management Systems and E-learning System; b) Developing fibre Internet links to all campuses of the University that are not currently connected; c) Increasing internet bandwidth to enable high speed information access and collaboration between campuses and other research partners; d) Developing structured Local Area Networks with enhanced wireless footprint in all 5 campuses of the University; e) Developing a fully integrated Wide Area Network of the five campuses to enable seamless flow of information from the Data Centre at the Main Campus; f) Enhancing ICT infrastructure security to protect University's digital resources during both on-campus and remote access; g) Providing mechanisms for integration with High Performance Computing (HPC) platforms for research; h) Enhancing physical security using CCTVs and automated access control systems; i) Installing centralized uninterruptible power supply; j) Developing and implementing comprehensive disaster recovery and business continuity program for the University; k) Enhancing human resource capacity for ICT technical staff; and l) Deploy GIS systems to support research in spatial planning, agriculture, climate change, etc.

Strengthen service delivery in teaching and research: This will be done through strengthening JOOUST Centre of E- Learning and library services. Main activities will include a) Support in e-Learning Policy Development to enhance its effectiveness in offering its courses on both blended and online mode, b) build competence of teaching staff through training on blended/online instructional design and e-content development (OERs) of teaching and learning, c) expand the existing E-Learning lab with modern technologies and hardware, d) establish Audio/ Visual lab for e-learning content development, e) acquire innovative ICT solutions for Open Distance and Learning (ODeL), and f) develop content for courses to be offered through E Learning g) Setting up of students support call center. Activities in strengthening our Library will include: a) acquire relevant and up-to-date books on subjects of interest to VLIR projects, b) subscribe to relevant and up-to-date e-resources (e-journals and e-books) on subjects of interest to VLIR projects, c) subscribe to an anti-plagiarism software for improving the quality of scholarly articles, d) acquiring a library security system based on RFID and CCTV technologies for enhancing security of library resources, and e) provide user training on library services and technologies f) Enhanced Institutional Repository g) Establish a Bindery and Printing Press Unit to Support Scholarly Publications

To establish a Multidisciplinary Research Laboratory: This laboratory will assist other projects with data capture, storage, and analysis. Some of the important activities include: a) Data analytics lab b) Artificial Intelligence (AI) and Internet of Things (IoT) research and development where solutions for food security, climate resilience and environmental management will be developed, c) Build renewable energy farms monitoring system, d) Remote weather monitoring and modeling, e) IoT enabled home clean air systems, f) Disease modeling in crops and livestock, g) Risk modeling in crop and livestock production, h) Environmental monitoring and modeling, i) Non-communicable disease surveillance, j) ICT4D innovations, k) Develop data analytics related certifications , and l) Provide graduate education opportunities for new talents in IoT and AI. Other labs to be set includes Cyber and Forensic Lab, Mobile Computing Lab, System Dynamics and Geographical Information Systems (GIS).

To strengthen outreach through digital literacy for gender empowerment: Promote and Enhance Digital Literacy especially to those living in rural areas. Thus, the project aims to leverage access to ICT so that rural women and girls can obtain useful information to enhance their standards of living. It is believed that investment in ICT would be a key driver for this transformation and a vehicle for improved public and private service delivery, especially for rural areas. It will focus on girls and young women from underprivileged backgrounds, at secondary school, university, or out-of-school, on our mission to reduce the gender gap in ICT and empower more change-makers within the Lake Victoria Basin. Activities will include: a) conduct training in use of mobile apps in farming, marketing, health, sanitation and self-learning in collaboration with non-governmental organizations (NGOs) and b) develop digital literacy labs on our campuses and in situ in rural areas using a digital literacy moving laboratory(bus) fully equipped for end user training.

To establish Centre for E-waste and Green ICT: This will focus on how Green IT provides a potential way to tackle e-waste problem and specifically highlights the role of education and hence eliminate the environmental and health implications of E-waste.

Analysis of end-users / final beneficiaries: identity the end-users of the project results and describe the uptake strategy of the project (incl. structural barriers for end-users).

