

IUC Extended Concept note

Call Institutional University Cooperation (IUC) 2022

GENERAL INFORMATION

Programme information
Country and region of the programme
Tanzania, Dar es Salaam
Programme title (linked to strategic/thematic focus area)
Establishing a new centre “the African Centre for Sustainable Cities Studies ” to build capacity in education, research, innovation and societal outreach in order to foster an Inclusive and Sustainable Built Environment in a rapidly urbanizing city, Dar Es Salaam (SDG 11 in Dar Es Salaam).
Programme Summary (Focus of proposed strategic area(s) and institutional strengthening activity)
<p>Dar es Salaam is expected to attain a megacity status by 2030 with over 10 million people, whereby its current population of 5 million will more than double. This increase will have profound implications in terms of labour markets, housing, service infrastructures, environmental management and city-wide spatial planning. Reality shows that urbanization patterns in African cities, including Dar es Salaam, are linked with complex challenges, such as: informal economies coupled with low rates of economic growth; expensive and low-grade housing; inadequate and poorly managed urban sanitation and infrastructures; and poorly planned and inadequately connected cities, which are vulnerable to climate and health disaster risks; inadequate utilization of data infrastructure in supporting governance of the city in the aspects of optimal allocation of resources and effective delivery of services. Ardhi University (ARU) proposes to develop an African Centre for Sustainable Cities Studies (ACS¹) in order to (i) build capacity in education and training, research, innovation and societal outreach to contribute in generating solutions to these challenges and contribute to the sustainable growth of Dar es Salaam and its wider region in line with the Sustainable Development Goals (SDGs) in general and SDG 11 in particular, and (ii) realize the ambition of becoming an internationally recognized, inclusive, civic university that responds to societal and environmental problems.</p> <p>The IUC programme shall adopt an integrated strategy, including: 1. Research, 2. Education and training and 3. Societal outreach. Interdisciplinary shapes these activities in 3 well-chosen pilot sites, building on iterative feedback loops that allow for a flexible adjustment of choices. By focussing on 3 selected and exemplary sites (city centre/coastal site/suburban site), the complexity that characterises the catalytic process of social and systemic change will be tackled. To ensure relevance of the expected outputs of the proposed IUC programme, all relevant stakeholders contributed to the development of this extended concept note and they will be involved in a participatory way in all the stages of the respective activities, including the conceptualization of the problem, the development of possible ways to respond and the dissemination of research results. In this approach we use the concept of the ‘Quintuple Innovation Helix Framework’ as model. Besides the university, the government, the industry and the public, the environment is taken up as the 5th stakeholder.</p> <p>The African Centre for Sustainable Cities Studies is the backbone of the project. In the ACS, the focus will be on 5 academic domains of change and two transversal. All strategies are defined in line with SDG11 and the SDG’s in general, and all activities take the specific needs and demands of ARU and the wider society into account. One of the functions of the centre will be to organize the research from the different research groups during and after the IUC programme and package them to a user-friendly form/format. The academic domains of change are 1) Land Use Planning, 2) Decent Housing, 3) Socio-Economic Development, 4) Urban Transport and 5) Cultural Heritage. The two transversal domains are ‘Gender and Participation’ and ‘ICT and Smart Sustainable and Inclusive Cities (SSIC)’. Green management is, as gender, incorporated in all domains of change.</p> <p>Figure 1 below visualizes and summarizes the integrated programme description (why, how, who, what and the short-term outputs, mid-term outcomes and long-term impact of the programme). A larger version of this figure, as well as additional information on the proposed IUC programme, can be found on the following website: https://sites.google.com/uhasselft.be/iuc-ar.</p>

¹ A list explaining the abbreviations used is available at the end of this document.

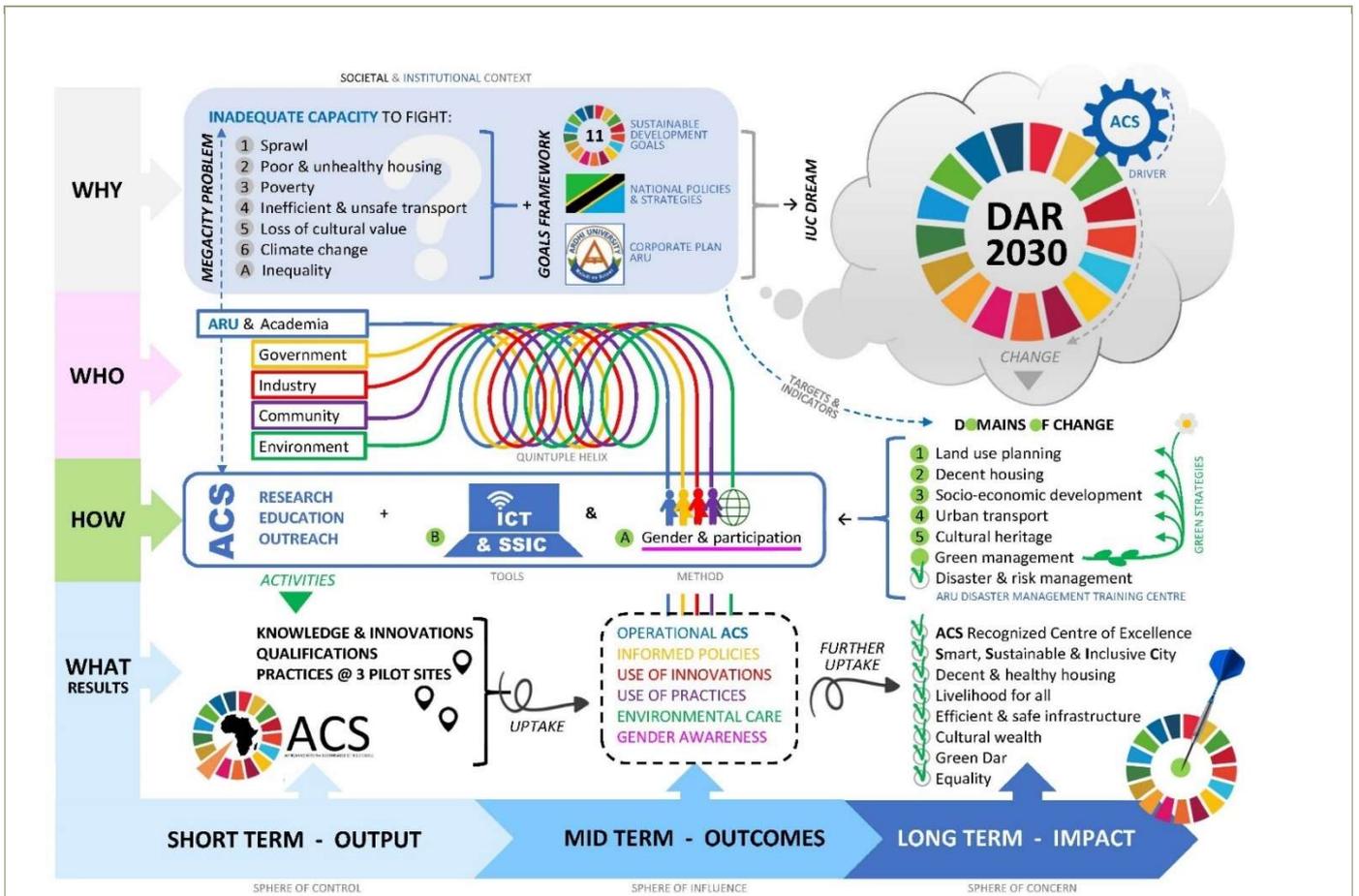


Figure 1: summary of the proposed IUC programme

Applying partner university (institution and proposed local coordinator)

Full name of the institution (+ abbreviation)	Ardhi University (ARU)
Name of the local IUC coordinator	Professor Gabriel R. Kassenga
Name of the authority of the local university (Vice-Chancellor)	Professor Evaristo Liwa
Applying Flemish university (institution and proposed Flemish coordinator)	
Full name of the institution (+ abbreviation)	Hasselt University (UHasselt)
Name of Flemish IUC coordinator	Professor Rob Cuyvers
Signature of the authority of the local university (Rector, Vice-Chancellor, President,...)	

Prof. Evaristo J. Liwa
(Vice Chancellor)

Prof. Gabriel R. Kassenga
(Local IUC Coordinator)

Signature of the coordinators (Flemish and local IUC coordinator)

Rob Cuyvers

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)?

This extended concept note was developed as an extension of the concept note submitted to VLIR-UOS in October 2019. Based on a joint needs analysis and workshop to develop the initial concept note, the team members agreed to embrace the SDG as main frame of reference, and to make SDG 11 in specific the cornerstone of the project. The targets of SDG 11 align with the domains of change. After the acceptance letter, and information of the selection of UHasselt as coordinating Flemish University, communication on the way forward started between the two institutions, and with a range of well-known expert professors from all other Flemish universities (UGent, UAntwerp, VUB and KUL) and university college PXL. In addition, ARU involved all stakeholders who were identified during the preparation of the initial concept note. A planned physical meeting with colleagues from Flemish universities had to be cancelled due to the COVID-19 pandemic, but online communication continued (through e-mails, online meetings at the individual project level, the coordination level as well as on the general programme level, e.g. on August 25th and October 27th, 2020). A meeting involving local stakeholders was held on August 18th and 19th 2020. During this stakeholders meeting, advisory boards for each domain were formed and these are the ones that will foresee the implementation of all domain activities during the programme implementation. During the development of the extended concept note, comments given by the VLIR-UOS selection commission (selection stage 1) were addressed as follows:

- **Limited disciplinary scope of ARU:** ARU will develop a multidisciplinary approach to deal with the worldwide problem of the sustainability of fast-growing cities. In the African Centre for Sustainable Cities Studies, a broad range of stakeholders and a network of Tanzanian universities with different disciplines will participate.
- **Gender mainstreaming:** Since ARU is committed to gender equality and aims to strengthen the implementation of gender mainstreaming within its own organisation, a transversal project on gender and participation has been included. This project will enhance the review and implementation of the existing ARU gender policy, ensure the academic projects include gender perspectives in their project approach and implementation and develop a research and education project (more details can be found in project 7.6, p. 30).
- **Reference to the National Strategy for Growth and Reduction of Poverty – (Mkukuta II – 2010):** This strategy was not mentioned because it was phased-out and replaced by The National Five Years Development Plan II (2016/17 – 2020/21), which is now referred to in the extended concept note.
- **Risk analysis:** The comments have been taken on board and therefore the risk analysis section has been improved (see section 5, p. 16).
- **Impact:** On the one hand, a range of stakeholders will be involved in the process in different ways, and on the other hand, the research and the participative approach will focus on 3 well-chosen pilot sites. This way, we will try to tackle the complexity that characterises the catalytic process of social and systemic change (which involves attitudinal and behavioural change and power relations).
- **Sustainability:** To ensure the sustainability of the project, representatives of all the relevant internal and external stakeholders and beneficiaries, including the end-users of the research outputs, participated in the development of this extended concept note. Their needs and demands, as well as their capacities to use new knowledge and applications, were taken into account during the development of the extended concept note (bottom-up approach). This IUC programme will give ARU the opportunity to build long-term, strong relationships with these stakeholders and end-users. As of the start of the IUC programme, each project will ensure direct contact with end-users focusing on dissemination from an early stage onwards (e.g. through sensitization activities, trainings to apply the new knowledge, etc.). This is important to ensure research uptake towards the end of our IUC programme. By establishing an African Centre for Sustainable Cities Studies (ACS) the different academic and transversal projects in this process will be embedded firmly within ARU.

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.**

Dar es Salaam and SDG 11

According to the UN population forecasts, Tanzania's urbanization process is occurring faster than in other East African countries with an average annual urban growth of 5.4% (UN, 2018). In 2018, the estimated population of Dar es Salaam was about 5 million. By 2030, the city will achieve the 'megacity' status (+10 million), possibly reaching a population of 21.4 million people by 2052 (UN, 2016) due to high birth rates and increasing migration to Dar es Salaam. This **rapid urbanization** causes significant **challenges** including a growing number of informal settlements which have inadequate and overburdened infrastructure and services (e.g. waste collection, water and sanitation systems, roads and transport), worsening air pollution and unplanned urban sprawl without surveyed and serviced land for housing development and which lack security of tenure (UN-Habitat 2015). Over 70% of the population lives in informal settlements and about 61% of the city's built-up area is covered by informal settlements without basic services (Gwaleba and Masum, 2018). Furthermore, green spaces are diminishing fast and vegetated surfaces are increasingly being sealed by rapidly built-up areas (Lindley et al. 2015). These challenges attenuate the city and its ecosystems, thereby increasing their **vulnerability to climate change** linked to sea level rise, flash floods, typhoons and storms (Kebede and Nicholls, 2011). The widespread proliferation of scattered neighbourhoods that lack planned transport and infrastructure undermine the city's ability to offer competitive advantages in cost effectiveness and job creation from investments.

By addressing the above challenges with the ACS, Dar es Salaam will become more inclusive, safer, more resilient and more sustainable, contributing significantly to reaching the SDG targets and SDG 11 in particular, in the different domains of change:

1. Land use planning (SDG 11.3, 11.5, 11.6, 11.7, 11.A, 11.B)

Dar es Salaam faces serious challenges in physical planning as a result of lack of proper citywide land use plans and poor urban development control leading to mushrooming of informal settlements as well as unorganised and unproductive land uses (Kombe, 2010). As such, land allocation becomes an exclusive and politicised market with little incentive to ensure equitable distribution, access and ownership for poor and marginalised groups especially the widow, women and the elderly. Furthermore, the uncontrolled city development has compromised both quality and quantity of urban green spaces and their ability to support food production, stormwater drainage, groundwater recharging, erosion control and recreational services (Gómez-Baggethun & Barton, 2013). Efforts to formalise and regularise these settlements have not yielded adequate and safe housing with basic services. As such, the settlements are prone to land use related conflicts, thereby threatening peace, security and environmental sustainability. Moreover, the socio-cultural behaviours and attitudes are not linked to the current urban planning practices. Similarly, the livelihoods discourse which is causing problems even in planned areas e.g. infringement of pedestrian ways as a result of carrying out informal businesses is missing. In addition, regional (village) planning is conducted as a way to confirm land uses (the science component is missing). This contributes to lack of important information like land capability (suitability) assessment which is a scientific way to make decisions or suggestions on the best land use options. In these views, the focus will be on how to facilitate negotiations among all actors involved in the regularisation process (a process which is anyway taking place). Such a negotiation process may require other tools, roles, protocols, etc. (ref. comment of the selection commission on systemic change). Hence, on the one hand, research is needed to create an understanding on efficient urban and regional land use planning in order to improve city management and housing so as to effectively contribute to inclusive and sustainable urbanisation. On the other hand, geospatial technologies and artificial intelligence are needed to be utilized to evaluate and study urban environments. In this case, issues of urban morphology, urban sprawls and growth trends are of high importance for decision making.

2. Decent housing (SDG 11.1, 11.5, 11.6, 11.C)

The presence of informal settlements has complicated efforts to provide centralized services for **sanitation systems** and therefore offsite sanitation coverage remains low. More than 70% of the population in Dar es Salaam use on-site sanitation systems and out of this about 52% is unsafely managed (Sandec, 2015) and more than 66% of the onsite facilities are unimproved (Household Budget Survey, 2019). The systems are affected by poor technologies, improper practices, and inadequate resource recovery options. Improper solid waste management as affected by poor mobility and accessibility further complicates the situation. Solid Waste production in Dar es Salaam is estimated to be about 4,252 tons per day (0.815 kg per capita per day) of which about 59% is managed, the remaining is left near house premises, in open pits, streets, markets or storm water drainage affecting the city's beauty (United Republic of Tanzania (URT), 2014a). Resource recovery from both liquid and solid wastes is affected by limited knowledge on the appropriate and affordable technologies as well as poor housing characteristics that are incompatible with their installations. The above highlighted problems may ultimately lead to high operation costs, environmental pollution, loss of resources and nuisance. Organic solid wastes can be properly treated and be used as fertilizers in green spaces for city beautification. It can also be used as a source organic fertilizer to support urban agriculture to ensure development of agri-food industry (see socio-economic domain below).

On the other hand, portable **water supply** in off-grid areas is inadequate and often polluted due to leaking water pipes that are contaminated with poorly managed and leaking on-site sanitation systems. Strategies for integrated water management involving sustainable practices such as rainwater harvesting are not adequate. Some residents in peri-urban areas use other water sources including private water vendors supplied from shallow wells that are in close proximity to pit latrines (Mwafubela, 2017), leading to potential risks of contamination and spread of waterborne diseases. About 18.5% of the residents in urban areas of Dar es Salaam, of which most are women and children, spend more than 30 minutes to obtain water for drinking purposes (Tanzania Demographic and Health Survey, 2016).

Despite the fact that efforts have been made by the Government to increase the rate of electrification, electric energy provision in Tanzania is still a challenge. The Renewable Energy Working Group (REWG) reports that electrification is expensive as it requires high cost of transmission and distribution infrastructure per customer. Moreover, limited knowledge, absence of demand consideration, lack of maintenance, social-cultural and acceptability are the barriers for the implementation of **renewable energy** technology (such as Solar PV technology and biogas from waste) (Mittlefehldt, 2018). Energy reports (International Renewable Energy Agency 2017; Practical Action (Organization), 2016) indicate that electrification generally boosts-up rural economy through agro-food activities, better health and education and poverty reduction.

Rapid urbanization is accompanied by a high housing demand and the need for enormous quantities of **construction materials**. This already resulted in increasing prices for basic construction materials, such as cement, and in shortages on the market. Additionally, the production process of many commonly used construction materials has a severe environmental impact due to high amounts of embodied energy and CO₂ emissions and the depletion of scarce resources. According to the 2012 Population and Housing Census, in Dar es Salaam, cement-based bricks are the main walling (95%) and flooring (88.2%) materials for dwelling units, which is the highest in urban and rural areas of Tanzania (URT, 2014b). Besides the high CO₂ emissions associated with cement production, raw materials and aggregates are mostly extracted from quarry sites and transported over larger distances, worsening the traffic, consuming non-renewable minerals and negatively affecting the environment. At the end of their life cycle, construction materials are only recycled to a very limited extent in Tanzania (20%, whereas the rest is thrown away, according to Sabai, Lichtenberg et al. 2011) and only for low-value applications such as landfill and foundations (i.e. downcycling). In order to support sustainable construction and material use in Dar es Salaam, the potential of circular building design, the reuse of building materials and components and the use of recycled aggregates and other low-impact materials needs to be further explored, taking into account not only environmental, but also social and economic criteria.

3. Socio-economic development (SDG 11.1, 11.5, 11.6, 11A, 11C)

All over the world, cities are recognising the pivotal role of food in the evolution towards more resilient and sustainable societies, including economic development and social wellbeing. This is reflected in (newly established) global networks, such as Milan Urban Food Policy Pact (MUFP) or RUAFA Global Partnership on Sustainable Urban Agriculture and Food Systems; or in the growing number of metropolises (such as Sao Paulo in Brazil (Amorim et al. 2016) or Rome (Sonnino, 2009). Bordering the Indian Ocean, the metropole Dar Es Salaam is a diverse setting, with land and sea offering resources as well as challenges. Also, in the context of the rapid expansion of Dar es Salaam, there is the challenge of 'feeding the city' (Steel, 2008), i.e. assuring the availability and accessibility of nutritious, healthy, appropriate and affordable food. Midst to this challenge, sustainable urban foodscapes may offer the opportunity to foster environmental health and livelihood sufficiency (Mikkelsen, 2011). A foodscape deals with the food-people-land nexus (Vonthron et al. 2020). It is a relational network of spatially proximate as well as more distant relations, including interconnected physical, socio-cultural, economic and policy elements at both micro and macro-levels (from household level to regional and international level). In other words, it is the spatial manifestation of and social relations between food provisioning activities (from production, to processing, distribution, sales, cooking, eating, and waste disposal). The historically grown foodscape of Dar es Salaam is a 'symbiotic food system', based on the activities of a multitude of small-scale and interdependent actors, ensuring the provision of food for all communities, and creating opportunities for a diverse set of agri-food entrepreneurs that operate in the local food production, processing, or retail in its broadest sense (Wegerif and Hebinck, 2016). There is no corporate vertical or horizontal integration and little to no state coordination. This organically grown entrepreneurial environment poses challenges for governance, and demands for new types of partnerships (SDG 17) to be able to allow the transition towards more sustainability and resilience. While governance actors and institutions used to be fragmented along the different activities of commodity chains, a food system view requires coordinated and collaborative action of all these actors (van Bers et al. 2019).

A particular focus on agro-entrepreneurship for women and youth, and on empowerment of marginalized groups in participative governance of local food systems, is important to bring understanding of the barriers, incentives and disincentives towards city growth and investments.

4. Urban Transport (SDG 11.2)

Inefficient physical planning of Dar es Salaam city has led to major challenges of coping with extreme levels of traffic congestion linked to: 1) the rapid population increase, 2) the spatial city expansion with increased levels of commuting, 3) the sharply increasing use of motorized vehicles, 4) the mono-centric city structure with a few ring roads or high level roads to meet the increased demand (Melbye et al. 2015). About 63% of residents in Dar es Salaam use public transport, 15.2% use private transport and 21.7% use other modes of transports such as walking, bicycle, motorcycles and tricycles. Due to lack of adequate infrastructure in the city, vehicles spend significant time in traffic congestion (Gwaleba, 2018) leading to one person spending about 170 minutes per day in travelling to work. Public transport systems except Bus Rapid Transport (BRT) are operated without strict routes/timetables. The large manufacturing industries, commercial centres, community facilities such as health, education and market centres are largely serviced by road transportation systems which add another layer of mobility and accessibility challenges. Poor transportation networks, increasing road accidents and insecurity characterise the city transport system with women, people with disability, elderly and children being the most affected. Air pollution in Dar es Salaam has been attributed to the increased number of vehicles, and lack of conservation measures to transportation corridors and right of ways. For example, higher sulphur dioxide gas, suspended particulate matter and lead concentrations as compared to WHO maximum limits have been reported in the city (Jackson, 2004). The polluted air poses health risks linked to respiratory diseases. The proposed IUC programme will research and contribute to feasible solutions that can be applied to minimize transportation difficulties and air pollution thereby contributing to SDG 11 target 2 on safe, affordable, accessible and sustainable transport system for all, improving road safety, with special attention to the needs of those in vulnerable situations (women, children and persons with disabilities as well as elderly) and environment.

