

INTERACT-BIO DIALOGUE
BIODIVERSITY MAINSTREAMING VIA THE TERTIARY
EDUCATION SECTOR: AN URBAN DESIGN APPLICATION



July 2023 | Tanzania

INTERACT-Bio
Integrated action on biodiversity



1. BACKGROUND

Urbanisation tends to drive a disconnect between people and nature. Thus, interventions to enable urban societies to understand and reconnect with nature are critical to improve our health, well-being and prosperity. Biodiversity mainstreaming is an approach to align governments, policies, sectors and activities with biodiversity concerns. It is a long-term process, requiring a decade or more and ideally involving diverse sectors and appropriate entry points (Manuel et al., 2016; IIED, 2017; Puppim de Oliveira et al., 2014). Establishing the natural world in education policy is an essential entry point for biodiversity mainstreaming. The development and design of environmental education programmes can help to achieve impact by priming the next generation of scholars, by focusing on local issues and collaborating with scientists (Dasgupta, 2021).

When the Thematic Atlas of Nature's Benefits to Dar es Salaam (Karutz et al., 2019) was released, one of the responses from the Dar es Salaam City Council was that the education sector would benefit from elements of the Atlas, modified to suit different education levels. In line with this interest, the dialogue summarised here is based on a pilot exercise conducted during 2021 in collaboration with the Ardhi University in Dar es Salaam. Third year urban design students at Ardhi University (ARU) (Chuo Kikuu cha Ardhi, in Swahili) were introduced to the Thematic Atlas and ecosystem services concepts and then asked to incorporate these ideas into their urban design projects.

Ardhi University was established as an independent university in March of 2007. The roots of Ardhi University can be traced back to pre-independence (1964) days when it was a Surveying Training School offering technician certificate courses in land surveying. Prior to 2007 (between 1996 and 2007), it existed as a constituent college of the University of Dar es Salaam. Back in 1979, the Centre for Housing Studies was established as a joint project between the governments of Tanzania and the Netherlands, as part of the Ardhi college. The centre has now grown into the Institute of Human Settlement Studies (https://en.wikipedia.org/wiki/Ardhi_University). The Institute offers teaching in Urban Design which is the ARU teaching unit relevant to this Dialogue.

It is not uncommon for Ardhi University graduates to find employment in government after their training, in particular in the Ministry of Lands but also other government sectors (e.g. city and municipal councils) and departments such as the Vice-President's Office: Environment Ministry, as well as the Ministry of Agriculture. A long history of the relationship and mutual influence between the Ardhi University graduate generation and government, especially land-use decision-making, means that ARU provides a rich opportunity for biodiversity

mainstreaming through the education sector.

The geographical location of ARU in Dar es Salaam is also significant. The City of Dar es Salaam is located in a globally important biodiversity hotspot, the 'Eastern Arc Mountains and East African Coastal Forests' hotspot (Burgess et al., 2009; Burgess et al., 2017; Meyers et al., 2002; Mittermeier et al., 2011). The Coastal Forest Hotspot runs along the Tanzanian and Kenyan coasts from the border with Somalia in the north, to that with Mozambique in the south. Of the original 30 000 km² extent, just 2 000 km² (i.e. 6.7%) of this hotspot remains. Biodiversity hotspots are areas of exceptional concentrations of endemic species (i.e. species found nowhere else in the world) that are simultaneously experiencing a high rate of habitat loss. For example, the African flame tree, *Fernandoa magnifica* and the tiny greenbul bird (*Phyllastrephus debilis*), are found only in the coastal forests of East Africa. Remnants of native coastal forests remain within Dar es Salaam City, pointing to an opportunity to restore the benefits provided by this unique natural heritage within an urban setting.



Dar es Salaam.

2. ADAPTING THE URBAN DESIGN CURRICULUM

The basic urban design curriculum

The INTERACT-Bio technical team, including the Helmholtz Centre for Environmental Research – UFZ, (Leipzig, Germany), held several planning sessions with Dr Nelly Babere, Master (‘Head’) of the Urban Design studio and Prof Alphonse Kyessi of the Institute of Human Settlement Studies (ARU) and Advisory Board member of the INTERACT-Bio project. The standard Urban Design Studio curriculum was considered and adapted to include a module on the Thematic Atlas and specifically incorporating ecosystem services thinking.

For third year students, the Urban Design Studio course is a semester course. It represents a core subject for the semester which is supported by other courses such as Urban Planning and Design Theory, Urban Infrastructure Planning and Management, Project Planning and Management and Research Methodology. Students are expected to acquire and integrate skills and knowledge from the supporting courses into their Urban Design Studio course.

Introducing the ecosystem services module

Module title: Mapping Urban Ecosystem Services – the case of the ‘Thematic Atlas of Nature’s Benefits in Dar es Salaam’:

Objectives of the module:

- Introduce the concept of ecosystem services and their potential for urban sustainability management and urban planning;
- Introduce the INTERACT-Bio project and its application of the ecosystem services concept;
- Introduce the ‘Thematic Atlas of Nature’s Benefits to Dar es Salaam’ and facilitate its critical appraisal by students and its potential use in urban design and planning;
- Integrate ecosystem services concepts into urban design education.