This project will benefit all the other projects in the JOOUST VLIR-IUC Programme, the University, community and industry. Improved connectivity will spur access to government digital services. The project will assist the University and the community with data capture, storage, cleansing, analysis, security, and online privacy. Such data will range from agricultural, climate, weather, environment and health. The developed data repository will be used by different experts from economics, agriculture, environmental sciences and health among others seeking to mine data for decision making in their respective domains. The project will assist the University offer quality education services to a global market from anywhere and anytime without interruption as one witnessed during this COVID-19 pandemic. The project will provide a platform and technical assistance to students, youth, women groups and the vulnerable member of our society to build IT applications to solve societal problems related to agriculture, health, climate, environment, education, business, child trafficking, and social. The project will help the community around LVB especially the girl child to sharpen their IT skill and embrace technology for gender mainstreaming. Other beneficiaries include NGOs, industry, local universities, colleges and high schools.	
Presentation of the project team: present the project team, the available expertise and the expertise sought for.	
Proposed local project leader	**Dr. Silvance Abeka** (School of Informatics and Innovative Systems)
Local project team *(Other involved staff: professors, assistants, (administrative) collaborators, etc,). Also mention involved departments/faculties/universities.*	***Dr. Solomon Ogara*** *(Computer Science),* ***Dr. Samuel Liyala*** *(Information Systems and Technology),* ***Dr. Joshua Agola*** *(Information Systems and Technology),* ***Dr. Festus Ngetich*** *(Library Services),* ***Dr. Paul Abuonji*** *(ICT Directorate)* ***Prof. Elisha Opiyo*** *(School of Computing and Informatics, University of Nairobi),* ***Prof. Antony Rodrigues*** *(ICT Directorate).*
Overview of available domains of expertise in the project team	The project has brought on board expertise on Data analytics, ICT4D, E-Learning, Library Services, Cybersecurity, ICT Innovations
Comments on the expertise sought for at level of the Flemish HEIs	Artificial Intelligence application in modelling, Internet of Things, Data Management, Gender expert

7.5. Project 5: Strengthening Climate Change Resilience among Communities and Ecosystems in the Lake Victoria Basin

Objectives: State the objectives of the project. What do you want to realise through the project (medium-term (5 year) objectives). To what long term objectives will the project contribute (can be both internal and external to the university)
Project's Medium-term (5 year) objectives are: 1. To establish climate and air quality monitoring and modelling and early warning system; 2. To strengthen the resilience of communities and ecosystem to climate vulnerability; 3. To enhance access to clean energy for service and productive use. **Project's Long term (10 year)objectives include:** 4. To enhance the livelihoods of communities in Lake Victoria Basin by building the adaptive capacity of communities and resilience ecosystems through knowledge-driven community-based adaptation initiatives supported by state-of-the-art modelling and early warning systems; 5. To entrench low carbon development pathway in the LVB through harnessing renewable energy resources for service and productive use.
Explain the link with the context analysis, the programme objectives and the other projects. Detail the context analysis if needed (e.g. the specific theme, specific challenges of the departments involved, the local/sectoral context, etc.).
Climate change is globally acknowledged as one of the most significant development challenges facing humanity. There is increasing evidence that climate change is directly affecting the social, economic and human development of countries.[31,32] Climate change is already a reality in Kenya, and its impacts are being felt widely. The effects of climate change and related disasters have the potential to adversely impact the majority of Kenyans, given that about 75% of the population depends directly on land and natural resources for their livelihoods. Lake Victoria Basin (LVB) is one of the regions in Kenya facing the greatest impact of climate change. Climate shocks such as floods in the Basin severely impact on local communities whose livelihoods depend on the Lake to

support agriculture, fisheries, and livestock. Further, the adverse effects of climate change in the Basin are expected to include eruptions of diseases such as malaria, typhoid and diarrhoeal and respiratory illnesses which disrupt health systems, increase poverty and affect ecosystems as well as impact on critical infrastructure across the region. These adverse impacts of climate change have combined with poverty, poor policy and poor institutional frameworks to make the situation even worse. Effective climate change adaptation recognises that women, men and children experience impact differently depending on where they live, how they sustain their livelihoods, coping mechanisms and the roles they play in their families and communities.[33]

Describe the strategy of the project: how will it reach its objective(s)?