5. Cultural heritage (SDG 11.4)

The history of Dar es Salaam is identified, among others, by historical buildings, relics and structures that carry and preserve cultural identity and memory. However, many historical buildings and sites of historical and cultural value are being neglected, and even demolished. Due to a lack of resources and planning, they are left to deteriorate beyond repair. Revitalizing the historic urban environment and preserving architectural heritage potentially impacts several social, cultural and economic domains: (1) influence on wellbeing of local communities and their cultural identity and memory, (2) influence on the quality and meaning of specific areas in the city that can act as leverage for new development, (3) influence on businesses, (4) role in the tourism sector, (5) influence on the real estate prices and the renovation and repair of the built environment, (6) influence on the ecological situation and rational use of resources (Gražulevičiūtė–Vilėniškė et al. 2011). Also, the city structure is threatened from demolition to pave way for new, large-scale modern buildings or structures, thereby erasing important layers of the history, local identity and the heritage of the place, the city and her surroundings. The conversion of historical buildings into modern structures amounts to loss of significant knowledge on architecture, construction materials and techniques as well as immaterial aspects such as craftsmanship and traditional knowledge of building techniques. In the past decade significant heritage sites have disappeared. Inventories of valuable heritage sites exist, but policy instruments are very limited to protect them and as such, traces of Tanzania's past are threatened. Generally, there is lack of awareness among the society on the importance of architectural heritage in socio-economic development and sustainability. Coupled with the shift of the government offices from Dar es Salaam to Dodoma Capital city and hence the introduction of new uses and functions, the city is likely to lose its architectural identity and hamper tourism and livelihoods unless deliberate initiatives are taken to protect the city. Research is needed to improve this understanding and identify effective spatial models to guide sustainable development of facilities with a potential to promote and protect the world's cultural heritage.

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.**

As earlier explained, ARU offers integrated training, research and public services in the fields of land and built environment under one roof, and therefore it is a critical player in spatial planning; development economics; architecture; urban transport planning; environmental science, technology, and management; land management; geospatial sciences and technologies; built environment at large and allied fields. ARU is therefore best positioned to contribute to **environmental solutions**, especially the realisation of SDG 11 in Dar es Salaam (the core topic of the project). Although there are other universities, which have started offering some of the fields that historically belonged to ARU, the university is the only one in Tanzania and East and Central Africa where training of all professions in land and built environment are offered under one roof.

1. Academic capacity building

Resources allocated to research and capacity building by ARU are currently **limited**. ARU does have a strong network with societal players (as argued in a later section), on which it could depend to take up a more civic role. It currently lacks the budget and experience to systematically involve this network in their teaching and research, particularly in new areas such as cultural heritage and urban transport. In terms of research, the university has inadequate research funding sources, which cannot contribute to the long-term plans of the university in knowledge creation and solving problems in the built environment, especially in Dar es Salaam. The value of most research projects at ARU are under 100,000 USD. Although these projects have contributed to boosting research culture at ARU, the low budget limits the possibility to have research outputs that have significant impact to the society and the institution.

With respect to **human resources**, ARU has currently 260 academic staff. Out of these, 14 are Professors (11 male; 3 female), 25 Senior Lecturers (15 male; 10 female), 46 Lecturers (26 male; 20 female), 113 Assistant Lecturers (86 male; 27 female) and 62 are Tutorial Assistants (33 male; 29 female). It is therefore evident that only 33% of staff (Lecturers to Professors) can adequately handle research projects and training in their domains but **67% of staff** (Tutorial Assistants and Assistant Lecturers) **need Master's and PhD training** respectively. Low numbers of staff at professorial levels show that the capacity of the university to write fundable proposals for large grants is limited. This was one of the shortcomings identified in VLIR-UOS country strategy (2011). About 19 academic staff with PhDs are expected to retire within the next five years and an additional 20 will retire in 6 to 10 years to come. Therefore, there is an urgent need to build capacity of available young researchers.

ARU members of academic staff have been publishing in journals recognized by the Web of Science as an outlet for their research outputs. For example, between 2015 and 2017, ARU published about 35 articles in journals indexed in the Web of Science. The number of articles is not adequate, but indicates the potential capacity of the university to conduct high quality research. In 2018, ARU enrolled a total number of 3,868 and 256 undergraduate and postgraduate students, respectively. The ARU Medium Term Strategic Rolling Plan (MTSRP) (2019/2020 – 2024/25) requires ARU to enrol a total of 9,969 and 901 undergraduate and Postgraduate students, respectively. It also envisages to increase the number of postgraduate programmes. ARU established five PhD Programmes between 2016 and 2019. In the next five years ARU expects to establish another five (5) new postgraduate programmes according to its strategic plan. The expected increase in the number of enrolment and new postgraduate programmes indeed require well trained academic staff with a PhD degree and with adequate research experience.

2. Inclusiveness and gender

ARU understands that one of the pillars of sustainable development is **inclusiveness**. In this regard, the university has a directorate of Gender Dimension Unit which is responsible to overseeing the social diversity and implementation of gender sensitive policies to mainstream gender issues into the day-to-day operations of the university. This operation is guided by the Gender Policy 2008 and its Action Plan, Anti-Sexual Harassment Policy and Anti-Sexual Harassment Policy Implementation Action Plan, 2018. The gender policy of 2008 is past overdue for review. Nevertheless, its implementation has been fostered by the ARU MTSRP (2017/18-2019/20). The policy has assisted in undertaking several workshops, campaigns and seminars to create gender awareness to the university community. This awareness is mainly based on improving gender relations amongst the ARU staff and students community. Gender issues are advocated in current major policy and curricular reviews and operations. Following the changes within the gender issues discourses and environment, the university has limited research, teaching and consultancy capability. There are only 3 standalone gender courses offered in 2 undergraduate and 1 postgraduate degree programs despite that the degree programs offered at ARU are aimed to tackle societal and environmental problems affecting the communities. Limited engagement with gender related issues is owed to financial constraints, inadequate links with national and international organs and inadequate qualified staff.

At this moment, ARU has **limited expertise in civic participation** and empowering physically, socially, culturally and economically disadvantaged groups. On the other hand, the ARU Research Policy insists on building strong linkages between the university research and industry for the benefit of both parties. However, the technology transfer infrastructure at ARU, such as technology transfer offices, incubators and technology hubs have not been developed.

3. ICT infrastructure and expertise in Smart Sustainable and Inclusive Cities

ARU understands the potential of ICTs in enabling and accelerating the Sustainable Development Goals (SDGs). ICT can contribute towards sustainable cities and communities in the form of infrastructural and application support in areas such as intelligent transportation systems and smart management of water resources and sanitation services. While some cities globally are racing towards becoming smart by using ICT to support city management (Gutierrez et al., 2015), Dar es salaam remains behind in this pursuit. ARU being the only institution in the country with a strong focus on sustainable city studies, **lacks ICT capacity** (human and infrastructure) that can enable studying smart sustainable and inclusive cities and the use of ICT in education (e.g. blended/online learning), research and societal outreach. Inadequacy in ICT not only limits the understanding of smart cities but

also challenges the ability of the university to disseminate knowledge through ICT. Therefore, through this programme, the university aims at building fundamental academic & research capacity to support the transition towards a Smart, Sustainable Inclusive Dar Es Salaam and guide the strategic development of smart sustainable city solutions.

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.**

Ardhi University is a public university established in 2007 under the Tanzania Universities Act of 2005 and Ardhi University Charter of 2007. Its mission is to be a leading centre of excellence in knowledge generation and dissemination responsive to the dynamics of the national, regional and global conditions. It also has a vision of becoming a **leading civic centre of excellence in providing innovative and integrated learning, research and public services** that advance sustainable development at national level and beyond, especially on land development. Being a civic centre, ARU will be a university that is responsive to problems facing the community surrounding it. Currently, its operations are guided by the ARU Corporate Plan (2019 – 2029) which emphasizes the need to conduct **research that aims at solving societal problems** in order to increase its relevance to the society. ARU is the **only institution** in East and Central Africa **offering integrated training, research and public services** in various disciplines related to the **land and built environment** under one roof. ARU is unique in carrying out applied research whose outputs significantly contribute to **Sustainable Development Goal (SDG) 11** which aims at **making cities and human settlements inclusive, safe, resilient and sustainable**.

In the next ten years, ARU envisages to take a leading position in East Africa in addressing critical societal challenges in cities such as traffic congestion, poor housing and services, land use conflicts resolution, low economic growth, sustainable local food systems, preservation of cultural heritage, gender mainstreaming and climate change. ARU will, therefore, embark on human resource capacity building, research, public outreach in the mentioned domains and make all its operations ICT-based. By 2030, ARU expects to have a highly skilled community of scientists with access to an improved research environment, to effectively communicate research outputs to engage, inform and support policy decision-making.

The proposed IUC programme focuses on SDG 11, but consciously takes into account synergies and conflicts between SDG 11 and the other SDGs as presented in figure 2 on the right side. Furthermore, this IUC programme is built upon different **National Policies and strategies** such as the National Five Years Development Plan II (2016/17 – 2020/21) and is responsive to the ARU Research Agenda. The programme will thus contribute to the common efforts of alleviating poverty and inequality among the Tanzania populace.



Figure 2: synergies between SDG 11 and the other SDG's

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.**

ARU has strong links with **government ministries and agencies** (Local Government Authorities; Ministry of Lands Housing and Human Settlements Development; Ministry of Water and Irrigation; Ministry of Works, Transport and Communication; Disaster Management Department of the Prime Minister's Office; Urban Water and Sanitation Agencies; Ministry of Agriculture; Ministry of Health, Community Development, Gender and Children), as well as with **private sector**. This emanates from the fact that a considerable number of employees in these institutions and in the private sector are ARU graduates and, most importantly, the university provides technical and policy advice to these institutions. For example, ARU has been offering services to Local Government Authorities in preparation of different land use plans.

ARU has a strong link with **professional bodies** for disciplines that are taught at the university. The stakeholders are involved in curricula review and development of new programmes.

ARU has also maintained research networks with **international organisations** such as the World Bank, DAAD, BMZ, USAID, the EU, DANIDA, WFP and SIDA. These links have facilitated capacity building at ARU in terms of training of academicians at MSc and PhD levels as well as building capacity in research undertakings.

ARU networks with **local communities and Civil Society Organisations** (CSOs) including NGOs such as WAT-Human Settlements Trust that deals with decent housing under women's group initiatives, and Community Based Organisations (CBO's) such as Hanna Nassif and Tabata where ARU provided skills on upgrading informal settlements.

Through outreach programmes, ARU has conducted training to local communities in District Local Government Authorities on land use and management as well as natural resources management (e.g. alternative energy technologies using waste). ARU has also created networks in research cooperation with **national higher education institutions**, including the University of Dar es Salaam and Sokoine University of Agriculture. Furthermore, ARU has collaborations with other **African universities** such as Stellenbosch University and University of Johannesburg in South Africa, Kwame Nkrumah University of Science and Technology in Ghana and Makerere University in Uganda. ARU also collaborates with **European universities** such as Hasselt University in Belgium (Master's exchange and joint PhD's), TU Dortmund in Germany (Joint Master's programme) and the Swedish University of Agricultural Sciences and KTH Royal Institute of Technology in Sweden (Double PhD Degree Programme). These collaborations have improved ARU's visibility and its capacity in training, research and public service delivery.

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.**

Dar es Salaam will be a megacity by 2030. This IUC has the ambition to contribute to **making Dar es Salaam and its wider region in 20 years to be the most sustainable city in East Africa** in accordance with the different targets of UN SDG 11. This demands evidence-based knowledge and strategies on planning of spatial growth, decent housing, productive economic activities and sustainable food systems, efficient and safe transportation, and management of natural and cultural ecosystems, for all. **ARU envisages to be in 10 years' time, an internationally recognized, academic centre for integrated, participatory and problem solving approaches in training, research and public service;** offering: (i) people-oriented training for the East and Central African Region (with blended learning); (ii) applied research to support policy makers, industry, community and academia; (iii) community services, built up with all stakeholders, including the communities. To support this institutional strategy, the IUC will establish an **African Centre for Sustainable Cities Studies (ACS)** in which ARU staff and stakeholders, and Tanzanian, East-African and Flemish universities will collaborate. Transdisciplinarity will be a key feature of their work. Innovations of the ACS will target academia, government, industry, civil society and the environment (quintuple helix). This will contribute to the realization of one of the core values of ARU which is 'excellence', by ensuring top quality operations are embedded in education, research and public services.

This IUC will improve human capital building with a focus on equity through **Master and PhD training** and enhance research support by **funding research projects** in areas identified in the institutional strategy. The research environment and learning will be enhanced through the **improvement of ICT infrastructure and ICT based research operations** (Smart Sustainable and Inclusive Cities). To tackle the gender imbalance in academic staff (171 male (66%) and 89 females(34%)) a specific, **affirmative approach** will be set up to bring **gender balance**. This involves availing research and training opportunities for female staff so that they can be promoted to higher academic and research ranks. This, in turn, will enhance nurturing enrolment of more female students who are currently few (39.2%) as compared to male students (60.8%). Therefore, this IUC will ensure that participation is gender balanced in terms of education, research and outreach. This will help ARU to realize its core value, '**equity**' by ensuring equal opportunities and non-discrimination on the basis of personal, ethnic, religious, class, gender or any other social characteristic, using concrete actions and strategies as explained in the gender and participation project (project 7.6, p. 30). The **participatory community outreach services** will also be improved through training (both short and long term). These operations will be implemented through cooperation with Flemish and other Tanzanian Universities such as the National Institute of Transport and Mzumbe University. The successful implementation of the IUC will make ARU one of the **top-ranked universities in Sub-Saharan Africa**. This will be achieved through the production of high-quality research and publications funded under the cooperation. Hence, in 10 years, ARU will be a vibrant, motivated and highly skilled community of scientists, a centre that produces research outputs that have **direct impact and application in solving societal problems as stipulated in SDG 11**.

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.**

By 2030, Dar es Salaam will achieve the ‘megacity’ status. This **rapid urbanization** causes significant **challenges**. Solutions to complex problems in rapidly urbanizing cities need an **integrated approach**. The proposed IUC consists of domains of change which are crosscutting and build on one another. The transversal ICT & SSIC project will integrate the solutions and knowledge generated to develop a smart city model that will ensure sustainability of the city. As stated in the institutional context analysis, ARU needs to increase its capacity in training, research, supporting infrastructure and community outreach. Hence, the IUC aims at **strengthening ARU’s organisation and capacity to train, carry-out community-based research and enhance community outreach programmes through**, among others, the establishment of an **ACS**. The IUC will develop training and research with a societal impact as Dar es Salaam becomes a megacity (in accordance with the local context analysis and the domains of change in which ARU has a vast experience). As mentioned, the IUC effectively addresses all 7 targets (SDG 11.1-11.7) and all 3 indicators (SDG 11.A-C) of SDG 11 primarily, as well as several aspects of related SDG, as is detailed here below in the domains of change:

1. Land use planning: Rapid urbanization of cities, other urban centres and rural areas (which surround cities and form the rural-urban linkages) amidst ineffective development control has resulted into unregulated development, growth of informal settlements and land use conflicts. This situation culminates into sprawling cities beyond the servicing capacity; dysfunctional city structures and urban service ecosystems; and challenges in land governance both in cities and rural areas. In addition, cadastres which support physical and land use planning do not sufficiently address the current planning needs of the users. Therefore, there is a need to develop a **participatory planning and conflict management framework** for resolving land use issues and effectively undertake development control for the purpose of conserving the environment and ensuring liveable cities. This challenge will be tackled in project 7.1 (p. 20).

2. Decent housing: Dar es Salaam is facing challenges in housing, water supply and sanitation. The loss as a result of poor sanitation is estimated to be US\$ 206 million (Water and Sanitation Program, 2012). This domain aims at building capacity to plan and manage decent housing with **efficient and adaptive sanitation, energy and water supply systems making use of sustainable materials and construction techniques** and adoption of feasible and affordable treatment and resource recovery technologies, creating an enabling environment through policies, guidelines and well-defined institutional arrangements. The outcomes include: decent housing, improved public health, sanitation and access to clean and safe water, increased use of renewable energy, sustainable materials and techniques and enhanced use of organic solid wastes in enhancing green spaces in the city. The project will also attain improved livelihood through sanitation business which will ultimately positively affect community wellbeing and lessen the burden to women and children. This challenge will be tackled in project 7.2 (p. 22).

3. Socio-economic development: Urbanizing cities are confronted with considerable rates of unemployment amid untapped and under-exploited economic opportunities. Essentially, unemployment substantially affects the youth, women and other marginalized groups, majority of which rely on informal economy. Nonetheless, the informal economy has not received requisite attention by policy makers (UNDP, 2017), and existing as well as emerging urban and peri-urban economic opportunities such as in agripreneurship, agri-food industry and agri-food tourism are largely under-exploited. The aim of this domain is to generate knowledge as well as innovative strategies for enhancing inclusion of communities as well as their ability to take advantage of economic opportunities sustainably. The outcome will be **enhanced participation of communities, particularly youth, women and other marginalized groups**, in positive socio-economic development processes of Dar es Salaam. This challenge will be tackled in project 7.3 (p. 24).

4. Urban transport: Transportation in Dar es Salaam is challenged by mobility constraints, road safety issues and proper public transport management systems. This domain aims to **improve the traffic safety of city dwellers, to reduce the transport poverty of vulnerable population groups** (like women, elderly or disabled persons), to **improve the efficiency and sustainability of the transport system** (by improving the public transport and non-motorized transport modes), and to **improve the supply chain strategy**. The outcomes will lead to a safer driving behaviour; less transport problems by vulnerable population groups; a sustainable modal shift, reducing the contribution of motor transport, traffic congestions and car accidents; an efficiently organized supply chain strategy, which will lead to improved cost bases, as well as less related external costs such as pollution, congestion and emissions. This challenge will be tackled in project 7.4 (p. 26).

5. Cultural heritage: The ongoing rapid urbanization in Dar es Salaam is posing threats on the city’s long-established cultural identity. Historical buildings and sites and the knowledge embedded therein are being demolished, thereby erasing the city’s material and immaterial heritage as well as economic potentials for sectors such as tourism. Inclusive and balanced strategies of adaptive reuse of heritage buildings, sites and urban areas are needed to foster sustainable growth. The project will develop **strategies for sustainable design and construction, and methods for conservation and adaptation of architectural heritage and its embedded knowledge**, focussing on safeguarding the cultural, environmental, material and immaterial heritage and identity. This challenge will be tackled in project 7.5 (p. 28).

Within all these 5 domains of change a **gender and societal/community participation** perspective will be mainstreamed. As such mainstreaming does generally not happen automatically, we will adopt the OECD/DAC two-track strategy (also implemented by the Belgian Development Cooperation). On the one hand, support will be given to each of the different domains of change to integrate/mainstream a gender and societal participation dimension. On the other hand, a specific (transversal) gender and participation project will be implemented that has gender and societal participation as its major objective (project 7.6, p. 30). This will showcase the benefits of a gender-sensitive and participatory approach and contribute to gender equality and empowerment. Through a second transversal project (project 7.7, p. 32), **ICT & SSIC** will also be integrated within all projects to support packaging of created knowledge and mainstreaming of smart technologies research agenda towards city’s inclusiveness and sustainability. The transversal theme of **green management** will be tackled by the different projects. Especially in land use planning (green corridors, open spaces, public spaces), decent housing (water management in relation with green management), cultural heritage (green and open spaces as cultural landscapes) and socio-economic development (urban agriculture as part of a network of green spaces). In urban transport, green infrastructure strategies (mitigating fragmentation impact of transportation infrastructure, green corridors along infrastructure) will have a central role.

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 IUC is aimed at increasing the available capacity at ARU on the level of participatory **research**, (blended) **education and training** and inclusive **societal outreach** in the 5 academic and 2 transversal domains of change mentioned above. The outputs and outcomes that will be produced will have direct and significant impact on solving societal problems as stipulated in the **2030 Agenda for sustainable development**. Therefore, the proposed IUC integrates the principles in its programme strategy: **leaving no one behind, interconnectedness and indivisibility, inclusiveness and multi-stakeholder partnerships**. This way, the research will also adhere to principles of Responsible Research and Innovation (RRI, EU 2013). Furthermore, sustainability and embeddedness in the societal and institutional context are key factors to ensure success of this IUC. The programme strategy takes this into account by fully integrating the IUC programme in a new **African Centre for Sustainable Cities Studies (ACS)**. An organigramme of the ACS and more information can be found on the **programme website**: <https://sites.google.com/uhas-selt.be/iuc-aru>). As indicated in the table below, the IUC will focus on the following strategies:

1. Research: the research that will be conducted in the 5 academic and 2 transversal domains are all interdependent (for details and objectives, see section 7). Most project activities will be located in 3 exemplary locations in Dar es Salaam. These 'pilot sites' serve as test beds for innovative practices, as well as showcases of best practices for dissemination of results: (1) city centre (Kisutu/Gerezani), (2) coastal site (Bagamoyo), (3) suburban site (Mwenge/ARU campus) (more info: see [website](#)). The following outputs will be produced:

1.1. Seven interdisciplinary research groups (reflecting the 5 academic and 2 transversal domains) embedded within the ACS. The research groups will engage in sustainability strategies as of the start by building capacity in proposal writing, participating in international conferences, and establishing relationships with other actors or (inter)national networks. The research groups will organize at least **3 joint International Conferences** with a focus on Sustainable Cities during the programme implementation.