Module format

The module consisted of 4 half-day sessions which combined a lecture and interactive discussion (online). Students then travelled to the City of Tanga (a port city in northeast Tanzania) for field work. Each student

group (consisting of 4 to 6 students) was given a section of Tanga to redesign, integrating new understanding of ecosystem services. Following field work, seven (7) student groups were tasked to present their design projects for review by two external reviewers. These activities took place between April and August of 2021. The ecosystem services module structure is provided in Table 1 below.

Table 1. Ecosystem services and third year urban design class: Module structure

Session	Theme
Lecture 1 Lecturer: Augustin Berghöfer (UFZ) 21 April 2021	The concept of ecosystem services between sustainability science and policy input and discussion in plenary.
Lecture 2 Lecturer: Ernita van Wyk 3 May 2021	<ol style="list-style-type: none"> 1. Recap ecosystem services concepts. 2. Introduction to the INTERACT-Bio project. 3. Student assignment: Take approximately 3 photos of neighbourhood or city showing urban nature. Create a report showing nature in the city: Annotate photos with information on ecosystem services associated with the nature as photographed. Use p 18-19 of the Thematic Atlas for guidance.
Lecture 3 Lecturer: Augustin Berghöfer (UFZ) 10 May 2021	<ol style="list-style-type: none"> 1. Approach to developing the Thematic Atlas (presentation.) 2. Open discussion and fielding questions from students: linking ecosystem services (Thematic Atlas) with urban policy, urban planning and urban design.

<p>Lecture 4 Lecturer: Augustin Berghöfer (UFZ) 26 May 2021</p>	<p>Student critique of the Thematic Atlas Group assignment for the 26th of May - preparation guidance notes: Divide in five groups, each one to focus on a different section of the Thematic Atlas work:</p> <ol style="list-style-type: none"> 1. Socio-economic importance 2. Water is a human right 3. Public health 4. Prepared for climate change 5. Dar es Salaam: a biodiversity hotspot <p>Read the text closely, discuss in the group and prepare max 6 ppt-slides per group to respond to the following questions: What are the principal messages? How is the argument made that urban green infrastructure is beneficial? In your view, what are strengths and what are weaknesses in the evidence, and in the way it is being presented? Do you find it convincing? Why/why not? How could the atlas be used to improve urban sustainability in DSM? Please develop two concrete ideas. Prepare for a short presentation (max 8 minutes) to be held 26.05.21</p>
<p>Student field work in Tanga (June 2021)</p>	
<p>Session 5 28 July 2021</p>	<p>Student presentations and review (See section below)</p>

3. EXERCISE: RECOGNISING ECOSYSTEM SERVICES

The purpose of the assignment following Lecture 2 was for students to connect with and recognise ecosystem services in situ, in their own neighbourhoods and in the city generally. It was intended to stimulate the notion that nature provides ecosystem services and to stimulate the notion that nature provides ecosystem services at different scales and not only in wild and remote places, but also in ordinary and man-made/artificial landscapes. A number of examples of what students produced are highlighted here.

Ecological services at Kizinga River

Supportive services: The ecosystems at Kizinga River include supportive services such as flood control, soil erosion prevention on the Kizinga River banks and other parts of the landscape, pollination, facilitated by insects and supports other biodiversity by providing habitats.

Provisioning services: Kizinga River provides residents with water which is used for drinking and irrigation, fish as food, raw materials such as construction materials and wood as fuel. However, overexploitation can lead to the depletion of ecosystem resources.

Regulating services: Trees provide shade and cooling and help to regulate air quality. They serve as natural carbon sinks, they also help in treatment of water in the Kizinga River filtering and decomposing harmful substances. This helps to conserve the total ecological system.

Cultural services: Provided in the activities such as eco-tourism in Mtoni Estuary where river Kizinga enters the Indian ocean, which helps the community to benefit from the tourism as an economic activity. It is also used for educational purposes.



Irrigating food with water from the Kizinga River.



People enjoying shade along Vitamin Street. Trees along the roads provide shade to road users, making the journey more comfortable whilst walking. This encourages more people to walk rather than use cars, leading to reduced amounts of toxic emission gases released into the atmosphere.

Ecosystem services analysis at Mshikamano (Ubungu Municipality, Dar es Salaam)

Mshikamano is a ward in the Ubungu district of Dar es Salaam. In this ward there are different, or mixed land uses where some activities benefit from the ecosystem services in the area. For example, informal businesses along the Magufuli bus terminal benefit from the trees that are found in the area which provide shade for them to conduct their business sheltered from heat.