Establishment of climate and air quality monitoring and modelling and early warning system – The project will establish a state-of-the-art climate and air quality monitoring and modeling system for long-term monitoring of climate and air quality around the LVB. Skilful climate forecasting and timely early warning forms the foundation of any operational climate centre. This output will harness the use of GIS and remote sensing as well as climate modelling technologies. The project will work with Kenya Meteorological Department to package and disseminate community-friendly early warning messages to support communities' climate risk preparedness and adaptation planning. The warning system will include forecasts on rainfall onset, cessation and distribution of dry/wet spells and temperature. Communities' indigenous knowledge will also be incorporated to increase the effectiveness of the systems. This output will be delivered with a strong collaboration with **Project 4 (ICT)**.

Strengthening the resilience of communities and ecosystem to climate vulnerability - The project will enhance community resilience through promotion of diversification of resilient livelihoods interventions such as smart climate agriculture, climate-resilient fishing technologies, sustainable natural resource management, etc. Further, the project will seek to generate socio-economic impacts of climate change in LVB. The project will, specifically, seek to promote adaptation interventions including technologies that address the needs of women, youth and other vulnerable groups. These activities will be implemented in collaboration with **Project 1 (Management of LVB Natural Resources)** and **Project 2 (Sustainable Agrifood Systems)** in areas such as promotion of climate-smart agricultural technologies, diversification of livelihoods, promotion of agro-business, promotion of nature-based enterprises etc. Working closely with Project 1 wild plants and animals will be identified and included in the inventory. The project will involve processes such as carbon flux monitoring from forest and other surfaces, modelling of Lake Victoria surface temperature as well as the broader climate modelling which has got a big impact on the biodiversity. The project will use SWAT modelling to monitor the impact of different land-use systems such as forest and agricultural on the environment. The project will also deploy ecosystem-based adaptation (EbA) for the wide adaptation measures.

Harnessing renewable energy – Lake Victoria Basin has abundant renewable energy resources, which include solar, wind, bio-energy and small hydros. Despite these potentials, over 90% of the residents of the Basin are still using traditional biomass for cooking while kerosene is the predominant energy source for lighting. The use of traditional biomass harms human health and the environment. It is estimated that exposure to smoke from such households results in 4 million deaths annually globally due to indoor air pollution (IAP) (or household air pollution (HAP)) related diseases, with millions more suffering from acute and chronic respiratory diseases, heart diseases, blindness and burns. Kenya records an average of 15,000 mortalities annually due to IAP related diseases. This is particularly critical in addressing the COVID-19 pandemic. Based on currently available knowledge and clinical expertise, older adults and people of any age who have underlying medical such as respiratory diseases and heart conditions are at higher risk for severe illness from COVID-19. The use of clean energy, therefore, has a significant contribution in mitigating the impacts of COVID-19. Further, the project will seek to harness renewable energy resource to enhance access to clean energy as part of the United Nations' Sustainable Development Goal 7.

Analysis of end-users / final beneficiaries: identity the end-users of the project results and describe the uptake strategy of the project (incl. structural barriers for end-users).

The project will mostly benefit the resource-limited rural communities whose standard of living and livelihoods are tied to improved agricultural productivity. Community seed producers, seed companies, and agro-dealers, research institutes, extension and NGOs will be imparted with skills to support building the capacity of small-holder farmers, including linkages to markets. The uptake strategy of the project will be the development of ICT supported inclusive and innovative extension and information system, studying (dis-)adoption patterns of technologies across mega- environments.

Presentation of the project team: present the project team, the available expertise and the expertise sought for.

Proposed local project leader	**Prof. Benard Muok**
Local project team *(Other involved staff: professors, assistants, (adminis-*	**Prof Regina Nyunja** *(Biodiversity),* **Prof Dennis Ochuodho** *(Natural Resource Management and Ecosystems),* **Prof Darius Andika** *(Food Security),* **Dr. Caleb Olweny** *(Climate Smart Agriculture),* **Dr. Solmon Ogara** *(ICT*).

trative) collaborators, etc,). Also mention involved departments/faculties/ universities.	
Overview of available domains of expertise in the project team	The project has brought onboard expertise on climate change and renewable energy, biodiversity conservation, natural resource management and ecosystem ecology, food security, plant breeding, climate-smart agriculture and ICT.
Comments on the expertise sought for at level of the Flemish HEIs	Climate change modelling expert; Climate change adaptation expert; Renewable energy expert

8. Budget indications

Total annual budget[1] applied for during Phase 1 IUC Cooperation:

Indicative project budget repartition[2]:

Title of project	Type[3]	Indicative % of project budget
Programme Support Unit-PSU (including Local and Belgian Administration Costs, Coordination and Project Leader Allowance, and Salary for Programme Manager)	Operations Unit	20
Project 1: Management of the Lake Victoria Basin Natural Resources	Academic theme-based project	15
Project 2: Building Capacity for Transformative Agri-Food Systems for Resilience in the Lake Victoria Basin of Kenya	Academic theme-based project	15
Project 3: Building Capacity for Research, Management and Control of Communicable and Non-Communicable Diseases	Academic theme-based project	15
Project 4: Strengthening ICT infrastructure to Enhance Research, Teaching and Learning (Basic ICT infrastructure and equipment)	Transversal Institutional Strengthening Projects (TISP)	20
Project 5: Strengthening Climate Change Resilience among Communities and Eco-systems in the Lake Victoria Basin	Academic theme-based project	15
Total		**100%**

[1] See budget section in the call document. Annual IUC budget in Phase 1 is a fixed amount.
[2] A part of the programme budget will be needed for the PSU. In this section we only want to see the relative weight of the different projects.
[3] 2 types of projects: academic theme-based projects or Transversal Institutional Strengthening Projects (TISP)

REFERENCES

1. World Bank (2018). Africa - Second Phase of the Lake Victoria Environmental Management Project (English). Washington, D.C.: World Bank Group.
2. UNEP (2006). Lake Victoria Basin Environment Outlook: Environment and Development. UNEP, Nairobi.
3. Shelley McGuire, FAO, IFAD, and WFP 2015. The State of Food Insecurity in the World 2015: Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress. Rome: FAO, 2015, Advances in Nutrition, 6(5): 623–624.
4. Alliance for a Green Revolution in Africa (AGRA) (2014). Africa Agriculture Status Report: Climate Change and Smallholder Agriculture in Sub-Saharan Africa. Nairobi, Kenya.
5. Biesalki HK (2013). Hidden Hunger: A highly impressive call to action for solving a global challenge. ISBN 978-3-642-33950-9
6. Gabriel D, Steven M. Sait William E. Kunin Tim G. Benton (2009). Food production vs. biodiversity: comparing organic and conventional agriculture. J. Appl. Ecol. 50(2):355-364
7. Wandiga SO, D Olago, M Marshall, M.Opondo, PYanda, R Kangalawe (2006). Climatic, Socio-economic and Health Factors Affecting Human Vulnerability to Cholera in the Lake Victoria Basin, East Africa. Ambio
8. UNEP (2004). Odada, E.O., Olago, D., Kulindwa, K.A.A., Bugenyi, F., West, K., Ntiba, M., Wandiga, S. and Karimumuryango, J. East African Rift Valley Lakes, GIWA Regional assessment 47. University of Kalmar, Kalmar, Sweden.
9. Anyah RO and FHM Semazzi (2004). Climate variability over the Greater Horn of Africa based on NCAR AGCM ensemble. Theoretical and Applied Climatology 86(1):39-62.
10. Ogallo LJ (1988). Relationships between seasonal rainfall in East Africa and the Southern Oscillation. Journal of Climatology 8 (1): 31-43.
11. Semazzi F and X Lian (2011). A Modelling and Empirical Study of the Climate of the Lake Victoria Basin of Eastern Africa. North Carolina State University Raleigh, Raleigh, NC, United States.
12. IPCC 2007 Climate Change (2007). Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Published for the Intergovernmental Panel on Climate Change. Cambridge University.
13. Cook KH and EK Vizy (2013). Projected Changes in East African Rainy Seasons. J. Clim 26: 5931-5948. DOI: 10.1175/JCLI-D-12-00455.1
14. Sillman J., VV Kharin, X Zhang, FW Zwiers, D Bronaugh (2013). Climate extremes indices in the CMIP5 multimodel ensemble: Part 1. Model evaluation in the present climate. JGR Atmospheres 118: 1716-1733.
15. Easterling DR., GA. Meehl, C Parmesan, SA Changnon, TR Karl, LO Mearns (2000). Climate Extremes: Observations, Modeling, and Impacts. Science 289: 2068-2074.
16. Le Treut H, R Somerville, U Cubasch, Y Ding, C Mauritzen, A Mokssit, T Peterson and M Prather (2007). Historical Overview of Climate Change. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
17. EAC (East African Community) (2011): Enhancing Safety of Navigation and Efficient Exploitation of Natural Resources over Lake Victoria and its Basin by Strengthening Meteorological Services (Authors: Semazzi, F. (Lead), S. Yuter, J. Kiwanuka-Tondo, L. Xie, C. Burleyson, B. Liu, K. Smith, P. Waniha (North Carolina State University); L. Rose (Atmospheric Technology Services Company, Norman, OK); R. Barakiza (Institut Geographique du Burundi), P. Ambenje (Kenya, Meteorology Department), A. Twahirwa (Rwanda Meteorological Service), H. Kabelwa (Tanzania Meteorological Agency), R. Wesonga (Uganda Meteorological Department), L. Gallo, and J. Mute (University of Nairobi and ICPAC, Kenya), and F. Kiludde (Uganda, UMEME).
18. Muli JR (1996). Environmental problems of Lake Victoria (East Africa): What the international community can do. Lakes and Reservoirs 2:47-53. https://doi.org/10.1111/j.1440-1770.1996.tb00047.x
19. Odada, E.O., Olago, D.O. and Ochola, W., Eds., 2006. Environment for Development: An Ecosystems Assessment of Lake Victoria Basin, UNEP/PASS
20. Gornall, J., Betts, R., Burke, E., Clark, R., Camp, J. et al. (2010) Implications of climate change for agricultural productivity in the early twenty-first century. Phil. Trans. R. Soc. B (2010) 365, 2973–2989. DOI: 10.1098/rstb.2010.0158
21. Zhao, C., Liu, B., Piao, S., Wang, X., Lobell, D.B. et al. (2017) Temperature increase reduces global yields of major crops in four independent estimates. PNAS 114: 9326-9331. DOI:10.1073/pnas.1701762114
22. Ray, D.K., West, P.C., Clark, M., Gerber, J.S., Prishchepov, P.V. (2019) Climate change has likely already affected global food production. PLoS ONE 14(5): e0217148. DOI: 10.1371/journal.pone.0217148