1.2. Increasing number of publications in (inter)national peer reviewed journals and **conference contributions** through training in scientific writing and collaboration with Flemish researchers. To strengthen capacity of ARU young researchers, each PhD student shall be required to produce 2 peer reviewed publications in Journals indexed with SCOPUS. Furthermore, each PhD student will be required to attend 2 international conferences.

1.3. Improved research support services including access to digital resources and training on scientific and project proposal writing. The ACS will train at least 30 members of academic staff each year (transversal projects). After the training, researchers will submit proposals for funding (at least 3 proposals per annum, 30 for the entire IUC duration). This is a sustainability strategy because ARU will attract external research and scholarship funds which will consolidate the capacity that will have been developed by the IUC.

1.4. An International Research Network in Sustainable Cities Studies will be created. This network will promote scientific and academic collaboration on the topic of "sustainable cities" between universities, communities, public and private institutions, government, industries and other stakeholders both in Tanzania, other African countries and Belgium.

2. Education and training: the following outputs are envisaged:

2.1. Training of academic staff: A total of at least 44 PhD's and 54 Master's will be trained with support of the IUC of which in each group **at least 50% will be women** to maintain gender balance. To build capacity of ARU staff, the proposal strives for joint PhD supervision and publications between ARU and the Flemish universities. PhD students will be admitted at ARU but will spend up to 3 months at Flemish universities per annum. Master's will conduct short research stays for their master thesis or by completing an international master programme at a Flemish university, enabling them to share and apply the acquired knowledge in ARU. The ACS board and the IUC Joint Steering Committee will closely follow-up and monitor the Master's and PhD's that are being trained, ensuring a successful and timely completion of the programmes.

2.2 Development of 3 new Master and 1 new PhD programmes. MSc. in Land Use Planning and Conflict Management, MSc. in Urban Economics and Msc and PhD in Urban Transport. In these programmes, courses on gender-sensitive development will be included related to the specific content of the programme. To ensure the programmes are relevant and respond to local needs, they will be developed in collaboration with stakeholders in communities, industry and other universities. Furthermore, a mandatory course on 'Business Studies' will be introduced in all the programmes, focussing on entrepreneurship, innovation and development of business plans. Sustainability of the developed postgraduate programmes will be ensured through collaboration with the Tanzanian government, local authorities, public agencies, the private sector, NGOs as well as international institutions such as the FAO, UN-Habitat and the Green Climate Fund. ARU has already initiated such contacts with most of these institutions.

2.3. Innovative teaching approaches: Parallel with the integration in research, the use of ICT and SSIC will be implemented more and more in teaching programmes as well through blended and distance learning. 5 academic staff and 5 technical staff will be trained (short course) on state-of-the-art methods of operationalizing blended learning and dissemination of research results.

3. Societal outreach: Since ARU focuses on conducting community-based research and education that aims at solving societal problems, it is crucial that research outputs are built up with, provided to and used by the local communities and the broader scientific society. To ensure participatory research and facilitate uptake, the following strategies are used:

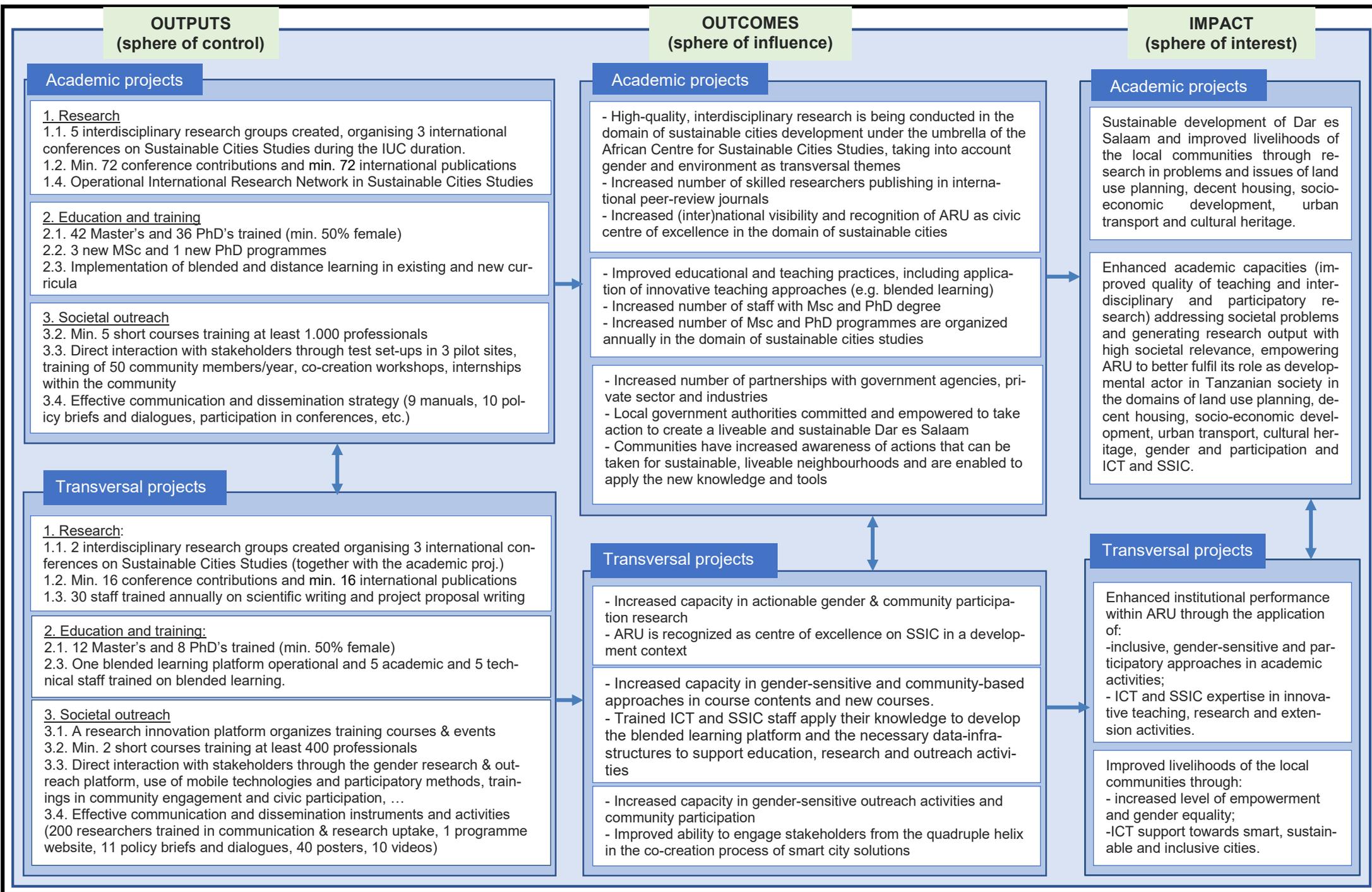
3.1. Creation of an innovation platform within the ACS to assist researchers with the valorisation of their research results and community participation in knowledge co-creation in sustainable cities by organizing: (i) **training courses** on innovation adoption, proposal writing and scientific writing (see 1.3 above); (ii) an "**Innovation Business Plan Competition**" to encourage scientists to develop business plans of their innovations; (iii) a "**Science and Technology Week**" where the communities, industry and

other universities shall exhibit their innovations and can learn from each other; (iv) a “**Youth Science Day**” where primary and secondary school pupils are invited to show their innovations.

3.2. Short courses for professionals: Once established, the ACS will annually offer 7 short courses related to all research domains, e.g. community mapping and monitoring, gender mainstreaming and budgeting, GIS in land use planning, archival and digital preservation, architectural and archaeological preservation, rainwater harvesting, Water, Sanitation and Hygiene (WASH), business or entrepreneurship skills, resource recovery from waste, green infrastructure for floods mitigation, traffic safety to vulnerable groups, gender-sensitive analyses. Each year, at least 140 people (minimum 20 per short course, divided over industry, policy and civil society) will be trained.

3.3. Direct interaction and collaboration with stakeholders: Stakeholder workshops were already carried-out during the formulation of this extended concept note in order to gain insight in the needs of beneficiaries and end-users. During the implementation of the IUC, the following strategies will be used to involve stakeholders in order to build trust, respect and mutual understanding: (i) **test set-ups** will be organized in the 3 pilot sites and hands-on trainings will be offered to end-users to apply and use the developed technologies and new knowledge (at least 50 community members trained annually); (ii) **co-creation workshops** will be organized regularly to involve stakeholders in data collection, share information and give feedback on intermediate results, validate research findings and create ownership; (iii) the transversal project on gender and participation will offer **training in community engagement and civic participation annually** and (iv) ARU will place their postgraduate students in communities and industries to study their particular needs and increase the employability of their graduates.

3.4 Communication and dissemination strategy: annually at least 20 researchers receive training in research communication and uptake to various audiences. Different communication and dissemination tools will be combined, including: (i) a dedicated **website** for the IUC to increase its visibility; (ii) **manuals and practitioners’ tools** to make innovations user-friendly for different stakeholders (translated in Kiswahili language and adapted to the Tanzanian culture to ensure uptake by the local population); (iii) **blended/distance learning programmes**; (iv) **sensitization activities** in the form of media coverage, on-site demonstrations and restitution workshops; (v) **policy briefs and policy dialogues** to advice the relevant decision and policy makers on policy interventions; (vi) the organization of 3 **International Conferences on Sustainable Cities Studies** targeting (inter)national researchers and local stakeholders, including policy makers; (vii) **conference contributions and publications** in highly ranked journals for which ARU will set funds aside to facilitate this and (viii) **networking** and collaboration with (inter)national universities and organizations which will create a multiplier effect beyond the IUC.



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

ARU's Corporate Plan (2019/2020 – 2029/2030) has identified five key result areas, which will move the university to the next level. By establishing the ACS, an integrated and interdisciplinary structure will answer the call for operational and institutional change. The IUC programme and collaboration covers all key result areas of the ARU Corporate Plan as follows:

1) **Research, Innovations and publications:** The IUC programme will: (i) reinforce collaborative and multidisciplinary research engagements; (ii) improve research and dissemination skills of academic staff; (iii) establish research collaboration with industry and; (iv) increase the number of publications.

2) **Training and learning:** To ensure relevance of academic programmes to industry, there is a need to (i) mainstream entrepreneurship skills amongst staff and students and develop curricula for master and PhD programmes addressing societal needs, (ii) expand undergraduate and postgraduate students' enrolment in various degree programmes; (iii) enhance online learning; (iv) enhance ICT & SSIC applications and make ARU's operations ICT-based. The IUC will contribute to these needs.

3) **Outreach and public services:** The IUC aims to foster public services linkages with the private sector and promote community outreach activities. Outreach plans have been developed in collaboration with stakeholders in each domain of change.

4) **University Capacity and Governance:** In this IUC, junior staff will carry-out research, outreach activities and publish papers under the guidance of senior staff from ARU and from other Flemish Universities. Furthermore, joint PhD projects will enhance the capacity of ARU academic staff and administrative and technical staff will be trained by the transversal projects.

5) **Partnerships and internationalization:** Thanks to the IUC, researchers will attend international conferences and publish in international journals. The ACS will build an international network, and organize an international conferences. These initiatives will enhance the visibility and international appeal of ARU.

Lastly, the themes **Gender and Environment** are also very important for ARU. Therefore, these two themes are integrated throughout the IUC programme as a whole and a specific transversal project on gender and participation has been included.

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

Besides academia, the IUC programme ensures links with industry, community and government. First of all, this concept note has been developed based on in-depth discussions with the expected end users of the research results of this (see [website](#) for details). During the workshop a shared understanding of the current situation was discussed and a shared vision of change was agreed upon. Actual needs of stakeholders have been taken on-board. Secondly, all stakeholders will be actively involved in the IUC process. Advisory boards including stakeholders have been formed for each project. These boards will oversee the implementation of the projects. Annual planning and review meetings will be carried-out (see 'Positioning of the Programme Support Unit'). Specific outreach plans will define appropriate strategies. Thirdly, at the domain/project level, participatory research at pilot sites ensures the involvement of local communities, while innovation plans will link with industry and engagement with government ministries and agencies and the production of policy briefs will ensure that research outputs will be used to inform policy in the relevant areas. Hands-on trainings and demonstrations will reinforce new skills uptake and scale-up.

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).

Both women and men will have equal opportunities to engage in opportunities emanating from the project implementation in the various domains of change. Firstly, at ARU, it is expected that this IUC will alleviate the problem of gender inequality in the academic staff. By ensuring that at least 50% of scholarships and research opportunities are available to women, in the next 10 years ARU will (thanks to this IUC programme) increase the number of female PhD holders by at least 22 and master's holders by at least 27. This will give them the opportunity to be considered for appointments in university leadership positions. Secondly, women in Tanzania are the ones who shoulder the burden of day to day home and family activities. By enhancing their livelihoods (outcome of the socio-economic development and cultural heritage projects), improvement of their mobility in the city (transport project), improving safe water supply, and provision of clean energy (decent housing project), the overall human development status of women and children will improve with a concomitant effect in overall poverty reduction. Thirdly, the transversal gender project will assure gender-sensitive outcomes in all other projects/domains. In line with the SDG and the OECD/DAC guidelines, a two-track approach will be adopted. On the one hand, efforts have been done to mainstream a gender (intersectionality) and societal participation dimension in the different projects. On the other hand, a specific gender (intersectionality) project has been identified that is positioned at the crossroads of the different projects and that adopts a gender-sensitive participatory/community-based approach. In this transversal project, gender equality and empowerment are the predominant objectives.

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.

In fast growing cities, the environmental conditions are under pressure. This IUC integrates green infrastructure strategies as a way of minimizing impacts of climate change, especially floods and warming. The land use planning project deals with green and water management. The decent housing project addresses water pollution, water scarcity, energy supply (wind, biogas, solar) and sustainable building materials and techniques. For example, the use of biogas for cooking will replace wood and charcoal consumption, hence deforestation will be reduced. Access to resource efficient technologies will reduce pollution, protect public health and improve housing. Through the socio-economic development project, a more resilient local food system will lower food waste and increase the amount of locally produced and consumed food and enhance greening through urban farming. The urban transport project is geared towards minimizing greenhouse gas emissions and safe, efficient and green infrastructure. In the cultural heritage domain, adaptive reuse addresses the use of locally available materials. This will protect the environment from exotic materials and promote indigenous solutions for thermal comfort, energy efficiency, rain water harvesting, etc, in tandem with maintaining the cultural identity of place.

4. Updated stakeholder analysis (stakeholders meeting report: [see website](#))

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
ARU community [Academic staff and researchers, Technical staff, (e.g., ICT staff), Students, University authorities].	The capacity of ARU academic staff has to be strengthened in the domains of research, education, and societal outreach. Out of 260 academic staff, only 33% have a PhD, 44% a master degree and 23% a bachelor. There is also a big gender imbalance: only 34% of the academic staff are female (of which only 37% holds a PhD and 30% a master degree). The capacity of academic and technical staff has to be strengthened, especially in the areas of ICT to support the SSIC agenda and blended learning. Students have limited access to innovative teaching approaches (e.g. blended learning; entrepreneurial competences and extension of research findings) and postgraduate programmes, due to the inadequate capacity of staff to use innovative teaching approaches and to supervise postgraduate research. Furthermore, only a limited number of postgraduate programmes are offered. The university authorities aim to improve the education, research and societal outreach in order for ARU to become a leading civic centre of excellence in sustainable development, especially in the domain of sustainable cities and the land and built environment.	All ARU schools and departments will be engaged in the IUC through participation in the research, education and outreach activities under the umbrella of the ACS. ARU academic staff will be trained in innovative teaching approaches and community engagement, will participate in conferences, will develop new master and PhD programmes, will publish research outputs and will supervise PhD's. Selected staff will have the opportunity to pursue a master or PhD in collaboration with Flemish universities. Furthermore, the transversal project will focus on gender mainstreaming. ARU students will benefit from: enhanced, innovative teaching approaches (thanks to improved ICT facilities and strengthened capacities of academic staff); better ICT infrastructure and facilities; and a larger offer of postgraduate programmes. The ARU authorities will play a key role in the programme and will be responsible to create an enabling environment and ensure the institutional sustainability of the programme, e.g. effectively implement and regularly update and monitor the gender policy; ensure staff retention by providing attractive incentives for capable and motivated staff; etc. They will be actively engaged through the local Steering Committee.
Grassroots leaders at Ward and Mtaa (village/street) levels and community	They support and facilitate community-based projects execution, e.g. by mobilizing residents for decision-making; and settling disputes. They are not formerly mandated by responsible authorities but are key stakeholders for the IUC since they live and interact with the local communities which are the end-users and beneficiaries of the research outputs.	Representatives of the communities will be engaged directly in the different projects through research (Focused Group Discussion, surveys, interviews), outreach and dissemination activities, consultations, co-creation and restitution workshops, seminars. Their skills will be enhanced through short professional courses. Representatives will also be included in the External Advisory Board (EAB) of the ACS.
NGOs, CBOs, Civil Society Organizations (CSOs) (list of examples see website)	They provide support to the local communities through seminars, awareness creation or publicizing findings uncovered through research. These organisations are strong in advocacy and community engagement hence key partners in facilitating outreach and dissemination. They engage in lifelong learning for women through advocacy of civil rights, social justice, good governance as well as gender issues. They are important stakeholders for data collection, co-creation and dissemination activities, but generally lack technical and financial capacity in delivering effectively their services to the communities. The IUC can bridge this gap by strengthening their capacity through outreach programmes, workshops, trainings, etc.	They will be engaged through collaborative research, data collection and data sharing, co-creation and restitution workshops and dissemination activities and official documents. Representatives of NGO's and CBO's will also be included in the External Advisory Board of the ACS. The heritage domain will particularly take advantage of the existing link with the Dar es Salaam Centre for Architectural Heritage (DARCH) for community engagement, advocacy, consultations and knowledge dissemination during the project implementation. Other stakeholders include: Bremen Overseas Research and Development Association (BORDA Tanzania); Tanzania Women's Lawyer Association (TAWLA); The Human Settlements Trust (WAT); Tanzania Bus Owners Association (TABOA).
Professional Boards (register and regulate professionals)	They have a high interest and influence on professional matters and underscoring professional challenges. The IUC will be very relevant for them because they ensure the link between the professional field and academic training and education.	Representatives of the Professional Boards will be engaged through consultations, stakeholders' workshops and seminars and they will be included in the External Advisory Board (EAB) of the ACS.
Private sector	They have a low influence in decision-making but highly benefit from research outputs.	Through workshops, seminars and data sharing and in developing the projects on specific sites.

Academic institutions	Engage in research, education and societal outreach. Highly interested in (research) collaboration and a high influence in the programme implementation.	Collaborative research, data sharing, academic fora, training sessions, conferences, workshops, policy dialogues. Representatives of other academic institutions will be included in the EAB of the ACS.
Local Government Authorities (LGAs)	LGAs are responsible for different functions in their areas. They have a high interest in executing and implementing projects but a low influence in decision-making (approval by central ministries).	LGAs will be engaged through workshops, professional dialogues and field visits. They will also play an important role in data collection and dissemination. Representatives will be included in the EAB of the ACS.
Central Government Agencies & Government Ministries (list of examples see web-site)	Central Government Agencies are responsible for overseeing land use planning; environment; small-scale industries development; urban and rural transport; energy and utilities; agriculture and regulation of standards in the country. The Ministries are responsible for the provision of national directives, standards, policies, laws and regulations. Both agencies and ministries enforce laws and therefore have a high influence in decision-making (but a rather low interest in research). They tend to use research outputs as a source of recommendations and therefore the gathered data and outputs produced by the IUC will be presented to them in the form of policy briefs.	Since they have a high influence on decision-making and thus play an important role in the uptake of programme outputs, the relevant agencies and ministries will be consulted and engaged as of the start of the IU through meetings, consultations and workshops. They will provide secondary data and participate in professional dialogues and field visits to explore realities/challenges. They will also provide valuable insights to ensure the IUC conforms to the country's national strategies and development plans and will thus fulfil a monitoring and quality assurance role. These agencies will sponsor their employees to undertake courses that will be established under the IUC. Representatives of relevant agencies will be included in the EAB.
International Organizations [UN-Habitat, World Bank, Green Climate Fund, UN Women]	International organizations provide important strategic insights and ambitions on the issues of the SDG, human settlements, environment and gender. They are involved in different interventions and have similar interests in ensuring sustainable development of megacities and in improving the conditions of the local, vulnerable communities. However, they need local support and research-proven solutions to increase their impact.	International organizations can influence policy and decision-making and often have financial means to set up new projects. Therefore, the IUC programme aims to establish a strong collaboration with them by engaging them through invitations to develop project implementation plans, and participation in conferences and funding new research projects to make the IUC programme sustainable.

ARU thus envisages to be a node in a heterogeneous network with local, national and international partners following the quintuple helix model. The ACS (with its External Advisory Board) is the umbrella to actively involve and connect this ambitious network.

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.

Through the decent housing project, this IUC will complement a BTC Project called 'Maji Yetu' (Our Water) completed in 2015 which provided access to clean drinking water for 200,000 inhabitants in the outskirts of Dar es Salaam by installing a total of over 15 water systems in different locations, building pilot sanitation facilities and improving the system for water drainage in Tandale ward. Additionally, the decent housing project will form a synergy with the ENABEL project implemented in Dar es Salaam that had the objective of providing clean, safe and reliable water supply and sanitation in 14 selected project areas in peri-urban and low-income settlements of Dar es Salaam. Furthermore, the IUC will learn from the sustainability plan from the Maji Yetu project which established and trained 15 'water consumer organisations', responsible for the technical and financial maintenance thereby forming a synergy. The IUC decent housing project and the gender and participation project will also complement the efforts of the ENABEL project in the Kigoma Region that facilitated the provision of basic infrastructure for water and sanitation (WaSKIRP project). The IUC has a similar objective as the ENABEL project, notably to increase access to safe/clean water and sanitation and reduce burden related to water and sanitation amongst communities, but focusing on the communities of Dar es Salaam. Through the socio-economic development project, the IUC programme will as well complement the ENABEL project that provided solutions to sustainable agriculture in the Kigoma Region and the Belgian Food Security Programme for the Districts of Longido and Simanjiro ('Maisha Bora') implemented between 2015-2020. A synergy will also be formed with the Rikolto initiative in Arusha that aims at making Arusha a Food Smart City by creating a new, inclusive, safe and sustainable food system by ensuring a protective and respectful of biodiversity and of ecosystems food production, a better access to fair, affordable, nutritionally adequate and safe food for everyone and a reduction of food waste and environmental deterioration. One of the objectives in the socio-economic development project is to contribute to a resilient and diverse network of economically performant agri-food enterprises in the city region of Dar es Salaam, with a focus on the role of women and youth. Rikolto and UGent are involved in research on governance of local food systems, and city-to-city learning about local food systems in Arusha. Rikolto aims at scaling-up the outcomes to a significant number of cities in the country.

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.).

ARU has a history of collaboration with a number of bilateral and multilateral agencies. The university collaborated with the World Bank under the Science, Technology and Higher Education Programme (STHEP). This project trained ARU staff to PhD level and built research infrastructure (Experimental Hall and Solid and Liquid Waste Treatment Plants) in the School of Environmental Science and technology. The decent housing project will use the facilities for their research. The IUC programme will form a synergy with other previous research projects such as:

- for the decent housing domain: *The last 100 Metres: Safeguarding Potable Water Provisioning to Unplanned Settlement* (sponsored by British Academy-Sustainable Development); *Water Resilient Green Cities In Africa* (DANIDA);
- for the land use planning domain: *Governance and Planning of Resilient Cities in East Africa* (BMBF and DAAD); *The Urban Land Nexus and Inclusive Urbanization in Dar Es Salaam* (East Africa Research Fund); *Quest for Alternative Urban Planning Model for Small Towns in Tanzania* (SIDA);
- for the IUC in general: SIDA has financed six research projects to build capacity of ARU researchers in executing research projects, links with the society and publishing in international peer reviewed journals. The IUC will create a synergy with the SIDA projects by training more academic staff, by building research capacity of ARU and by consolidating the capacity of ARU to collaborate with the society and industries. Besides funding for research projects, ARU has received support from different organisations (including SIDA, DAAD, the Tanzanian Government and VLIR-UOS) for PhD training of academic staff. However, as explained in the institutional context analysis, only 33% of ARU's academic staff hold a PhD, thus additional PhD training is necessary and the IUC will thus be complementary to these previous PhD scholarships. Lastly, the IUC will also create a synergy with the Erasmus+ student and staff exchanges that were initiated in 2016 between ARU and UHasselt.

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.).

A maximum degree of synergy and complementarity is sought with other VLIR-UOS initiatives (more info see [website](#)).

Global Minds (GM): UHasselt has funded two pre-doctoral visits from ARU staff (to prepare a joint PhD proposal) and is funding three joint PhD's with ARU staff members through the GM programme. There is a clear link with their topics and the projects of land use planning, decent housing and urban transport. Furthermore, UHasselt GM funded several staff mobilities to ARU to organize a parallel design studio with master students at ARU and UHasselt and to prepare a South Initiatives (SI) project on urban transport. Synergy might as well be created with the alumni impact barometer study of the Institute of Development Policy (IOB) (funded by UAntwerp GM) which includes a Tanzania alumni research team. Findings from this action research in which alumni are involved as co-researchers is interesting to feed into ARU's alumni policy. Furthermore, IOB's Tanzania's alumni chapter, which includes development actors positioned throughout Tanzania's society, offers various networking opportunities.

ICP programmes: A linkage can also be established with several ICP programmes in which ARU staff can participate, e.g.

- advanced masters in Development Evaluation and Management, Governance and Development, Globalisation and Development (IOB) which include courses on gender and community-based monitoring. Specific courses/units can be offered at ARU and if topics of master dissertations & field research overlap, twinning can be organised between ARU and IOB students.
- master of Transportation Sciences (UHasselt): the mandatory internship can be linked to the IUC programme and ARU researchers involved in the urban transport project can also give guest lectures (a first guest lecture already took place in 2019).
- master of Human Settlements and master in Sustainable Development (KUL).

South projects (SI projects/ other IUC's): Through the overlap in focus on water, community participation and gender (intersectionality), synergy is possible with the Fuatilia Maji project (= action research on mobile community-based water monitoring) that is implemented in the context of the IUC 4 SITE Programme with Mzumbe University. Through this synergy, previous VLIR-UOS investments can be valorised: the proposed IUC can learn from insights gained within the Fuatilia Maji project, interesting opportunities for cross-fertilization exist in terms of e.g. rural-urban comparisons while also networking between ARU and Mzumbe can sustain 4 SITE Programme realisations. The Fuatilia Maji project is itself a synergy project, benefitting as well the VLIR-UOS funded Going Global (GG) project (= ICP incremental funding) of the IOB. Besides Fuatilia Maji, the GG project has fed into the setup of the master in Development Evaluation at Mzumbe University which might also benefit ARU staff and create collaboration with Mzumbe staff. A complementarity will also be achieved through learning from an ongoing IUC implemented by the Nelson Mandela Institution of Science and Technology: ARU will learn from research related to water and sanitation, strategies on institutional strengthening (e.g. improvement of ICT) and outreach activities. Lastly, the proposed IUC will also learn from and establish a synergy with the IUC at Cuenca University, especially in the domain of Heritage.

5. Risk analysis (based on stakeholders input)

Risks + potential impact	Probability (1-4)	Potential impact (1-5)	Response
<p><u>Risk (external)</u>: Conflicts of priorities and development approaches between central government, municipality, and local community organs.</p> <p><u>Impact</u>: This may delay or hamper the implementation of the IUC programme.</p>	2	3	The IUC has involved the high-level leaders from the Government Ministries/Agencies. Some CEOs (for example: the Director of the National Land Use Planning Commission; the Director General of Small Industries Development Organization) appointed officials to participate in the IUC. Furthermore, the Permanent Secretary in the Ministry of Trade and Industries appointed an official who participated in the development of this concept note. The government institutions will be part of the research throughout the IUC implementation and, therefore, any conflicts of priorities will be solved before they reach an advanced stage.
<p><u>Risk (external)</u>: Significant reliance on external partner inputs.</p> <p><u>Impact</u>: Lack of independence, governance and ownership by ARU, which will affect the sustainability.</p>	2	4	VLIR-UOS is committed to help the universities to build training and research capacity to solve societal problems and its policies are stable and are not expected to change significantly to the extent of affecting the execution of the IUC. The ARU Authorities will make sure that it abides by its commitment as per agreement and will timely set up a 'phase-out plan' to ensure the sustainability of the IUC outputs and outcomes after the VLIR-UOS support.
<p><u>Risk (external)</u>: Change in Tanzania's Policy on donor funded projects.</p> <p><u>Impact</u>: The programme cannot be carried on/carried out as planned.</p>	1	4	Negotiations between ARU and the Ministry of Education shall be carried-out to make sure that the already signed projects are not affected. Clear agreements will be in place at the start of the programme.
<p><u>Risk (external)</u>: Non-collaboration of some local actors (NGO's, CBO's, Grassroot leaders and local communities).</p> <p><u>Impact</u>: The impact on the programme will be major, but this will be mitigated.</p>	3	4	By involving the local actors from the start the risk will be mitigated and will therefore be limited. Furthermore, 3 pilot sites were defined within the local community thus increasing their involvement.
<p><u>Risk (external)</u>: Reluctance of policy makers to incorporate research findings in the policy frameworks which will be developed.</p> <p><u>Impact</u>: In short term, research findings might not find their way to policy immediately, but in the long run, they will.</p>	2	3	Policy makers will be involved during the programme's implementation to make them aware and sensitize them. In the long run, research findings will be convincing and embedded within the local communities. This will increase the willingness of policy makers to take the results into account.
<p><u>Risk (external)</u>: Reluctance of the end users to take-up the research results.</p> <p><u>Impact</u>: If end users do not take up the research results, the impact is strong, since they are the scope of the societal outreach.</p>	2	5	Participation is key in all phases of the IUC. The end users have participated in the development of the concept note and take part in the programme's implementation. Trainings will be provided for them and information will be made available in Kiswahili to tackle language barrier risks.
<p><u>Risk (external)</u>: Lack of interest of other universities to collaborate.</p> <p><u>Impact</u>: Other universities are not the key stakeholders in this programme. They can be an added value, but they cannot make or break the programme, as the programme will be supported by the end users (internal and external).</p>	1	2	The programme has received support from various Flemish universities from the start, and ARU has a strong national (and international) network. By building on existing networks there will be a great interest and willingness for collaboration.
<p><u>Risk (external)</u>: Catastrophe or pandemic resulting in delays of the programme implementation due to 'lockdowns', limited mobility or other measures taken by the national governments.</p>	2	4	Adapt the planning of activities and think of creative and innovative solutions, always respecting the instructions of the national governments and their respective ministries.

<u>Impact:</u> The impact is strong, because face-to-face contact is important in this collaboration.			
<u>Risk (internal):</u> Delays in the release of programme activities. <u>Impact:</u> The impact of delays in intermediate results can be strong.	2	4	ARU and the participating Flemish Universities will work together to ensure timely implementation of programme activities and efficient application of funds. The programme support unit (PSU) is the main management body and will be embedded in the ACS and supported by the ARU authorities. The PSU will ensure, together with the Flemish coordination, a successful, coherent and efficient implementation of the IUC. A management manual will be prepared, detailing the responsibilities and divisions of tasks.
<u>Risk (internal):</u> Gender imbalance in the IUC project teams. <u>Impact:</u> Gender imbalance.	4	3	The ambition of the IUC is to have a good male/female balance in the local project teams and in the number of local project leaders. Due to the lack of qualified female researchers, there is currently a gender imbalance in the local project teams. This will be tackled by the IUC and after 5 years an evaluation will take place to include more female project leaders.
<u>Risk (internal):</u> Finding qualified PhD candidates, especially female candidates to ensure the gender balance. <u>Impact:</u> Gender imbalance.	1	3	There is a big interest of female ARU staff members to obtain a PhD. PhD positions will be announced early and through a variety of channels and female candidates will be encouraged to apply.
<u>Risk (internal):</u> Master and PhD students may drop-out. <u>Impact:</u> To book results, the drop-out has to be in control.	2	3	Selection of ARU staff to pursue a master or PhD degree, who are paid by the Tanzanian government and who are already employed by ARU (instead of others who might drop out of the studies in favour of paid employment). Furthermore, close monitoring, encouragement and counselling arrangements to postgraduate students will be put in place.
<u>Risk (internal):</u> Master and PhD graduates may leave the university after graduating. <u>Impact:</u> By a drop out of graduates it is impossible to build up academic capacity at ARU.	1	4	The creation of a strong international research network that provides opportunities also after graduation (master/PhD) will make ARU an interesting environment to work (resulting in a sustainable staff). Furthermore, by selecting ARU staff, a drop-out is already less likely and ARU will establish and implement an incentive scheme for academic staff and enforce a study-leave contract and a five-year bond with ARU after graduation.
<u>Risk (internal):</u> Insufficient capacity of academic staff to offer quality academic supervision for the PhD's and write publications for highly ranked journals or abstracts to participate in conferences. <u>Impact:</u> Poor quality scientific research.	1	3	Training of staff in scientific writing; PhD's will be jointly supervised by Flemish HEI allowing ARU researchers to build capacity in PhD supervision; ARU researchers will collaborate with their Flemish peers and will benefit from trainings in Flemish HEI if necessary.
<u>Risk (internal):</u> Trained technical staff (e.g. ICT) may leave the university for a better paid job in the private sector <u>Impact:</u> Lack of sustained ICT capacity at ARU.	2	3	Implementation of an enabling environment with sufficient incentives for staff. Set up of a "peer-to-peer learning network" to ensure that qualified staff share the experience and skills they have gained through the programme.
<u>Risk (internal):</u> Changes in top University Management. <u>Impact:</u> Lack of institutional support which may lead to poor quality programme implementation and results.	2	4	The IUC is designed to address key result areas in the university strategic plan and thus embedded in the university governing structures and supported by the ARU authorities. As such its progress will be reported periodically to the University Council. Therefore, whoever is appointed will be responsible to make sure that the IUC is implemented successfully.
<u>Risk (internal):</u> Reluctance of academic staff to use blended teaching approaches and participatory, inclusive approaches. <u>Impact:</u> Underuse of ICT capacity, lack of societal uptake and impact, non-inclusive (biased) results.	1	4	The participatory approach, involving staff of all departments and Schools, has been used since the formulation of the programme proposal. Staff is motivated to enhance their skills through training. Furthermore, the involvement of the university management in the IUC guarantees the commitment of the staff.

<p>Risk (internal): Lack of continuity of the newly developed master and PhD programmes due to lack of students, lack of resources (human and financial). Impact: Newly developed programmes are stopped.</p>	1	4	<p>The master and PhD programmes are very relevant for ARU, for the society and for students from other African countries. This ensures a large willingness and interest to continue the programmes. Furthermore, thanks to the IUC, ARU academic staff will have developed the necessary skills to continue the programmes.</p>
---	---	---	--

6. Institutional embeddedness

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

This IUC programme aligns with ARU's Corporate Plan. The Chairman of the ARU Senate, which is the highest decision-making body in all academic matters, has approved the submission of this extended concept note. From the development of the concept note to the writing of this extended concept note, the Deputy Vice Chancellor responsible for academics (DVC-AA) has been coordinating all the activities that lead to successful submission of the initial concept note and this extended concept note. In this concept note, all the five academic units at ARU have participated in its development and, therefore, the proposed IUC is a **university wide programme** that is fully **supported by the university management**. The Head of Departments and the Deans are supporting the programme and they have been participating in various activities related to the extended concept note, including, participation in contributing to project ideas, participating in writing the concept notes, and participating in a self-assessment exercise. The self-assessment methodology adopted enabled the participation of the entire ARU community (senior vs junior; academic vs technical and administrative). This participation has inculcated a sense of university-wide ownership for the IUC programme. The extended concept note has been approved in accordance with the ARU research Operational Policy and Procedures which requires the same to be approved by the Departmental and Schools Higher Degrees Research and Publications Committee, Senate Higher Degrees, Research and Publications Committees and the Senate. The reporting on the progress, will follow the same channel. Apart from these procedures in the Guidelines, the ARU community including the Vice Chancellor is eager to see this programme implemented because it will be the first programme of this magnitude and indeed it will help ARU to realize its dream. Furthermore, the proposed IUC programme will be implemented when ARU will be implementing its second Corporate Plan (2019/2020 – 2029/2030). All the proposed activities in the proposed IUC programme are geared towards implementation of all the key result areas in the plan. To ensure a two-way linkage between the researchers, implementing Schools, stakeholders and Advisory Boards on the one side and the ARU Management on the other side, the university has appointed the Deputy Vice Chancellor for Academic Affairs to be the institutional coordinator. Furthermore, the ACS will be embedded in ARU's organizational structure and members of the ACS Board will be appointed by the ARU Management. These arrangements show that the programme is well **integrated in the university management structure**.

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.

This programme will be executed by collaboration between ARU and Flemish Universities. Hasselt University will take a lead role as Flemish coordinator, but the programme strives to involve as many universities and university colleges as possible in the execution of the projects. For all domains, potential partners were already identified: for example, Ghent university has an interest to participate in the socio-economic development domain (prof. J. Dessein). KU Leuven is interested to contribute in the land use planning (prof. Y. Schoonjans and prof. H. Leinfelder), the decent housing (prof. P. Willems) and cultural heritage (prof. D. Van-neste, prof. F. De Boeck) domains. UAntwerp has an interest in the urban transport domain (prof. W. Dewulf) and the transversal project on gender and participation (prof. N. Holvoet). PXL University of Applied Sciences (J. Cleuren) and VUB (prof. Leo Van Audenhove) have an interest in the ICT and SSIC project. UHasselt has an interest to jointly participate with the other higher education institutions in the domains of land use planning, decent housing, socio-economic development, urban transport and cultural heritage. Furthermore, Master students who will be sponsored in this programme will be free to register in any Flemish university provided that they take courses and research projects that align with the themes of the proposed collaboration. Furthermore, for PhD supervision, students in collaboration with the domain leaders and the participating institutions from the Flemish Universities may choose a supervisor from any of the Flemish Universities. Lastly, other organisations, such as Energyville (KU Leuven, IMEC, VITO, UHasselt), and Busworld Academy, have also shown an interest in this programme. A broad Flemish support for this IUC programme is thus guaranteed.

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 Programme Support Unit (PSU) is a crucial part of the IUC programme as it is the main management body for the IUC programme locally. To ensure its institutional embeddedness, the PSU will be integrated as an administrative unit in the office of the Deputy Vice Chancellor for Academic Affairs. Once the African Centre for Sustainable Cities Studies is established, the PSU will be integrated in the ACS structure (for an organigramme of the ACS, see [website](#)).

The PSU will be responsible for the day-to-day operations of the programme and will be headed by the local coordinator who will be supported by the programme manager, an administrative officer and an accountant. Together with the Flemish coordination (Flemish coordinator and ICOS), the PSU will ensure a successful, coherent and efficient implementation of the IUC programme according to the operational plans and budget. The responsibilities of the PSU include: (1) Efficient and coherent overall managerial coordination (including the organization of Local and Joint Steering Committees and PSU meetings); (2) Operationalization and continuous monitoring of the overall programme activities and the academic and transversal projects; (3) Ensure smooth communication between internal and external key programme actors to promote synergies and increase the programme's visibility; (4) Efficient and transparent financial and administrative management (including the organization of mobilities, the procurement of equipment and supplies for the projects, etc.); and (5) Efficient and timely reporting of programme activities (e.g. to VLIR-

UOS). A specific management manual for the IUC programme – based on the VLIR-UOS as well as the internal rules and regulations of ARU – will be prepared by the PSU, detailing the responsibilities and divisions of tasks.

The PSU will collaborate closely with the existing university organs such as the Department Higher Degrees Research and Publications Committee (DHDRPC), Schools and Institute Boards, Senate Higher Degrees, Research and Publications Committee (SHDRPC) and the Senate. These organs are responsible for endorsement and approval of newly developed postgraduate curricula, student admission, research proposals and reports. For the financial aspects, the PSU will work in close collaboration with the financial services of the university. Regarding internal reporting, the PSU will ensure the projects submit quarterly progress reports, which are presented to the Committee of Deans and Directors and to the Senate Higher Degrees, Research and Publications Committee. The committee will report the progress to the Council, which is the top decision-making body in the university.

To ensure the proper functioning of the IUC, three coordination committees are established for decision-making: the Local Steering Committee (LSC), the Flemish Steering Committee (FSC) which will both meet at least twice a year (more often if deemed necessary) and the Joint Steering Committee (JSC) which will meet at least once a year. These committees are essential to ensure the effectiveness of the programme through planning, implementation, monitoring and evaluation and decide on the necessary adjustments to all programme activities and documents. They also monitor the IUC programme in terms of quality, synergy and financial reporting. The committees serve as a forum for exchange, reflection, strategic guidance to the programme, generation of new ideas, progress monitoring, problem solving and decision making. The LSC is composed of the ARU Vice Chancellor (chairperson of the LSC), local coordinator, programme manager, all project leaders, a representative of the Dean of Schools, a representative of the ACS Board and other stakeholders (whenever necessary). The FSC is composed of the Flemish coordinator, ICOS, all project leaders, team members willing to participate and a VLIR-UOS representative. The JSC is composed of the LSC and FSC members. During the JSC, the activities for the coming year will be discussed as well as the programme's achievements during the previous year and possible improvements where necessary. The PSU and the project leaders will present their plans and reports. The meetings will be attended by stakeholders from Flemish Universities, representatives of all stakeholders, including the industry, society, policy makers, etc. The meetings will be carried-out in Tanzania and the teams shall visit the research sites to evaluate progress and ascertain performance of different programme and project activities within the framework of addressing societal problems. Students' progress reports will as well be monitored during the JSC.

7. Project identification

Add a sub-chapter (like 7.2.) for every project² that you have identified. Max. 1,5 / 2 pages per project.