23. Sultan, B., Defrance, D., Iizumi, T (2018) Evidence of crop production losses in West Africa due to historical global warming in two crop models. Scientific Reports 9: 12834. DOI:10.1038/s41598-019-49167-0
24. Gan, Y., Liang, C., Hamel, C., Cutforth, H., Wang, H. (2011) Strategies for reducing the carbon footprint of field crops for semiarid areas. A review. Agronomy Sust. Devept. 31:643–656 DOI 10.1007/s13593-011-0011-7
25. Arora, N.K. (2019) Impact of climate change on agriculture production and its sustainable solutions. Environmental Sustainability 2:95–96. DOI: 10.1007/s42398-019-00078-w
26. Leinonen, I. (2019) Achieving environmentally sustainable livestock production. Sustainability 11:246. DOI:10.3390/su11010246
27. Karwacka, M., Ciurzyńska, A., Lenart, A., Janowicz, M. (2020) Sustainable development in the agri-food-sector in terms of the carbon footprint: A Review. Sustainability 12:6463. DOI:10.3390/su12166463
28. Harvey, C.A., Saborio-Rodriguez, M. Martinez, M.R. et al. (2018) Climate change impacts and adaptation among smallholder farmers in Central America. Agriculture & Food Security 7: (57). DOI:10.1186/s40066-018-0209-x
29. Parkin D M, Bray F I and Devessa S S (2001). Cancer burden in the year 2000. The global picture. European Journal of Cancer, 37, S4-S66.
30. Government of Kenya (2007). Kenya Vision 2030. Nairobi, Kenya. Website: https://vision2030.go.ke/
31. Arnell, N.W., J.A. Lowe, B. Lloyd-Hughes, and T.J. Osborn. 2017. The impacts avoided with a 1.5◦C climate target: a global and regional assessment. Climatic Change 147: 61–76.
32. IPCC 2014. Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
33. Ongoro, E.B., and W. Ogara. 2012. Impact of climate change and gender roles in community adaptation: A case study of pastoralists in Samburu East District, Kenya. International Journal of Biodiversity and Conservation 4: 78–89.