² 2 types of projects: academic theme-based projects or Transversal Institutional Strengthening Projects (TISP)

7.1. Project 1: Land use planning - Participatory planning and land-based resource use conflict management for sustainable growth of Dar es Salaam metropolitan and its region

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)

a. Objectives: The objective of this domain is to develop capacity in research, education and societal outreach in matters pertaining to participatory planning and land-based resource use conflict management to **promote equitable and sustainable use of land resources** so as to improve the spatial and socio-economic environment of Dar es Salaam city and its wider region.

b. Medium-term achievements:

1. Model the **sprawl and growth trends of Dar es Salaam city** and driving factors from 2005 to 2026 (medium-term) and to 2031 (long-term) so as to understand mechanisms triggering rapid urban development by using the Mobile Monitoring Approach. The objective is to train PhD and master students in operating geo-spatial mapping technologies.
2. Analyse the past and present **land-use planning practices, social behaviours and the subsequent spatial, social and economic impacts** from 2005 to 2026 (medium term) and 2031 (long-term). The objective is to train ARU researchers in developing strategies to improve the formal-informal planning interface, solve tenure security issues and reduce land grabbing.
3. Explore **land-based resource use conflicts and management approaches** with the application of approaches such as Artificial Intelligence, Mobile Monitoring and Internet of Things (IoT). The aim is to train ARU researchers in land-based resource use conflict management through effective development and application of integrated planning strategies.
4. Develop **capacity of land users on the use of participatory mapping technologies, data analytics and earth observation data** for monitoring and debating rapid urban development by 2031.

In the first five years of the project implementation, 4 PhD and 4 master students in operating geo-spatial mapping technologies and big data analytics will be trained. Furthermore, 8 peer reviewed publications, 8 conference contributions and one policy brief will be produced. In addition, a master programme in Land Use Planning and Conflict Management will be established and a resource use conflict management framework developed. It is also anticipated that 100 members of the community will undergo a short course training in participatory planning.

c. Long-term achievements: In ten years, a conception of a viable integrated planning approach, a sustainable spatial and socio-economic development of land users will be attained. The project is also expected to attain minimization of land use conflicts in local communities who are end-users of land resources. The project will as well improve capacity of local authorities and NGO's to use Big Data Analytics, Mobile Monitoring and Internet of Things (IoT) approaches and SSIC for transforming urban (and rural) communities to sustainable digitally driven communities. Specifically, in ten years, the following will be achieved: 8 PhD and 8 masters produced, at least 16 peer reviewed publications, 16 conference contributions and two policy briefs produced, one interdisciplinary research group formed and one master's programme up and running. The project will as well establish a participatory land use and conflict management platform and one practitioners manual on resource use conflict management. In addition, at least 200 members of the community will be trained on participatory planning.

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.).

a. Link with context analysis: General land in Tanzania constitutes 2% of the country but it is under immense pressure from the rapidly growing population. By 1988, the country had 22,533,000 inhabitants with 27.6% living in urban areas (URT, 1988); in 2017 the estimated population was close to 55.4 million people and the urban population constituting 33% (World Bank, 2018; UN-Population, 2018). Due to increased population, the government has not been able to meet the demand for planned, surveyed and serviced land to urban dwellers resulting to 70-80% of the urban population living in informal settlements with limited basic infrastructure and secured land tenure (Kyessi, 2010). These deficiencies are contributed by, *first*, vibrant urban land markets and government failure to provide surveyed and serviced land (Briggs, 2011). As such, land allocation has been behind the rate of informal land acquisition. Such failures in physical planning backed by social behaviours and attitudes, urban livelihoods, and limitations in applying geo-spatial monitoring technologies have thence created chaotic urban sprawl, urban transport problems and high travel costs, poor solid and liquid waste management, and informal settlements development (Kironde, 2006). *Secondly*, failures in implementing urban development schemes and exercising effective urban development control have culminated into land use conflicts. Moreover, village land comprises 70% of the total land (URT, 1999) while the country has 12,545 registered villages, only 1,640 (about 13%) have village land use plans but still land resource-based conflicts persist (Schreiber, 2017). To a large extent, improper land use planning and increased human and livestock population have led to land use conflicts over access, use and management of land resources leading to losses of lives, properties, violence and destruction of crops (Falanta and Bengesi, 2018). Such challenges restrain swift and sustainable environmental and socio-economic development and have escalated tensions between communities and authorities and have pushed community members to abject poverty. These have drawn national concerns to find solutions some of which have not been effective. Land use planning and geomatics are one of ARU's core disciplines. Yet, limited capacity in education, research, supporting infrastructure and community outreach are significantly constraining its contribution in addressing and developing a national response in land matters. To be spatially informed on these issues, the use of participatory mapping technologies and earth observation data as well as the need, readiness and ability of users to accept, interpret and use data, are vital to provide information for planning and decision-making both in urban and rural areas. The domain will therefore concentrate on issues related to participatory planning and land-based resource use conflict management.

b. Link with the programme: The proposed IUC programme is built upon SDG 11 which aims at making cities resilient and

sustainable. The main objective of this domain of change is to offer solutions to problems associated with lack of proper city planning and emergence of informal settlements which threatens the resilience and sustainability of Dar es Salaam city.

c. Link with other projects: Lack of controlled city expansion and the application of geo-spatial mapping technologies lead to emergence of informal settlements characterized by lack of decent housing (housing without basic services such as water supply, lack of proper handling of solid and liquid wastes – see project 7.2). Moreover, haphazard city expansion has adverse effects on gender (especially women), children and the elderly as well as on the environment such as soil erosion, occurrence of floods and elevated temperatures in turn impacting socio-economic developments (see project 7.3). Furthermore, uncontrolled city expansion poses challenges to urban transport infrastructure (see project 7.4). All these problems have profound effects on the social-wellbeing, economy, livelihood of the community and the city structure at large. From these problems, the most affected are the children, women and the elderly (see project 7.6). The project aims to train academic and professional staff to address all of these issues. ICT and blended learning will be key to meet this ambition. The developed technologies will be disseminated to the end users under the outreach activities which will be organized in cooperation with the gender and participation project.

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

The uptake strategy shall be *academia-practitioner collaboration* in finding out practical solutions to practical problems by linking theory and practice. Through this strategy, the stated objectives will be reached through:

1. Research: ARU academic staff will undertake an action-research on rapid urbanisation and the role of planning and conflict resolution while data collection will involve local communities through participatory resource mapping, focus group discussions and individual interviews. Specific themes will include but not be limited to social behaviours and urban livelihoods in physical planning, land grabbing and speculation and geo-spatial mapping. The strategy will provide researchers an opportunity to timely undertake, complete and produce results and outputs. At a strategic level, publications and conferences will be key to disseminate research findings and policy briefs will inform changes in policies or laws. Where research will find voids, research results will be used to review existing policies, laws, standards and regulations deemed in physical planning.

2. Education and training: ARU runs training programmes in spatial planning and geo-spatial sciences hosted by the Urban and Regional Planning and Geo-spatial Sciences departments. Other schools and departments run some planning courses which require service lecturers from other departments. Training of staff at PhD and master's levels will benefit the university in teaching and in curricula (re)development. The established African Centre for Sustainable Cities Studies (ACS) will offer an MSc. in Land Use Planning and Conflict Management in rapidly growing megacities. In addition, staff and land professionals at central and local government levels, the private sector, NGOs, CBOs will be trained on regular basis through short courses whereby teaching curricula will be jointly developed in order to include the needs of stakeholders.

3. Societal outreach: A conflict resolution platform will be formed within the ACS, in collaboration with other stakeholders to undertake training of village, ward and sub-ward-planners on participatory resource mapping and conflict resolution. Regional workshops and training sessions at city, municipality, ward and sub-ward levels will be used to disseminate research results and policy briefs to stakeholders. In these fora, research results and innovations devised will be disseminated to end-users.

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

a. Project end users: ARU will benefit by increasing trained academic staff and research results which will improve teaching and research practices leading to international reputation and curricula development. This goes in line with increasing research capacities of individual researchers and students. Furthermore, the Ministry of Lands, Housing and Human Settlements Development (MLHSD) can use the results and recommendations to review existing policies, laws, guidelines and regulations that govern physical planning and geomatics. The National Land Use Planning Commission (NLUPC), in collaboration with district, village councils and rural communities (villagers) will use models devised to review existing or prepare new guidelines to address issues that hinder effective planning and implementation of village land use plans. Other end-users include the Tanzania National Roads Agency (TANROADS), the Tanzania Rural and Urban Roads Agency (TARURA), Tanzania's National Housing Corporation (NHC) and NGOs (e.g. WAT TRUST).

b. Uptake strategy of the project: The stakeholders who were involved during development of this extended concept note will be involved in project execution. What is likely to inhibit the initiatives may be customs and traditions especially some voiceless groups in decision-making processes. However, this will be tackled by the establishment of (i) a stakeholders' platform (consultative meetings) to consolidate the link between ARU and other end-users and (ii) an advisory board which constitutes members or representatives from ARU, NGOs, private sector and industry will be established. Furthermore, policy dialogues will be carried-out to share the results with the policy makers.

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

Proposed local project leader	Fredrick Magina (Urban and Regional Planning Department)
Local project team	✓ARU: Regina John (Urban and Regional Planning); Zakaria Ngereja/Beatrice Tarimo (Geomatics); Adorf Tweve/Theresia Burra (Economics and Social Studies); ✓Ministry of Lands, Housing and Human Settlements Development: Grace Mbeni; ✓National Land Use Planning Commission: Stephen Nindi/Eugene Cyrilo.
Overview of available domains of expertise in the project team	GIS & remote sensing, urban/regional planning, demography, community development, economics.
Comments on the expertise sought for at level of the Flemish HEIs	Participatory planning, strategic planning, conflict management, informal settlements

7.2 Project 2: Decent housing - Towards improved urban water supply and sustainable sanitation resource recovery, sustainable energy and material uses for decent housing

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)

a. Objectives: To contribute towards improved urban water supply and sustainable sanitation resource recovery, sustainable energy and material uses for decent housing. This will be achieved through research, education and societal outreach in issues related to: (a) **access to clean and safe water**, (b) **improved sanitation and enhanced resources recovery** from solid wastes and wastewater, (c) deployment of off-grid/mini-grid electrification through **renewable energy** and (d) use of **sustainable building materials and techniques**.

b. Medium-term achievements: In the medium term, several achievements are envisaged: water sources and quality databases created, cost effective technologies, sanitation business models, and sanitation useful products developed, general design principles, guidelines and recommendations for more sustainable material use and specific sustainable building solutions developed. The expected outcome is the uptake of the sustainable energy, water and resource recovery and building material technologies. In addition, during the first five years of project implementation, 4 PhD and 4 master students will be trained where 50/50 gender will be applied and minimum 8 peer reviewed publications, 8 conference contributions and one policy brief will be produced. Furthermore, 100 professionals will be trained through short courses in resource recovery, water quality and green infrastructure, sustainable energy systems and sustainable material use. This will result in enhancing potential for clean and safe water, sanitation technologies, increase awareness related to renewable energy and sustainable material use, foster resources recovery, increase knowledge and skills among researchers and community members; enhance quality of training and learning; improve research capacity and teaching infrastructure and foster collaboration and networking.

c. Long-term achievements: The project will contribute to the improved public health, community livelihoods and wellbeing; enhanced sustainable resource use among several stakeholders (producers, contractors, designers, local communities, policy makers) and informed decision making on resource recovery, water quality and green infrastructure, sustainable energy systems and sustainable material use by policy makers. Furthermore, ARU's institutional network (community, industries, institutions, policy making bodies) will be strengthened which will ultimately lead to sustainability. In ten years, 8 PhD and 8 masters will be produced, at least 16 peer reviewed publications and 16 conference contributions will be produced, two policy briefs and 5 manuals on the developed technologies/ processes will be produced, an interdisciplinary research group will be created and 200 professionals will have been trained through short courses.

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.).

a. Link with the context analysis: The project will contribute towards making Dar es Salaam city inclusive, safe, resilient and sustainable through solving problems related to infrastructure provision and management. Energy, water and sanitation, making use of sustainable materials are essential for achieving SDG 11 (as well as the other SDG's).

b. Link with the programme objectives: The project strategy of using postgraduate students is in line with the programme strategy of improving the capacity to carry out research. Involvement of stakeholders at all levels will ensure that the project makes a contribution to achieve solutions for the societal challenges. Infrastructure provision in cities is crucial in meeting SDG 11. Water is needed in all sectors to meet demands for domestic, institutional, industrial and firefighting requirements. Adequate sanitation services are essential for public health, aesthetics and minimal pollution. Access to adequate and affordable energy is essential for sustainable urban development. Production and application of sustainable materials and techniques can enhance sustainable cities' construction, growth and expansion.

c. Link with the other projects: Informal settlements limit mobility thereby affecting the efficiency of waste collection and emptying of faecal sludge. Difficult mobility leads to inefficiency in faecal sludge management leading to high costs of emptying. Difficult mobility also affects waste collection leading to illegal dumping in drains or by the road side and resulting to environmental pollution (Breeze, 2012). Therefore, improvement in mobility (project 7.4) will also contribute to improved waste management and sanitation. Increased access to renewable energy will reduce the living costs and hence improve the economic status of the communities (project 7.3). Participatory planning (project 7.1) will eventually decrease informal settlements and facilitate improved provision of services (including waste and wastewater). Sustainable materials can be an integral part of the construction techniques for adaptive reuse of buildings (project 7.5). There is also an obvious link with the transversal project gender and participation (Project 7.6). The transversal ICT and SSIC (Project 7.7) will be used for monitoring purposes and to make Dar es Salaam a smart city.

d. Detailed context analysis: Provision of adequate, affordable and decent housing is of crosscutting relevance to sustainable development, linking to a wide range of areas including health, energy efficiency and inclusion (WHO, 2016). In order to improve the status of living for Dar es Salaam, provision of decent housing is of paramount importance which comprises basic services including energy, accessibility, water and sanitation facilities. Currently, 62.75% of households are using improved latrines, 22.85% have hand washing facilities and 30.67% treat their drinking water (NSMIS, 2019). Only 13% of Dar es Salaam is connected to a sewerage system while a large proportion depends on onsite sanitation which predominantly requires emptying when latrines are full (Kihila *et al.*, 2015) which is still a challenge due to the emptying costs, inadequate designated disposal site for wastewater treatment and sludge management. Also, expansion of sewerage system in Dar es Salaam is limited in most areas due to the existence of informal settlements where 70%-80% of residents in Dar es Salaam live in (Jenkins *et al.*, 2014). The available opportunities for improving water accessibility including rainwater harvesting are not adequately harnessed. Apart from

water supply and wastewater, Dar es Salaam generates 4,161 tonnes of solid waste per day. Out of these, 37% (1,533 tonnes) is collected and less than 200 tonnes per day are recycled. In Tanzania, the Energy Access Situation Report 2016 reveals that only 16.9% of rural areas have access to electricity compared to 65.3% in urban areas. The report suggests that grid electricity is more prevalent in urban areas, where 96.4% of the households with access to electricity were connected to the grid compared to rural areas, of which only 34.5% of the households had access to electricity from the grid. In developing countries, the renewable energy system is regarded to be important in urban and rural areas where grid extension is a challenge (Tucho et al., 2014). A community-owned approach is proposed (Li et al., 2013). With urban expansion, the demand for sustainable building materials is increasing. The use of conventional materials is limited with its supply, hence alternative building materials such as solid waste products and circular construction materials and techniques are inevitable.

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

1. Research: Four main research areas have been identified: i) **Clean and safe water:** Techniques for harvesting, conservation strategies and water quality improvement options will be investigated under this area. Investigation of alternative water sources and quality surveys, exploration of the potential and techniques for rain water harvesting will be carried-out. (ii) **Resource recovery:** The project will undertake mapping of different types of wastes that have potential for resource recovery, conducting laboratory and pilot scale experiments on optimal generation of sanitation products using various waste-feacal sludge mixes for optimal biogas generation, briquettes and fertilizers; techno-economic evaluations (with artificial intelligence) and development of strategies for the scale up. (iii) **Renewable energy:** Exploration of the potential renewable energy alternatives, testing the technologies via mini grid approach. Investigation on applications such as solar energy (photovoltaics and solar heating), windmills and biogas production will be done. Options/ways to integrate renewable energy systems with water, sanitation will be sought. Knowledge on the potential and challenges for the scale up of renewable technologies; strategies for scale up of the technologies and for building the capacity of communities on renewable energy will be investigated. (iv) **Circularity in the built environment:** An inventory of existing material flows will be made in order to critically reflect on the environmental impact and to detect potential improvements or alternatives for lower impact construction. Apart from the four areas of focus, the project will ensure that the research findings are widely disseminated to the public. A link between the research and the society will be maintained through workshops, ICT based communication systems (e.g. mobile app). The ACS will provide the link between research and society.

2. Education and training: Under this strategy, Postgraduate studies (PhD and MSc) will be undertaken involving Flemish and ARU teams. Tailor made trainings to local government officials and other stakeholders on issues related to water, sanitation, energy and sustainable materials will be conducted to build their capacity. Trainings geared towards improving the engagement and use of ICT in monitoring of the project will be done to selected community representatives.

3. Societal outreach: The capacity of local communities on implementation of the resource recovery technologies will be built through hands-on training and demonstrations in the envisaged ACS. A tailored training manual will be developed. Scientific articles will be jointly produced and published in peer reviewed journals. Policy briefs to inform the practitioners and policy and decision makers will be developed. Staff and student exchange programme will be established to enhance networking and shared experiences and skills (see medium and long-term achievements above). A link between the research and the society will be maintained through workshops, ICT based communication systems (e.g. mobile app).

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. Project end users: (i) ARU: through an increased number of trained academic staff and improved teaching and relevant research results; (ii) the central government (Ministries): through the use of research results for informed policies as well as building capacity of their staff; (iii) Regulatory bodies (e.g. EWURA, NEMC): through the use of results to develop appropriate monitoring and evaluation frameworks; (iv) Technical institutions (e.g. TIRDO, TEMDO and CAMARTECH): through the adoption of the recommended affordable resource recovery technologies and device ways for scale up. The implementation of technology at pilot scale level (3 pilot sites) will ensure upscale to the community.

b. Uptake strategy of the project: The uptake strategy will be through the ACS, the research field demonstrations and publications. Manuals and guidelines to be developed as a result of the findings will be another strategy for sustaining the programme results. The stakeholders/ end users were involved during development of this extended concept note. They will be involved in project execution.

c. Structural barriers for end users: The lack of political will may affect the participation of community members in project. However, the local project team has an excellent knowledge and understanding of the local context and its long-term collaboration with beneficiaries and end-users will tackle these challenges.

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

Proposed local project leader	Dr. Jacob Kihila (Institute of Human Settlements Studies)
Local project team	Dr. Nyangi Chacha (Department of Environmental Science and Management) Gervas Jones (Department of Environmental Engineering) Fredrick Ligate (Department of Environmental Science and Management) Albert Nyiti (Institute of Human Settlements Studies) Emmanuel Nsekela (Institute of Human Settlements Studies) Petro Mwamlima (Department of Environmental Science and Management)
Overview of available domains of expertise in the project team	Environmental Engineering, Environmental Sanitation, Housing, Sociology,
Comments on the expertise sought for at level of the Flemish HEIs	Urban water management, Climate change impacts, Renewable Energy, Sustainable Materials and Techniques

7.3 Project 3: Socio-economic development - Increasing the sustainability of urban foodscapes through agri-food entrepreneurship

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)

a. Objectives: The aim of this project is to **contribute to enhanced entrepreneurship in the foodscape of (peri-) urban Dar Es Salaam in order to improve the livelihoods in its deprived communities**. There is a particular focus on **women and youth**, as these are among the poorest of the urban farmers (Lee-Smith, 2010; Mlozi et al., 2014).

b. Medium-term achievements: In five years, the project intends:

- i. To **map the different networks of food provisioning, leading to a typology of the foodscape of Dar es Salaam**. This will inform the other objectives of the project with a clear picture of the Dar es Salaam foodscape, and foster actors to graft their strategic entrepreneurial or policy choices on an in-depth understanding of the context.
- ii. To assess which business models can **enhance the performance of agri-food entrepreneurs (SMEs) in order to increase their livelihood conditions**, with particular attention to barriers, incentives and disincentives that women and youth face. This will be achieved through:
 - a. Enhancing the skills of women and young entrepreneurs to establish and manage agri-food enterprises.
 - b. Assessing to what extent and how agri-food entrepreneurs can graft their activities on the important tourism industry, by evaluating different business models for sustainable agri-food tourism.
- iii. To contribute to an **enabling governance environment, by initiating a Food Policy Council in the three selected locations in Dar Es Salaam**, as a means to 1. Increase the participation of stakeholders in decision making about agri-food entrepreneurship, 2. Empower women and youth in the agri-food entrepreneurial network, and 3. Stimulate public procurement, as a means to increase the market opportunities of urban and peri-urban producers and processors of food products.
- iv. To investigate if and **how the foodscape of Dar es Salaam can serve as a laboratory for other cities**, and how ARU can play a pivotal role in this, using the vehicle of the African Centre for Sustainable Cities Studies.

During the first five years of project implementation, the following outputs will be achieved: training of a total of 4 PhD and 4 Masters students (who are members of ARU) academic staff; production of 8 peer reviewed publications and 8 conference contributions; production of one policy brief and one manual; one food policy council formed and a new master programme in Urban Economics created. In addition, 100 professionals will be trained in the short courses.

c. Long-term achievements: To contribute to a **resilient and diverse network of economically performant agri-food enterprises** in the city region of Dar es Salaam, with a focus on the role of women and youth, and contribute to the creation of an **enabling governance environment**, allowing for genuine participation of relevant stakeholders (citizens, communities, farmers, entrepreneurs, policy makers) in decision making about food-related issues. In the long-term, a total of 8 PhD and 8 masters who are members of ARU academic staff will have been trained. Additionally, at least 16 peer reviewed publications, 16 conference contributions and two policy briefs will be produced, an interdisciplinary research group and three food policy councils will be formed, a master programme in Urban Economics will be up and running and 200 professionals will be trained in community-based research and empowerment.

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.).

a. Link with the context analysis: Urban and peri-urban areas offer enormous economic opportunities for agripreneurship, agri-food industry and agrifood-tourism. Nonetheless, these are largely under-exploited. Importantly, Urban and Peri-urban Agriculture (UPA) – the production and processing of food in and around a city – is a key component of an urban foodscape, that requires attention. UPA is important in Dar Es Salaam, in particular for vegetables, eggs and milk. UPA is also an opportunity for urban entrepreneurship, in which women and youth can take up diverse roles (Mlozi et al. 2014). UPA is also an important lever for inclusion and empowerment of marginalized groups. On the consumer site, upper as well as lower class citizens are involved in UPA in Dar Es Salaam (Malekela and Nyomora, 2018, Kifunda, 2020). On the producer site, mainly poor urban farmers rely on UPA for their livelihoods (Lee-Smith, 2010). However, empirical evidence about the contribution of UPA to these issues in African cities including Dar Es Salaam, is scarce. Way back in 1992, UN Habitat and United Nations Environmental Program (UNEP) identified UPA as a priority in the Sustainable Dar es Salaam City Project (SDCP). Although consecutive policy plans have been developed, UPA in Dar es Salaam has received little political support due to its informal state (Halloran and Magid, 2013), the urban authorities' negative perceptions of UPA (Mkwela, 2013), the lack of coherent integrated policies and the consequent weak governance of the UPA. The lack of proper plans, designated areas and legally binding access to land leads to persistent or increased urban poverty especially for vulnerable groups such as women and youth (UNDP, 2016). Peri-urban areas of Dar es Salaam are largely neglected, hence their abundant potential for innovative, entrepreneurial activities related to UPA such as the creation of added value by processing food products in SMEs (Wegerif, 2014) and developing new niche activities such as agro-ecotourism (Mngumi 2019) remains underexploited.

b. Link with the programme objectives and the other projects: UPA activities are part of the broader domain of green management, adding open spaces to a network of green corridors that connects different parts of the city. This contributes to the improvement of livelihoods and the empowerment of women and youth, whose vulnerabilities are exacerbated by governance challenges that are dealt with in other projects, such as Projects 7.1, 7.2 and 7.4. It will also have synergy with Project 7.5, and contribute to an increased tourism portfolio of the city and the ACS. The focus on women empowerment links directly with Project 7.6. The use of smart ICT technologies (through support of Project 7.7) will foster interaction and flow of information and knowledge among food systems stakeholders. The project anchors on a multi-disciplinary, multi-departmental setting within and outside ARU. Within ARU, the main challenge is the adequate capacity in the fields of urban food systems, ecological analysis of foodscapes, and agro-tourism, among others. Outside ARU, the diverse stakeholders are confronted with multiple institutional challenges related to: governance of urban agri-food value chains, limited productivity and profitability of micro, small and medium enterprises, inadequate meaningful integration of women and youth in urban agri-food value chain activities, and effective community engagement.

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

1. Research: The project outputs include typologies of the foodscape of Dar es Salaam, business models for enhanced performance of agro-food entrepreneurs and sustainable agri-food tourism, improved knowledge about the role and challenges for women and youth within agro-food entrepreneurship and agri-food tourism, and knowledge about Food Policy Councils as governance tools of local food systems. These research outputs will be the results of PhD as well as MSc research.

2. Education and training: The research will be done in a 50:50 male-female ratio, by fellows of the *project team*, and at MSc level (n=8) and at PhD level (n=8 : PhD 1 for mapping, PhD 2-3 for business models for youth/women, PhD 4 for business models linked with agri-food tourism, PhD 5-6 for Food Policy Councils, PhD 7 for public procurement, PhD 8 on learning networks of sustainable city foodscapes). The new master programme in Urban Economics will be established to focus on the topical issues related to economics of cities. Different stakeholders will be involved in the development of its curriculum. This research and training will: 1. build the academic capacity of ARU; 2. inform stakeholders with relevant knowledge; and 3. through the carefully designed research activities, engage and empower different stakeholders. Tailor made training and awareness programs (including train-the-trainer initiatives) will facilitate the exchange of knowledge and capacity building of non-academic stakeholders, allowing for a genuine participation in the community-based research and empowerment activities. The enabling governance environment, leading to Food Policy Council(s), will result from participative processes in the context of Participatory Action Research. These processes, part of PhDs 5-6, will *empower* powerless groups in the selected communities in decision making about Local Food Strategies.

3. Societal outreach: At the local level, the project shall engage with targeted groups (with a focus on women and youth in agri-food businesses, as well as local policy makers), to enhance their knowledge, capabilities and skills for productive and effective participation within urban foodscapes. In this, the use of smart ICT technologies will foster interaction and flow of information and knowledge among food systems stakeholders. On a larger scale, the scientific and policy-oriented insights of the project will feed into the activities of the ACS, and will prepare the city council of Dar Es Salaam for participation in worldwide food-oriented city networks such as the Milan Urban Food Policy Pact and AgriProFocus.

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

a. Project end-users:

There are four groups of project end-users: ARU-end users, (peri-)urban farmers, agri-food entrepreneurs (in production, processing and marketing as well as agri-food tourism), and (local) policy makers (see table for a non-exhaustive list)

Project end-user	Possible end-users
ARU end users	Departments of: Economics and Social Sciences, Urban and Regional Planning, Financing and Banking, Land Management and Valuations, University Library, African Centre for Sustainable Cities Studies, Institute of Human Settlement Studies, Directorate of Postgraduate Studies Research and Publication, University Senate
(Peri-)urban farmers	Farmers unions/cooperatives; Tanganyika Farmers' Association; MVIWATA (National Network of Farmers' Groups in Tanzania); Tanzania food and gardening network (TAFOGANET)
Agri-food entrepreneurs	National college of Tourism; Association of Tour operators; Hotels Association of Tanzania; Tanzania Food Processors Association of Women & Youth Entrepreneurs (TAFOPA); Tanzania Chefs Association (TCA)

Beyond these Dar es Salaam based end-users, the project will inspire, through the *African Centre for Sustainable Cities Studies*, the actors of other African urban foodscapes as well as the global scientific communities.

b. Uptake strategy of the project:

The uptake and implementation of the project results are guaranteed through the participative and empowerment-oriented project approach. This is already reflected in the involvement of relevant stakeholders in the development of the extended concept note, and will consistently be adhered to in all stages of the respective project activities, from preliminary design stages to implementation, leading to co-production of skills, knowledge, strategies, guidelines, and practical policy options.

c. Structural barriers: These can be anticipated for, including an array of regulatory and institutional bottlenecks as well as socio-cultural barriers. Regulations and other institutional arrangements may limit access to finance as well as land-based resources to youth, women and other vulnerable groups. Likewise, at the government level, prolonged policy and decision-making processes may impair the effectiveness of its agencies in supporting efforts towards enhancing economic opportunities. In addition, socio-cultural norms may limit participation of groups such as women or voiceless citizens. The project's participatory and integrative approach will be used to mitigate potential risks from these barriers. To anticipate for and cope with unforeseen structural barriers, the project will (at project level at least once a year, at sub-project level more frequently) organize a reflexive round-table.

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

Proposed local project leader	Dr. Makarius Mdemu (ARU), Institute of Human Settlement Studies
Local project team	<ul style="list-style-type: none"> ✓ ARU – Institute of Human Settlements Studies: Dr. Tatu Limbumba; Dr. Yohannes Kachenje; Ms. Mariam Genes; Mr. Lazaro Mngumi; Ms. Matilda Ntiyakunze; ✓ ARU – Department of Economics and Social Studies: Dr. Luitfred Kissoly; Mr. Linus Lugaiyamu; ✓ Ministries (Natural Resources and Tourism): Mr. Deogratius Mdamu; (Industry and Trade): Ms. Aneth Mathania; ✓ Small Industries Development Organisation (SIDO): Ms. Shoma Kibende; ✓ Tanzania Food Processors Assoc. of Women & Youth Entrepreneurs (TAFOPA): Ms. Suzy Leizer.
Available domains of expertise in the project team	Town Planning, Natural Resource Assessment and Management, Business and Economics, Public Policy, Landscape Architecture, Food Governance and Community Development
Comments on the expertise sought for at level of the Flemish HEIs	Local Food Policy, Sustainable Food Systems, Participatory Action Research, (Peri-)Urban agriculture, Food Governance.

7.4 Project 4: Urban transport - Safe, inclusive and sustainable urban transport system

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)

a. Objectives: The aim of this project is to build capacity in education, research, innovation and societal outreach in the domain of urban transport, in order to achieve a safe, inclusive and sustainable urban transport system. For **capacity building in education**, different educational collaborations will be set up; aiming that in the end the ACS can provide a double degree Master and PhD programme in Urban transport with innovative teaching approaches, as well as short courses about urban mobility and logistics. For **capacity building in research**, a Platform on Transport, Logistics & Traffic safety will be created within ACS, based on participation of international and local key stakeholders; which act as overarching cooperation structure to foster research about urban transport, and aims to contribute to developing policies and action plans for improving traffic safety, logistics and transport at the national and local. For **capacity building in societal outreach**, different educational and research initiatives will be worked out, addressing the needs of the society; identified via direct interaction and collaboration with relevant stakeholders.

b. Medium-term achievements:

i. Education: active participation in distance learning programme of Transportation Sciences (UHasselt), organization of short residential blocks and the development of a **double degree Master programme Urban transportation**.

ii. **Improved traffic safety of city dwellers**, including **school children** who have an increased accident risk when travelling to school, by 1) developing a participatory data collection ICT-tool in order to collect information about safety problems, urban and school travel patterns; 2) developing innovative context-based on-line learning programmes for traffic safety education; and 3) influencing the driving behaviour of professional drivers. Expected outcomes are that city dwellers and children are more aware of risks or danger during their trips.

iii. **Reduced transport poverty of vulnerable population groups**, like women, elderly or disabled persons, who have an increased risk of being socially excluded, by 1) mapping their actual patterns via a GIS-based (Geographic Information System-based) application and compare these with their subjective travel needs, and 2) develop solutions to improve their travel behaviour. Expected outcomes are a higher societal participation of vulnerable population groups.

iv. **Improved efficiency and sustainability of the transport system**, by improving the public transport (PT) and non-motorized transport (NMT) modes. International expertise will be shared about safety aspects, sustainability and comfort of PT; which will lead to changes regarding the organisation of the PT system in Dar es Salaam (DAR); as well as about safety and behavioural aspects about walking and cycling infrastructure.

v. **Improved supply chain strategy**, by 1) identifying potential bottlenecks in the most important supply chains in the B2B (business-to-business) and B2C (business-to-consumer) environment and look for best local and international practices, and 2) optimize the current supply chain in cooperation with stakeholders and embracing these best practices.

The outputs during the five years of project implementation include: training of 2 PhD and 5 master students in urban transport area, 4 peer reviewed publications, 4 conference contributions and one policy brief produced, and 100 road users trained in urban transport safety through short courses.

c. Long-term achievements: a safer driving behaviour; less experienced transport problems by vulnerable population groups; a sustainable modal shift towards more PT and NMT use, reducing the contribution of motor transport, traffic congestions and car accidents; an efficiently organized supply chain strategy, which will lead to improved cost bases, as well as less related external costs such as pollution, congestion and emissions. In ten years, the following will be achieved: 6 PhD's and 10 masters produced, at least 12 peer reviewed publications and 12 conference contributions produced, one interdisciplinary research group formed, one manual and two policy briefs produced and a Platform on Transport, Logistics & Traffic Safety created. In addition, the project will have trained 200 city road users on urban transport safety.

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.).

a. Link with the context analysis: The rapid urbanization of Dar es Salaam (DAR) causes significant challenges in the domain of urban transport, including high levels of **traffic unsafety** (increasing road accidents with children and women being most affected). School children have an **increased accident risk when travelling to school** because of lack of self-control and lack of safe walkways to school, dangerous traffic conditions, mixed traffic lanes, etc. 93% of school children involved in traffic accidents are injured as pedestrian, compared to only 45% of adults. Children in DAR are more likely to be hit on small unpaved streets, by which 43.9% of their road traffic injuries occur while going to/from work or school (local traffic police data, 2016). There are high levels of traffic congestion and air pollution, due to **inefficient transport systems** and **unorganized public transport**. Traffic volumes continued to grow in a context of rising motorization (car ownership rate growing from 55/1000 to 180/1000 from 1980s-2016 (Kazaura, 2019), contributed by **unavailable, unsafe non-motorized transport systems**. Road safety for both pedestrians and cyclists is very low, which limits the walkability and cycling.

b. Link with the programme objectives: The aim of this IUC programme is anchored on **SDG 11**; addressing one of the targets of 11.2, which advocates for provision of access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

c. Link with the other projects: Transport challenges witnessed in DAR city are a manifestation of an uncontrolled city expansion as a result of inadequate city planning (project 7.1). Poor urban transport and poor city planning leads to housing with inadequate services (project 7.2). For example, traffic congestion affects efficient transport of solid wastes. This causes accumulation of solid wastes in settlements. Poorly planned road infrastructures in DAR have been affected by pluvial floods, thereby causing loss of properties and travel disruptions. Different ICT-tools will be used in both education and research (project 7.7).

d. Detailed project context analysis: As **urban transport is a new area in ARU**, resources allocated to research and capacity building are currently limited. The Department of Urban and Regional Planning at ARU is developing a new (double degree)

Master programme in Transportation Sciences, and is also anticipating to establish a Master in Road Safety and a Bachelor in Transportation Planning; but **lacks experience and knowledge** in innovative research methods and techniques in both mobility, logistics and traffic safety. Capacity building of the existing staff will be worked out, the implementation of this double degree Master programme, as well as (in a later phase) a new PhD programme. ARU has only limited expertise in civic participation: the staff **lacks knowledge in innovative methods in citizen-based mobility data collection**; while a low-cost and efficient method for gathering specific data is needed to provide accurate data for children road safety interventions and travel demand measures for disadvantaged groups. The **use of ICT** in education, research and societal outreach needs to be reinforced in different ways, for example: the development of a Master programme with distance and blended learning, the use of a participatory data collection ICT-tool to collect information about traffic safety problems of children, the use of a GIS-based application to map the travel behaviour of women, etc.

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

1. Research: Workshops will be organized by the Platform on Transport, Logistics & Traffic safety to identify key issues of road safety, logistics and transport that can be prioritized within the research cooperation framework. These will be related to:

- i. **Traffic safety of school children:** development and implementation of a **participatory crowd-sourcing data collection ICT-tool** which will be used in several schools, and will be the basis to develop innovative educational material for children, and behaviour techniques (e.g. gamification) to change driving behaviour.
- ii. **Transport poverty of women** (or other disadvantaged groups): development and implementation of a **GIS-based smartphone application** to monitor and influence the travel behaviour of women. Based on this data, specific travel and safety advice for women and children can be worked out.
- iii. **Efficiency and sustainability of transport system:** organisation of **research seminars** to share international best practices and guidelines about public transport systems (e.g. Bus Rapid Transit systems) and NMT, with a clear focus on inclusive measures enabling societal participation of disadvantaged groups.

2. Education and training:

- i. Active participation in the **Distance Learning** programme of Transportation Sciences (TS, UHasselt) by at least 10 Master students, of which at least 50% are women. Students can study via the learning platform (all lecture videos recorded, experience with MOOC and distance learning education organisation).
- ii. Organization of **short residential blocks** at ARU, in the context of the Distance Learning program TS. Organization of short residential blocks about Urban Logistics (collaboration with Antwerp University).
- iii. Development of a **double degree programme** Urban Transportation, as joint agreement in collaboration with UHasselt. At least 10 Master students, of which at least 50% are women, will be trained.
- iv. Development of **double degree PhD's** in TS and Urban Logistics (UAntwerp). 6 PhD students will do research on research topics related to urban transportation, of which at least 50% will be women.

3. Societal outreach: Results from the aforementioned researches and trainings will be **disseminated** to the stakeholders in the urban transport sector, and **new initiatives will be identified** based on their needs.

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. Project end users: ARU itself will improve teaching and research practices leading to international reputation and curricula development. **Key actors in the urban transport domain** will benefit, both by the organisation of local courses for professional as by research projects to improve the transport system; e.g. TANROADS, TARURA, DART (Dar es Salaam Bus Rapid Transit, TPF (Tanzania Police Force), LATRA (Land Transport Regulatory Authority), road safety regulations and laws, road user associations (i.e. TABOA). The project will yield direct recommendations for the **city government**. **Community-based actors** (e.g. NGO's) can use the data to develop contextual safety measures or educational material. Participating **local schools** will receive direct feedback about dangerous locations which they use to work out safety measures. School children, parents, city dwellers and in general **road users** themselves will benefit from the different research initiatives by having less traffic accidents and a more organized, efficient urban transport.

b. Uptake strategy of the project (including structural barriers for end users and mitigation strategy): Structural barriers may include a limitation in the uptake of project findings, caused by the differences between project and government priorities/policies; inadequate skilled personnel in transportation planning and management, and bureaucracy in implementation of research findings. However, this is addressed by the uptake strategy of the project: uptake of project results will be facilitated through a participatory and integrative process, by interactions with the stakeholders on a regular basis, and close follow-up of the project progress and results by the advisory board.

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

Proposed local project leader	Dr. Wilfred Kazaura (Urban and Regional Planning)
Local project team	<ul style="list-style-type: none"> ✓ ARU – Urban and Regional Planning: Dr. Eng. Frank Wambura; Prof. John Lupala; Eng. Baragamba Ernest ✓ ARU – Institute of Housing and Human Settlement: Ms. Neema Munuo ✓ National Institute of Transport: Dr. Msigwa Robert (Department of Operational and Research IT); Eng. Prosper Nyaki (Department of Transport Planning)
Overview of available domains of expertise in the project team	Urban Planning, Transportation planning, Civil Engineering
Comments on the expertise sought for at level of the Flemish HEIs	Transportation sciences, Traffic safety, Urban logistics

7.5 Project 5: Cultural heritage - Architectural Heritage Conservation through Adaptive Reuse: Assessing Design, New Functions, Construction Techniques and Cost Benefits

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)

a. Objectives: This project focuses on sustainable design (by finding new programs), construction techniques (including traditional techniques) and the cost benefits pertaining to adaptive reuse of architectural heritage. The main objective is to build capacity in research, training, and practices for fostering better, inclusive and more balanced processes of architectural heritage in Tanzania. This will ultimately lead to an enhanced understanding of cultural identity, sustainable business potential, heritage tourism, real estate sector and renovation and repair of the urban environment for improved livelihoods of the local communities.

b. Medium-term achievements: The medium-term achievements for this project are:

i. **Established capacity needs of the architectural heritage stakeholders** in revitalizing Tanzanian's architectural heritage in tandem with current global concerns of green/sustainable approaches and practices without undermining heritage values and economic potentials. Knowledge transfer regarding green approaches in adaptive re-use will be created.

ii. **Strengthened limited existing capacity in architectural heritage conservation** by bringing together disjointed efforts by various stakeholders (such as DARCH and the Architectural Association of Tanzania (AAT)) for optimal utilization of resources. Anticipated outputs are trained stakeholders in architectural heritage conservation; updated database of heritage monuments and sites in Dar es Salaam; and, established multifaceted approaches for adaptive reuse.

iii. Developed **design options, scenarios and possibilities for improving and upscaling traditional construction techniques** related to architectural heritage in the contemporary spatial challenges. Key outputs include highly trained and qualified designers with adequate theoretical frame of reference, practical skills and competences governing architectural heritage as well as societal outreach programmes involving specific target groups of the community in on-site workshops on aspects of immaterial heritage such as craftsmanship and traditional tacit knowledge that often implies deeply rooted fragments of identity.

iv. Developed pathways that integrate **economical and legal aspects** of handling protected heritage sites. This aims at building interdisciplinary capacity at ARU and the built environment professionals at large in predicting, advising and monitoring costs and legal consequences associated with architectural heritage for socioeconomic development. The anticipated outputs include established framework as a guiding tool to increase awareness among the professionals and community in utilizing optimally the architectural heritage for improved livelihoods. During the first five years of the project implementation, 2 PhD and 4 master students will be trained in architectural heritage management. In addition, the following will be achieved: 4 peer reviewed publications, 4 conference contributions and one policy brief produced. Furthermore, 100 stakeholders will be trained on heritage matters.

c. Long-term achievements: The long-term contributions of this project include: (i) improved awareness that can influence policy and practice in architectural heritage conservation in Tanzania; (ii) strengthened capacity of ARU staff, the society and built environment professionals at large in inculcating architectural heritage in programmes related to the built environment development; and (iii) improved architectural heritage as an important touristic sector in the Tanzania's national income. In ten years, the following will be achieved: 6 PhD and 8 masters trained, at least 12 peer reviewed publications, 12 conference contributions and two policy briefs produced, a protocol of good practices for policy purposes developed and one interdisciplinary research group formed. 200 city dwellers will have benefited from short courses on architectural heritage.

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.).

a. Link with context analysis: Pressure associated with rapid urbanization notably in the demolition of historical buildings and structures, has caused significant challenges on preserving cultural and architectural heritage in Dar es salaam. The demolished architectural heritage hampers tourism and urban livelihoods. Lack of detailed and updated land use and urban renewal plans for the city's Central Business District (CBD) and other important historical sites is linked to the current loss of buildings, ecological landscapes and identity. Continuing use of exotic building construction materials appear to disrespect the climatic, environmental and economic conditions of the city, thereby adding more problems on energy use and sanitation.

b. Link with the programme and other projects' objectives:

Growth of informal settlements, land related conflicts, overwhelmed infrastructure and services as well as traffic congestion are notable challenges associated with urbanization that the IUC programme is addressing. Conflicts o, urban spatial uses such as decent housing and transportation infrastructure are linked to the current loss of architectural heritage whereby some of the historical buildings have been demolished. As a result, the marginalised groups such as the urban poor lose their voice and legitimacy on urban spaces for their livelihoods and impact on their socioeconomic development. The use of ICT, which would enhance documentation and management of architectural heritage, is not significant. Therefore, to safeguard the city's identity, an integrated approach which encompasses all domains in urban development is required.

c. Detailed context analysis: Updated CBD strategic plans guiding inner city transformation has hardly considered architectural heritage. For example, the skyline of Samora Avenue, Dar es Salaam has been changed significantly, resulting into the loss of architectural heritage of the place. Legal instruments in Tanzania including the Urban Planning Act of 2007, the Antiquities Act of 1979, the Land Act of 1995 and the Local Government Act of 2002, work in isolation and contradiction with respect to conservation of architectural heritage. For example, Clause 62(1)d of the Local Government Act of 1983 acknowledges architectural heritage but also provides for demolition of structures that pose threat to human safety without the consultation of the Antiquities Authority, whereas the Antiquities Act strictly stipulates the preservation of buildings and artefacts with historical and architectural significance regardless of their structural status. Likewise, urban design practices lack sensitivity to urban architectural heritage. Examples of successful reuse of heritage are scanty and are mostly based on a single approach, i.e., strict conservation. The

aforesaid implies that there are uncoordinated efforts and lack of capacity among stakeholders and guardians of the built environment in heritage preservation. Moreover, there is lack of awareness among the local communities of the socio-economic benefits of architectural heritage. There is a need for concerted efforts to build capacity on a variety of levels: academic society, local community and Government Authorities. ARU and the society at large are lacking adequate expertise in integrating architectural heritage into current spatial discourses, as well as the needed pedagogical and research skills in the area.

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

1. Research: The project will generate several outputs, including green approaches in revitalising architectural heritage; design options, scenarios and possibilities integrating traditional construction techniques for architectural heritage; stakeholder participation framework for architectural heritage through adaptive reuse; and, pathways that integrate economical (cost analysis) and legal aspects of handling protected heritage sites. These outputs will evolve from PhD and MSc research.

2. Education and training: The project is anticipated to training a total of 6 PhDs. In addition, the programme will sponsor training of 8 Masters candidates in the MSc on Architectural Heritage Management within the duration of the project. Tailor-made short courses in the area of adaptive reuse of architectural heritage will also be conducted so that a critical mass of professionals and the community at large may cope with global trends in heritage management involving research by design, understanding traditional construction techniques, as well as understanding associated legal and economic implications.

3. Societal Outreach: Various public and private stakeholders will be engaged through workshops, seminars, and conferences to share and disseminate knowledge on the common challenges and opportunities in the architectural heritage of Dar es Salaam. In such engagements, policy briefs will be formulated to influence policy makers in safeguarding interests of architectural heritage. In addition, use of technologies such as virtual and augmented reality to support virtual tourism (smart tourism) in selected heritage sites to supporting raising awareness to community. This will be done in collaboration with Project 7.7.

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).

a. Project end users: The knowledge created in this project will be shared during consultative meetings and symposia that will involve stakeholders from the Local Government Authorities, Ministries related to human settlements development, conservation and land related issues and public and private real estate developers. Public sector departments include Antiquities Department, National College of Tourism (NCT), and National Housing Corporation (NHC). Private sectors/NGOs include Dar es Salaam Architectural Heritage – DARCH, and Urithi (an NGO dedicated to Architectural Heritage Conservation). ARU as well will use the generated knowledge and capacity to train its students and further research capabilities.

b. Uptake strategy of the project: The following strategies in sharing the end results with end-users will be adopted:

- **Use of participatory approaches:** At a grass-root level, participatory approaches involving Focus Group Discussions (FGDs) with community leaders will be effectively utilized to give the community a sense of ownership of the architectural heritage programmes for sustainability. The involved stakeholders in the formulation of the extended concept note and the Board of Advisors that has already been formed for this project form a platform for further engagement with more stakeholders in addressing their needs and challenges. At the level of the Government, discussions on policy briefs generated in the project will influence harmonization and mainstreaming of architectural heritage in the legal and operational structures and instruments.

- **Conducting regular sensitization seminars:** The goal is to win more community support through leaders, by engaging policy and decision makers, to raise attention and enhance advocacy of the concept of architectural heritage conservation. The regular seminars will guarantee the uptake of the results of the project by the stakeholders. The understanding and adoption of adaptive reuse strategy by stakeholders will mainstream the provision of inclusive spaces and places to accommodate the marginalized groups notably the disabled who seem to have been excluded in the previous buildings.

c. Structural barriers for end users: Lack of political will and ignorance propelled by negative stigma on the heritage by most individuals, financial limitations, and government development priorities may hamper effective implementation of the architectural heritage conservation programmes. Stakeholder’s engagement will be useful in creating awareness on the importance of architectural heritage to policy makers and the community at large.

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

Proposed local project leader	Dr Shubira Kalugila (Architecture Department)
Local project team	<ul style="list-style-type: none"> ✓ ARU – Architecture Department: Dr Daniel Mbisso; Dr Simon Mpyanga; Drs Godfrey Severe Ayubu ✓ ARU – Building Economics Department: Dr Sarah Phoya ✓ ARU – Civil Engineering Department: Dr Rehema Monko ✓ ARU – Interior Design Department: Dr Ombeni Swai ✓ University of Dar es Salaam – Business Studies Department: Dr Theresia Busagara
Overview of available domains of expertise in the project team	Available expertise in the team include; architecture, urban design, architectural conservation, landscape management, quantity surveying (cost modelling, cost control and construction project management) and Building Information Modelling (BIM)
Comments on the expertise sought for at level of the Flemish HEIs	The local team lacks adequate expertise in adaptive reuse strategies. Expertise is sought in heritage and adaptive reuse.

7.6 Project 6: Gender and participation - Towards gender-equitable and inclusive urban development (transversal institutional strengthening project)

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)

a. Objectives: The project's objective is to mainstream a gender³ and societal/community participation perspective in ARU's training, research and outreach portfolio.

b. Medium-term achievements: Mainstreaming a gender and societal participation perspective in ARU's training, research and outreach portfolio will lead to a higher level of gender-sensitivity in academic outputs. In line with the VLIR-UOS three-fixes gender policy, medium-term achievements are envisaged in three different interconnected areas:

1. **Numbers:** Starting from the current gap in PhD/master students, efforts will be done to attract female PhD and master students. Over the first five years of implementation, 2 PhD students and 4 master students will be trained, of which at least 50% will be female. All PhD & master students will include a gender & community perspective in their work (see also content). Project leadership positions will be targeted towards women which may function as role models.

2. **Content:** A gender & mainstreaming perspective will be mainstreamed in activities and outputs of the three academic pillars. An integrated approach (nexus education-research-outreach) will be adopted to assure policy relevant output with maximum impact:

- ✓ Education/training: staff's capacity in gender-sensitive and community-based approaches will be increased. This will feed into students' increased capacity through revised course content and new courses. Societal actors' knowledge and skills will be increased through short term courses and training packages. Over the first five years it is envisaged to develop 2 new short courses and train in total 250 professionals (of which half female).
- ✓ Research: staff and student's capacity in actionable gender & community participation research will be increased. Over the first five years of implementation, it is envisaged to produce 4 peer reviewed publications and 4 conference contributions.
- ✓ Outreach: staff and student's capacity in gender-sensitive outreach activities will be increased. This will stimulate uptake of education and research findings by different societal actors outside academia and contribute in the long run to more gender-sensitive policies and outputs in the different domains of change. Over the first five years of implementation, it is foreseen to produce 5 policy briefs, 5 policy seminars, 20 posters, 5 videos.

3. **Organisation:** To assure gender-sensitivity in numbers and content, underlying processes will be made gender-sensitive and participatory. Over the first five years of implementation, the existing ARU gender policy and its implementation will be reviewed, a gender research and outreach platform will be established, and a mentorship system will be put in place. It is foreseen to train (over five years) 100 female PhD & master students in writing of research proposals, policy briefs, curriculum vitae, and in communications to different audiences (presentations, development of posters and video's). A website will be established and yearly a (career) network event will be organised with stakeholders from government, donors, alumni, civil society.

c. Long-term achievements: In ten years, 4 PhD & 8 masters, at least 8 peer reviewed publications, 8 conference contributions, 10 policy briefs, 10 policy seminars, 40 posters and 10 videos will be produced. 500 professionals will participate in short courses and outreach activities organised at/by ARU. An updated gender policy, a gender research & outreach platform, an interdisciplinary research group and a mentorship system will be functional which will contribute towards an increased level of gender equality and empowerment both inside the university and in the different domains of change and community at large.

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.).

a. Link with and deepening of the context analysis: Gender-based differences exist in each domain of change and in higher education (including at ARU). Gender differences are sharpened when moving up to higher education and when focusing on some academic disciplines (sciences and engineering). While gender policies exist in the different domains of change and at ARU, the problem is often policy evaporation (non-implementation). This is due to a variety of factors, including technical issues such as lack of capacity in gender analysis and gender-sensitive design, budgeting, monitoring and evaluation as well as more political & institutional challenges, including deficient accountability structures towards citizens. Gender blindness leads to gender inequality but disregarding differences between individuals in policy-making more generally leads to ineffective policies overall.

b. Link with the programme objectives: Reaching the overall programme objectives, i.e. changes in each of the domains, needs a gender-sensitive approach. The project will thus support the university in reviewing and implementing its gender policy, and in mainstreaming a gender dimension throughout its research, education and outreach activities, with a specific focus on the different domains of change (link with projects). Changes in (gender-sensitive) outcomes cannot be realised if only supply side actors are involved, there is also a need for changes at the demand side. This calls for a participatory, community-based approach, as the strategy which will be adopted by the project to mainstream gender throughout the programme.

c. Link with the other projects: There are close links with all projects as gender and societal participation are transversal topics. Trainings will be offered to staff to support them in mainstreaming a gender/participation perspective in their projects, gender & community participation courses will be integrated in the 3 MSc programmes to be established. The project's research and outreach activities (see also below) will be at the crossroads of gender and the other domains of change and will also take place at the three exemplary sites. There is also a link with the transversal ICT project as the research will focus on gender-sensitive mobile community monitoring.

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

³ As men nor women are homogeneous groups, we also take into account other layers of differentiation (such age, disability status, marital status, ethnicity, ...) that may lead to multiple and reinforcing levels of inequality between individuals. Our gendered approach will take this intersectionality into account.

As explained below, the project will focus on the three academic pillars and will as much as possible work on the **nexus between the three pillars**.

1. Research: Capacity development in actionable gender-sensitive research will be done through training of 4 PhD & 8 Master students and their involvement in a gender-sensitive action research/citizen science project. A design on gender-sensitive community based mobile monitoring project (CBM) will be created at the three different selected project sites in which communities, policy-makers, civil society and academia will be linked. Through mobile CBM, communities can provide feedback on (gender-related) issues in the areas of land, water, sanitation, economy, housing, mobility, etc. to policy makers who get more accurate and quick information. It also offers multiple entry points for policy-relevant PhD (and MSc) research: using the data collected on different topics, but also on the CBM itself, its functioning and impact whereas also implementation at different sites offers opportunities for comparative (case study) research. The action research will be gender-sensitive in terms of processes and numbers and for all different types of actors involved. A mentorship system will be set up for PhD students. As the community-based project uses mobile technology, it will also help to narrow gender inequality in ICT and increase women's employability (also assuring sustainability).

2. Education and training: The project will build both ARU's staff's and student's capacity in gender-sensitive and community-based approaches with a specific focus on the different domains of change. First, trainings, seminars and workshops will be organised for staff to help in mainstreaming gender & community in their own academic activities. Education/training, content of existing courses will be revised and new courses will be developed for the new established programmes. Action labs for students will be organised through their involvement in the action research (see below). This education-research nexus activity does not only increase student's knowledge but also skills, attitudes and networks which may feed into more useful research & education while increasing their employability. In addition, short-term courses, trainings and workshops will be developed to target audiences outside academia including policy-makers and government staff, civil society actors, parliamentarians, etc. Such training (at the nexus of education-outreach) is important to help fill the gap of gender mainstreaming knowledge and skills that exists in society and if successful it might help to build a critical mass of gender capacity at the university and increase sustainability.

3. Societal outreach: The outreach will be done by drafting of policy/research briefs, blogs, videos, posters, use of mobile technologies and participatory methods (drawings and mapping). In line with the overall strategy, attention will be given to gender-sensitivity in terms of processes (number and format) as well as content.

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

a. Project end users: The end users of the project consist of the ARU staff and students. Others include the communities in which (action) research is done, the duty bearers at different levels (from local to ministry level = policy arena), civil society, the broader academic community. Others that we target are the staff involved in synergy projects (in particular the Fuatilia Maji project set up in the IUC with Mzumbe University) including as well Tanzanian alumni that have studied at a Belgian university.

b. Uptake strategy of the project: The nexus education-research-outreach assures that outreach is part and parcel of the entire project which is key to the uptake strategy. Action research/citizen science methodologies are specifically designed to create, from the very start, feedback loops between communities, policy-makers and researchers. This implies that the focus is on policy-relevant issues which stimulates uptake of the findings and impact. Uptake (also beyond the actors directly involved in the action research) is also stimulated through short-term courses (in gender analysis & budgeting, community-based monitoring/approaches, etc.).

c. Structural barriers for end users: Norms and traditions may pose structural barriers towards the involvement of voiceless groups in our activities. However, it is the project's aim to design processes in such a way that they help to remove these barriers and contribute towards gender equality, empowerment and well-being within communities.

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

Proposed local project leader	Dr. Angela Jesse – Economics and Social Studies (ESS)
Local project team	<ul style="list-style-type: none"> ✓ ARU – Economics and Social Studies (ESS): Prof. Eleuther Mwageni; Mr. Jimson Chumbula ✓ ARU – Urban and Regional Planning (URP): Dr. Nelly Babere ✓ Temeke municipal council: Ms. Tatu Ambakisye (Community development) ✓ Ms. Violet Deonatus Mbilima – Independent Researcher ✓ National Institute for Productivity: Ms. Haphsa M. Hinchu, Gender and Advocacy ✓ Mzumbe University – Department of Economics, faculty of Social Sciences: Doreen Kyando; Dr. Christina Shitima; Dr. Mursali Milanzi ✓ Mzumbe University – Institute of Development Studies: Dr. Frank Theodory
Overview of available domains of expertise in the project team	a) Dr. A. Jesse - Community Development, b) Prof. E. Mwageni - Demographer, (c) Dr. N. Babere - spatial planning and gender d) Mr. J. Chumbula - Community Development, e) Ms. T. Ambakisye - Community development, f) Ms. V. D. Mbilima - Independent Researcher, g) Ms. H. M. Hinchu - Gender and Advocacy expert, h) Dr. C. Shitima – governance of natural resources and gender ,i) Ms. D. Kyando – CBM, j) Dr. M. Milanzi - development evaluation, k) Dr. F. Theodory - participatory approaches, indigenous knowledge
Comments on the expertise sought for at level of the Flemish HEIs	Expertise in the area of gender & development and community-based approaches. As to stimulate linkages with other projects, also expertise in (some of) the other domains of change (land, water, economy, ...) is recommended. Given the importance of the contextual dimension in gender & community-based approaches, also previous experience in doing research, education and outreach in a Tanzanian context is an added value.

7.7 Project 7: ICT and SSIC - Improving Capacity to Innovate Smart ICT Solutions and Support Technology Transfer for Smart Sustainable and Inclusive Cities (transversal institutional strengthening project)

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)

Objective: The objective of this transversal project is to build fundamental research and strategic capacity on Smart, Sustainable and Inclusive Cities (SSIC), to prototype smart sustainable city solutions supporting the different IUC projects and for ARU to become a centre of excellence on SSIC. This will be done by:

1. Investigating the concept and underlying components of SSIC in a development context and develop insights on how to move towards such SSIC in Tanzania and how to make sure that this SSIC is all-inclusive, with respect to gender.
2. Exploring the potential of smart technologies to achieve the SDGs and address the challenges of cities in a development context in relation to the IUC projects.
3. Developing the specific expertise on data gathering, data handling, data-analytics, data-infrastructure and data-awareness as key-components required for SSIC and the different IUC projects.
4. Providing transversal support for the different projects in this IUC proposal on data-analytics and smart city solutions.
5. Develop a blended learning platform and tools in support of the different IUC projects and more specifically in relation to SSIC themes – data-analytics course, open data strategy course.
6. Engaging and stimulating (new) collaboration between key-stakeholders from the quadruple helix– government, industry, research and citizens – in the design and development of Smart City Solutions for the IUC projects and the ACS.

b. Medium term achievements: The medium-term achievements are:

- i. Develop a vision and strategy for SSIC and its role within a development context with a specific focus on Dar Es Salaam;
- ii. Develop a good understanding of the SSIC context – policy, infrastructure, user dynamics, ICT & gender and environment;
- iii. Define (new) collaboration models for the quadruple helix and build participatory policy making expertise at ARU ;
- iv. Research and develop the necessary supporting data-infrastructure and data-analytics competences at ARU;
- v. Develop a blended learning platform at ARU in support of the institution and more specifically in support of education and outreach initiatives developed in the IUC projects;
- vi. Develop prototypes of smart city solutions with all other IUC projects;
- vii. Develop training on data-analytics for stakeholders and for staff working in the different IUC projects;
- viii. Develop an outreach programme on SSIC for stakeholders in the quadruple helix.

During the first five years of the project, the following outputs will be produced: 2 PhD and 2 MSc students trained on issues of data-infrastructure, open data-governance models and data-analytics for SSIC in a developing context; 5 academic staff and 5 technical staff trained in SSIC (short courses); 100 stakeholders (including staff within the different IUC projects) trained on data analytics, smart city governance and blended learning; 4 peer reviewed publications and 4 conference contributions produced.

c. Long-term achievements:

- i. Develop a capacity programme on Smart Sustainable and Inclusive Cities;
- ii. Develop ARU as a recognized centre of excellence on SSIC, that will act as a central intelligence and expertise hub as well as an innovation space for SSIC in a development context;
- iii. Establish key generic SSIC infrastructures such as an open (city-)data architecture in close collaboration with Dar Es Salaam to act as an open innovation environment to support the development, testing and validation of ICT-based SSIC solutions;
- iv. Develop a portfolio on SSIC (data analytics, smart city governance,...) and blended learning.

Outputs produced in ten years include: 4 PhD and 4 Master students trained on the topics mentioned above; at least 8 peer reviewed publications, 8 conference contributions and one synthesised policy brief produced on SSIC; 200 stakeholders trained on data analytics, smart city governance, and blended learning; one blended learning platform and one outreach programme on SSIC developed; seven prototypes of smart city solutions developed and one interdisciplinary research group created.

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.).

a. Link with the context analysis: The SDG's and, in particular SDG 11 – make cities and human settlements, inclusive, safe, resilient and sustainable—are at the cornerstone of this project. In many developed countries Smart Cities are considered as important in achieving SDG 11 (U4SSC, 2017). The Smart City is called *smart* because the use of technology and the analysis of vast numbers of data collected, allows for more intelligent choices and actions – both at the individual level (by citizens) and at the collective level (by companies and city governments) – related to mobility, security, energy use, culture, markets, etc. at the level of the city (Ballon et al., 2017). Smart cities are hoped to improve quality of life, efficiency of urban operation and services and competitiveness, while ensuring meeting the needs of present and future generations with respect to economic, social, environmental, as well as cultural, aspects (U4SSC, 2017). Apart from the discussion on Smart Cities and Smart City Solutions in the developed world, the last years have seen a rise of interest in Smart Cities in a developmental context. The context in these countries is often different. Rapid urbanization as a result of population growth and urban migration, weak infrastructure and connectivity and highly unequal levels of development within the urban areas challenge the use of smart city solutions (Aghimien et. Al., 2020). There is a real risk that Smart Solutions will even augment inequality within the city (Ahmed & Gillwald, 2020). New approaches are needed that take these challenges into account. It is the ambition of ARU to contribute to these discussions and to foster a vision, strategy and solutions for SSIC in Tanzania.

ARU has some capacity in terms of researching and innovating on SSIC solutions. However, it faces limitations including inadequate infrastructure for data processing, lack of methodologies and mechanisms to create smart solutions in a broader SSIC context. The ambition is to develop local expertise on SSIC vision and strategy development as well as in methodologies to engage with stakeholders in a societal and citizen driven design approach. This will help ARU to train skilled researchers in smart

city solutions. Furthermore, ARU lacks a platform and tools for blended learning in support of the other IUC projects' objectives regarding education and outreach.

b. Link with the programme objectives: SDG 11— which is at the core of this IUC— is also at the core of any Smart City Vision and Strategy. Smart city technologies and solutions can play an important role in addressing the challenges with regard to this programme. This is the reason why SSIC was developed as a transversal project.

c. Link with the other projects: A Smart Sustainable and Inclusive City (SSIC) approach requires an integrated approach to infrastructure, city planning, data management and smart solutions. Cities all too often think and work in silos—which is detrimental to an integrated approach. This transversal project stimulates activities and thinking about smart solutions, data collection, analysis and management over the different IUC projects and bridges the different dimensions. It will develop methods for multi-stakeholder engagement and central (data-) infrastructure to support the use cases of those projects and map them to the broader SSIC strategy. It will also provide a blended learning platform to support and integrate the efforts for education and outreach developed within the other IUC projects.

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

The Smart City Strategy is in essence a participatory strategy that involves all stakeholders. This will be the starting point and philosophy of this project 7. Close collaboration between the stakeholders involved in project 7 itself, between project 7 and all other projects in the IUC and between the stakeholders of the quadruple helix will be integrated in the working of project 7. Smart City initiatives are also characterized by a combination of academic, practical and policy advocacy work, which will be integrated in the project. The above objectives will be achieved by:

1. Research: Research will centre around two main pillars of research. The **first pillar** 'vision and strategy' focuses on a) how to build a vision for SSCIs in a developmental context, b) what required strategy should be followed and c) how such vision can connect and address the challenges and solutions in the ACS projects. The **second pillar** 'SSIC Context' focuses on the investigation of the underlying building blocks in terms of local data sources, technology, access, skills and competences, that are crucial for the success of an SSIC.

2. Education and Training: Project 7 will develop several modules on SSIC, smart solutions, quadruple helix participatory methods, data-management and analysis. These modules will be offered on a blended learning platform. They can be 1) stand-alone courses, or 2) integrated courses in the MSc programmes developed in the other IUC projects. These courses will be developed between the partners and on the basis of at least 4 PhD and 4 MSc students that will focus their research on SSIC. University staff will be involved in internal training initiatives on SSIC subjects. Furthermore, 5 academic and 5 technical staff will be trained on state of the art methods of operationalizing blended learning and dissemination of research results.

3. Societal outreach: Smart Cities development is often participatory in nature. Involving the quadruple helix in this project is in itself contributing to societal outreach. However, this project will also focus on participatory policy making exercises with a focus on training and co-creating smart city solutions. By emphasising citizen science approaches in other projects we indirectly contribute to societal outreach in other projects.

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

Project end users: End users of the project include ARU researchers, students, central services/authorities, policy makers, city departments, industry & entrepreneurs, local communities and citizens.

b. Uptake strategy of the project: The uptake strategy consists of two main tracks. First, the capacity building and research activities will be in close interaction with the various actors of the quadruple helix in order to keep them engaged and to ensure their needs and challenges are included so that the outputs are directly applicable to their context. Second, as this is a transversal project, it will support and interact with the other IUC projects.

c. Structural barriers for end users: Structural barriers for end users include cost of adoption of technologies; lack of and unreliable infrastructure, embedding this into existing policy processes, limitations of current regulatory frameworks.

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

Proposed local project leader	Dr. Rigobert Buberwa, Computer Systems and Mathematics (CSM)
Local project team	<ul style="list-style-type: none"> ✓ ARU – Department of Computer Systems and Mathematics (CSM): Dr. Ntwa Katule; Mr. Godfrey Luwemba; Ms. Beatrice Kateule; Mr. Michael Nkotagu ✓ University of Dar es Salaam – Department of Computer Science and Engineering: Dr. James Chambua
Overview of available domains of expertise in the project team	Dr. Rigobert Buberwa: GIS and Database Dr. Ntwa. A. Katule: User Experience, ICT4D, Human-Computer Interaction Mr. Godfrey Luwemba: Data Communication and Embedded Systems Ms. Beatrice Kateule: Informations Systems Mr. Michael Nkotagu: Systems Integration, Software Engineering Dr. James Chambua: Machine Learning, Data Analytics
Comments on the expertise sought for at level of the Flemish HEIs	Smart City Expertise, Open data governance, Co-creation and participation experts, Living lab – based innovation, ICT4D, participatory policy making, e-inclusion policies, Smart city infrastructure and technologies, knowledge sharing.

8. Budget indications

Total annual budget⁴ applied for during Phase 1 IUC Cooperation: € 600.000/year

Indicative project budget repartition⁵:

Title of project	Type ⁶	Indicative % of project budget	Budget justification
Project 1: Land use planning	Academic theme-based project	14,5%	
Project 2: Decent housing	Academic theme-based project	18,5%	The domain has received the highest budget because it has more activities than the other domains
Project 3: Socio-economic development	Academic theme-based project	14%	
Project 4: Urban transport	Academic theme-based project	14%	
Project 5: Cultural heritage	Academic theme-based project	12,5%	The domain has received the least budget because it has less activities as compared to other domains
Project 6: Gender and participation	Transversal Institutional Strengthening Project	12,5%	The domain has the lowest budget. However, in line with a mainstreaming perspective, within each of the other projects activities (and budgets) are foreseen to integrate a gender and participation dimension.
Project 7: ICT and innovation	Transversal Institutional Strengthening Project	14%	
Total		100%	

The budget division above is indicative and is built on the following principles:

- A fair division between all projects. Some projects need more funds for putting in place research infrastructure (e.g. lab equipment, chemical reagents and experimental setups. That is the reason why some project budgets have a slightly higher budget. The project of decent housing receives the highest budget because it is the most substantial and complex.
- A general division between the academic (73,5%) and the transversal projects (26,5%), because transversal projects are important as well and specifically intended to build institutional capacity. The ICT project has a slightly higher budget than the gender and participation project because it needs more infrastructure, but both transversal projects are equally important for ARU.

⁴ See budget section in the call document. Annual IUC budget in Phase 1 is a fixed amount.

⁵ 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.

⁶ 2 types of projects: academic theme-based projects or Transversal Institutional Strengthening Projects (TISP)

Abbreviations

AAT	Architectural Association of Tanzania
ACS	African Centre for Sustainable Cities Studies
AI	Artificial Intelligence
ARU	Ardhi University
B2B	Business to business
B2C	Business to consumer
BMBF	Federal Ministry of Education and Research (Germany)
BMZ	German Federal Ministry for Economic Cooperation and Development
BORDA	Bremen Overseas Research and Development Association
BRT	Bus Rapid Transport
BTC	Belgian Technical Cooperation (now: ENABEL)
CAMARTECH	Centre for Agricultural Mechanisation and Rural Technology
CBD	Central Business District
CBM	Community based mobile monitoring
CBO	Community Based Organisation
CSO	Civil Society Organisation
DAAD	German Academic Exchange Service
DANIDA	Danish International Development Agency
DAR	Dar es Salaam
DARCH	Dar es Salaam Centre for Architectural Heritage
DART	Dar es Salaam Bus Rapid Transit
DHDRPC	Department Higher Degrees, Research and Publications Committee
DVC-AA	Deputy Vice Chancellor for Academic Affairs
ENABEL	Belgian Development Agency
EWURA	Energy and Water Utilities Regulatory Authority
FAO	Food and Agriculture Organisation
FONATA	Food and Nutrition Association of Tanzania
FSC	Flemish Steering Committee
GDP	Gross domestic product
GIS	Geographic Information System
GM (programme)	Global Minds (programme)
HBS	Household Budget Survey
HR	Human Resources
ICOS	Institutional Coordinator for Development Cooperation
ICP	International Course Programme
IOB	Institute of Development Policy
IoT	Internet of Things
IUC (programme)	Institutional University Cooperation (programme)
IRENA	International Renewable Energy Agency
JSC	Joint Steering Committee
KUL	KU Leuven (Flemish University)
LATRA	Land Transport Regulatory Authority
LGA	Local Government Authority
LSC	Local Steering Committee
MLHSD	Ministry of Lands, Housing and Human Settlements Development
MOOC	Massive Open Online Course
MTSRP	Medium Term Strategic Rolling Plan
MVIWATA	National Network of Farmers Groups in Tanzania
MUFPP	Milan Urban Food Policy Pact
NBS	National Bureau of Statistics
NEMC	National Environment Management Council
NGO	Non-Governmental Organisation
NHC	Tanzania's National Housing Corporation
NLUPC	National Land Use Planning Commission
NMT	Non-motorized transport
ODL	Open Distance Learning
OECD/DAC	The Organisation for Economic Co-operation and Development's Development Assistance Committee
PAR	Participatory Action Research
PORALG	President Office Regional Administration and Local Government
PSU	Programme Support Unit

PT	Public transport
PXL	PXL (Flemish University College)
REWG	Renewable Energy Working Group
RUAF	RUAF Global Partnership on Sustainable Urban Agriculture and Food Systems
SANDEC	Department of Sanitation, Water and Solid Waste for Development
SDG(s)	Sustainable Development Goal(s)
SDCP	Sustainable Dar es Salaam City Project
SHDRPC	Senate Higher Degrees, Research and Publication Committee
SI (projects)	South Initiatives (projects)
SIDA	Swedish International Development Cooperation Agency
SIDO	Small Industries Development Organisation
SMEs	Small and medium-sized enterprises
STHEP	Science, Technology and Higher Education Programme
TABOA	Tanzania Bus Owners Association
TAFOGANET	Tanzania food and gardening network
TAFOPA	Tanzania Food Processors Association of Women & Youth Entrepreneurs
TALA	Tanzania Land Alliance
TANCERT	Tanzania Organic Certification Association
TANROADS	Tanzania National Roads Agency
TARURA	Tanzania Rural and Urban Roads Agency
TASAF	Tanzania Social Action Fund
TASO	Tanzania Agriculture Support Organization
TAWLA	Tanzania Women's Lawyer Association
TBS	Tanzania Bureau of Standards
TCA	Tanzania Chefs Association
TCCIA	Tanzania Chamber of Commerce, Industry and Agriculture
TCU	Tanzania Commission for Universities
TDHS	Tanzania Demographic and Health Survey
TEMDO	Tanzania Engineering and Manufacturing Design Organization
TFNC	Tanzania Food and Nutrition Centre
TIRDO	Tanzania Industrial Research and Development Organisation
TOAM	Tanzania Organic Agriculture Movement
TPF	Tanzania Police Force
UAntwerp	University of Antwerp
UGent	Ghent University
UHasselt	Hasselt University
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Program
UN-Habitat	United Nations Human Settlements Programme
UNIDO	United Nations Industrial Development Organization
UPA	Urban and Peri-Urban Agriculture
URT	United Republic of Tanzania
USAID	United States Agency for International Development
VUB	Vrije Universiteit Brussel (Flemish University)
VETA	Vocational Education Training Authority
VLIR-UOS	Flemish Interuniversity Council for Development Cooperation
WASH	Water, Sanitation and Hygiene
WaSKiRP project	Water and Sanitation Kigoma Region project
WAT	WAT Human Settlements Trust
WHO	World Health Organisation
WFP	World Food Programme

REFERENCES

- Aghimien, D. O., Aigbavboa, C., Edwards, D. J., Mahamadu, A. M., Olomolaiye, P., Nash, H., & Onyia, M. (2020). A fuzzy synthetic evaluation of the challenges of smart city development in developing countries. *Smart and Sustainable Built Environment*.
- Ahmed, S., & Gillwald, A., 2020. Smart Townships will Build Smarter Cities. Reseach ICT Africa.
- Amorim, A. L. B. D., Rosso, V. V. D., & Bandoni, D. H. (2016). Acquisition of family farm foods for school meals: Analysis of public procurements within rural family farming published by the cities of São Paulo state. *Revista de Nutricao*, 29(2), 297-306.
- Ballon, P., van der Graaf, S., & Walravens, N., 2017. De smart city als humane publieke ruimte (The smart city as human public space). In P. Ballon, C. Macharis, & M. Ryckewaert, De humane stad (pp. 120–139). Politeia.
- Blum, N. U., Wakeling, R. S., & Schmidt, T. S. (2013). Rural electrification through village grids—Assessing the cost competitiveness of isolated renewable energy technologies in Indonesia. *Renewable and Sustainable Energy Reviews*, 22, 482-496.
- Brandes, K., Schoebitz, L., Kimwaga, R., Strande, L. (2015). SFD Report - Dar es Salaam, Tanzania - SFD Promotion Initiative. Eawag/Sandec The Department of Sanitation, Water and Solid Waste for Development (Sandec) at the Swiss Federal Institute of Aquatic Science and Technology (Eawag)
- Briggs, J. (2011). The land formalisation process and the peri-urban zone of Dar es Salaam, Tanzania. *Planning Theory and Practice*, 12(1), 115-153.
- Crivits, M., Prové, C., Block, T., & Dessein, J. (2016). Four perspectives of sustainability applied to the local food strategy of Ghent (Belgium): need for a cycle of democratic participation?. *Sustainability*, 8(1), 55.
- Falanta, E. M., & Bengesi, K. M. (2018). Drivers and consequences of recurrent conflicts between farmers and pastoralists in Kilosa and Mvomero Districts, Tanzania.
- Gómez-Baggethun, E., & Barton, D. N. (2013). Classifying and valuing ecosystem services for urban planning. *Ecological economics*, 86, 235-245.
- Gražulevičiūtė–Vilėniškė, I., & Urbonas, V. (2011). Architectural heritage as a socioeconomic opportunity for revitalization of historic urban centres: a global perspective. *Architecture and Urban Planning*, 5, 27-37.
- Gutierrez, J. M., Jensen, M., Henius, M., & Riaz, T. (2015). Smart waste collection system based on location intelligence. *Procedia Computer Science*, 61, 120-127.
- Gwaleba, Method J. (2018). Urban Growth in Tanzania: Exploring Challenges, Opportunities and Management. *Int'l J. Soc. Sci. Stud.*, 6, 47.
- Halloran, A., & Magid, J. (2013). The role of local government in promoting sustainable urban agriculture in Dar es Salaam and Copenhagen. *Geografisk Tidsskrift-Danish Journal of Geography*, 113(2), 121-132.
- Jabbour, J. Editors, 2014. *United Nations Environment Programme (UNEP)*, Nairobi, Kenya.
- Jackson, M. M. (2005). Roadside concentration of gaseous and particulate matter pollutants and risk assessment in Dar-es-Salaam, Tanzania. *Environmental Monitoring and Assessment*, 104(1-3), 385-407.
- Jenkins, M. W., Cumming, O., Scott, B., & Cairncross, S. (2014). Beyond 'improved'towards 'safe and sustainable'urban sanitation: assessing the design, management and functionality of sanitation in poor communities of Dar es Salaam, Tanzania. *Journal of Water, Sanitation and Hygiene for Development*, 4(1), 131-141.
- Kazaura, W. G. (2019). A GIS-Based Integrated Model for Exploring Effects of Land Use Changes on Transport Demand: The Case of Dar es Salaam, Tanzania. *Current Urban Studies*, 7(03), 459.
- Kebede, A. S., & Nicholls, R. J. (2011). *Population and assets exposure to coastal flooding in Dar es Salaam (Tanzania): vulnerability to climate extremes*. Global Climate Adaptation Partnership (GCAP).
- Kifunda, C. (2020). *The Role of Gender in Supporting Livelihoods through Urban and Peri-Urban Agriculture: The Case of Kinondoni Municipality in Dar es Salaam City, Tanzania* (Doctoral dissertation, Universität Oldenburg).

- Kihila, J., Mtei, K. M., & Njau, K. N. (2015). A review of the challenges and opportunities for water reuse in irrigation with a focus on its prospects in Tanzania. *International Journal of Environmental Engineering*, 7(2), 111-130.
- Kironde, J. L. (2006). The regulatory framework, unplanned development and urban poverty: Findings from Dar es Salaam, Tanzania. *Land use policy*, 23(4), 460-472.
- Kombe, W. J. (2010). Land acquisition for public use, emerging conflicts and their socio-political implications. *International Journal of Urban Sustainable Development*, 2(1-2), 45-63.
- Kyessi, A. G. (2018). Enhancing Security of Land Tenure in Informal Settlements: The Case of Wat-Human Settlements Trust in Hanna Nassif Settlement, Dar es Salaam Tanzania. *Utafiti Journal*, 8(1).
- Lee-Smith, D. (2010). Cities feeding people: an update on urban agriculture in equatorial Africa. *Environment and Urbanization*, 22(2), 483-499.
- Lindley, S., Pauleit, S., Yeshitela, K., Cilliers, S., & Shackleton, C. (2018). Rethinking urban green infrastructure and ecosystem services from the perspective of sub-Saharan African cities. *Landscape and Urban Planning*, 180, 328-338.
- Lyeme, H. A., Mushi, A., & Nkansah-Gyekye, Y. (2017). Implementation of a goal programming model for solid waste management: a case study of Dar es Salaam–Tanzania. *International Journal for Simulation and Multidisciplinary Design Optimization*, 8, A2.
- Malekela, A., & Nyomora, A. (2018). Food security: The role of urban and peri-urban agriculture. A case of Dar es Salaam City, Tanzania.
- Malongo R.S. Mlozi, Aldo Lupala, Sebastian W. Chenyambuga, Emma Liwenga and Theodosy Msogoya (2014). Building Urban Resilience Assessing Urban and Peri-urban Agriculture in Dar es Salaam, Tanzania. United Nations Environment Programme (UNEP)
- Melbye, D. C., Møller-Jensen, L., Andreasen, M. H., Kiduanga, J., & Busck, A. G. (2015). Accessibility, congestion and travel delays in Dar es Salaam—A time–distance perspective. *Habitat International*, 46, 178-186.
- Mikkelsen, B. E. (2011). Images of foodscapes: Introduction to foodscape studies and their application in the study of healthy eating out-of-home environments. *Perspectives in Public Health*, 131(5), 209-216.
- Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar] (2016), National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), and ICF. 2016. Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS), Dar es Salaam, Tanzania, and Rockville, Maryland, USA: MoHCDGEC, MoH, NBS, OCGS, and ICF.
- Mittlefehldt, S. (2018). From appropriate technology to the clean energy economy: renewable energy and environmental politics since the 1970s. *Journal of Environmental Studies and Sciences*, 8(2), 212-219.
- Mkwela, H. S. (2013). Urban agriculture in Dar es Salaam: a dream or reality?. *Sustainable Development and Planning VI*, 173, 161.
- Mlozi, M.R.S., Lupala, A., Chenyambuga, S.W., Liwenga, E. and T. Msogoya. (2014). Building Urban Resilience: Assessing Urban and Peri-urban Agriculture in Dar es Salaam, Tanzania. [Padgham, J. and J. Jabbour (eds.)]. United Nations Environment Programme (UNEP), Nairobi, Kenya
- Mngumi, L. E. (2019). Socio-ecological resilience to climate change effects in peri-urban areas: insights from the Pugu and Kazimzumbwi forest reserves of Dar es Salaam, Tanzania. *GeoJournal*, 1-17.
- NBS, (2019), House Budget Survey for 2017-2018, NBS, Dar es Salaam
- NSMIS, (2019), National Sanitation Database, Ministry of Health, Community Development, Gender, Elderly and Children, Dar es Salaam Tanzania
- Sabai, M. M., Marinescu, M. V. A., Mato, R. R. A. M., Brouwers, H. J. H., De Ligny, E. E. D. W., & Lichtenberg, J. J. N. (2011). Investigation on the possibilities for recycling construction and demolition waste in to building materials in Tanzania. In *conference; EurAsia Waste Management Symposium; 2011-11-14; 2011-11-16* (pp. 1-5).
- Schreiber, L. (2017). Registering rural rights: village land titling in Tanzania, 2008–2017. *Innovations for Successful Societies, Princeton University*. Available online: <http://successfulsocieties.princeton.edu/> (accessed on 25 August 2019).

Sonnino, R. (2009). Quality food, public procurement, and sustainable development: the school meal revolution in Rome. *Environment and Planning A*, 41(2), 425-440.

Steel, C. (2008). *Hungry City: How Food Shapes Our Lives*. Penguin Random House, New York

Tucho, G. T., Weesie, P. D., & Nonhebel, S. (2014). Assessment of renewable energy resources potential for large scale and standalone applications in Ethiopia. *Renewable and Sustainable Energy Reviews*, 40, 422-431.

Vivian, M., Yasin, S., & Joel, M. (2017). Potential Health Risks Associated with Consumption of Shallow Well Waters in Informal Settlements in Dar es Salaam, Tanzania. *Asian Journal of Environment & Ecology*, 1-11.

United Nations, (2018). The World's Cities in 2018

UN-Population, 2018. World Urbanization Prospects: The 2017 Revision. United Nations

UNDP, 2017. Social Policy in the Context of Economic Transformation. Tanzania Human Development Report. United Nations Development Programme. UNDP, URT, Dar es Salaam.

United Republic of Tanzania (2014). *Gender Mainstreaming Guidelines in the Big Results Now Programme*. Dar es Salaam: MCDGC.

United Republic of Tanzania (2016). *National Strategy for Gender Development*. Dar es Salaam MCDGC.

United Republic of Tanzania (2019). *Voluntary National Review. Empowering people and ensuring inclusiveness and equality*. Dar es Salaam: URT.

United Republic of Tanzania, URT., 1999. The National Land Act No.4/Amendment Act (2004). Dar es Salaam, Government Printer

United Republic of Tanzania, URT., 1988. Population and Human Population Census Report Government printer, Dar es Salaam Tanzania

United Republic of Tanzania, 2014, Population and Housing Census Report, National Bureau of Statistics, Dar es Saalam, Tanzania

van Bers, C., Delaney, A., Eakin, H., Cramer, L., Purdon, M., Oberlack, C., ... & Korhonen-Kurki, K. (2019). Advancing the research agenda on food systems governance and transformation. *Current Opinion in Environmental Sustainability*, 39, 94-102.

Vonthron, S., Perrin, C., & Soulard, C. T. (2020). Foodscape: A scoping review and a research agenda for food security-related studies. *Plos one*, 15(5), e0233218.

Wegerif, M.C. (2014). Exploring Sustainable Urban Food Provisioning: The Case of Eggs in Dar es Salaam. *Sustainability* (6), 3747-3779

Wegerif, M. C., & Hebinck, P. (2016). The symbiotic food system: An 'alternative' agri-food system already working at scale. *Agriculture*, 6(3), 40.

World Health Organization. (2016). *World health statistics 2016: monitoring health for the SDGs sustainable development goals*. World Health Organization.

DOCUMENTS TO BE SUBMITTED

<u>Annex2</u> : CVs potential project leaders