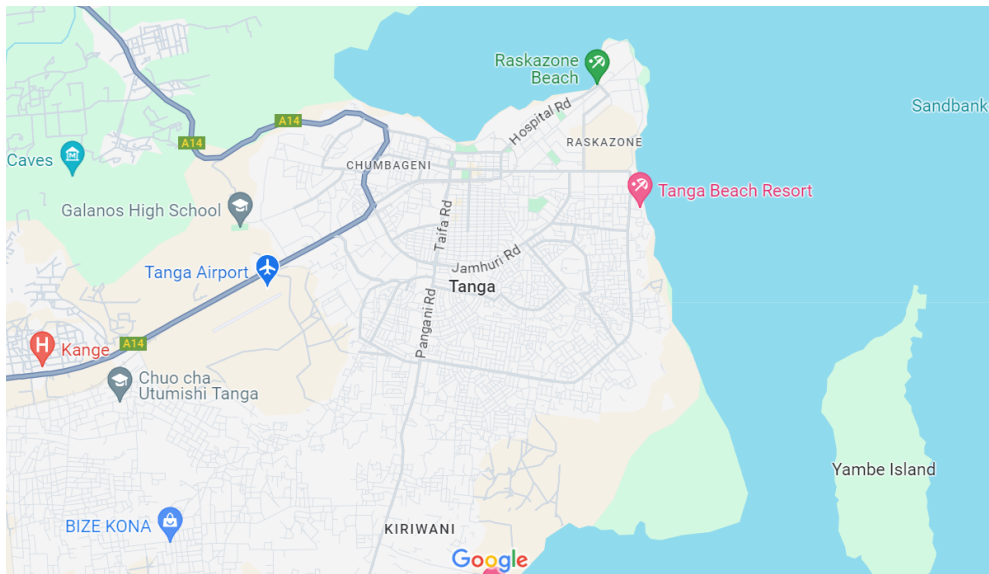
Informal trade in Dar es Salaam relies on shade where available.



Another ecosystem service is provided by short grasses and shrubs on a slope, preventing soil erosion because the vegetation helps to hold on the soil in the steep slope.

4. DIALOGUE WITH URBAN DESIGN STUDENTS

Session 5 of the ecosystem services module consisted of seven (7) student group presentations, with each group presenting their urban design based on a selected area of Tanga City, a coastal city in northern Tanzania. Review comments on the presentations were provided by Dr Finzi Saidi, Head of Department and Senior Lecturer in the Faculty of Art, Design and Architecture at the University of Johannesburg and Dr Ernita van Wyk, ICLEI Africa and Cities Biodiversity Center.



Google maps image of Tanga City, a coastal city in northern Tanzania.

Student Group 1: River Zigi Design

Design presentation: Integrating urban design principles and concepts such as walkability and disaster risk reduction (flooding) with ecosystem services, e.g. urban gardens for soil erosion control and improving the nature-based amenity and aesthetic value of the riverfront. Maintain stands of natural vegetation. Attention to all categories of ecosystem services: Provisioning, regulating, supporting and cultural services.

Student Group 2: Jet Waterfront Design

Design presentation: Design addresses shoreline area. Key issues: Inaccessibility (steep slopes) and ablutions not functioning, lack of lighting and lack of permanent area for local vending. Inadequate recreation facilities and inadequate seating. Soil erosion. Conducted stakeholder survey to understand user preferences. Vision: A waterfront that enhances ecosystem services provision, social cohesion and economic vitality. Maintain local forests for erosion control and climate regulation.

Student Group 3: Kichangani Park (Blue-green system: green belt)

Design presentation: Vision, to influence city development (in particular urban sprawl and working with the Tanga City Master plan), poor waste management & pollution, by conserving and enhancing the natural resource base. Design elements: recreation & sport facilities and cultural area. Emphasis on incorporating nature in the sports and recreation area.

Student Group 4: Raskazone Beach, Central ward

Design presentation: Coastal area of interest. Facilities need upgrading and absence of attractive features. Design elements, including gardens, sport and games areas and consideration of all age groups. User preferences information gathered with questionnaires and includes requests for maintaining the mangrove forest in particular as a tourist attraction and microclimate maintenance. Design objectives include maintaining the area to limit the impact of environmental hazards, e.g. ocean currents and creating space for cultural and religious activities.

Student Group 5: Blue-green system — Eco-theme Park

Design presentation: Kolekole natural forest (70 ha). Human activities encroaching on the forest. Vision to create an ecological hub in Tanga area. Objectives to create a nature-based design, facilitating recreation needs and restoring the ecology to enhance local adaptive capacity. Design elements include a reception area, recreation facilities, camping facilities and structured footpaths through the forest.

Student Group 6: Kolekole Forest Reserve

Design presentation: Managed by the Tanzania Forest Service. Activities in the forest include timber harvesting (e.g. teak), firewood collection (regulated), beekeeping (planned). Infrastructure (buildings and roads) in the forest are in poor condition. User preference study identified a need for resting areas, a restaurant, grocery food shops and improved roads for improved access (The forest is about 15 kms from Tanga City). Main objective to enhance ecotourism but at the same time to protect nature.

Student Group 7: Pongwe Kaskazini Open Space

Design presentation: Problem in area: environmental pollution (household waste dumped in the area). Vision to create an active, inclusive and sustainable open space, with a specific objective to enhance nature to provide shade and aesthetic value. User preferences gathered and include: seating facilities, waste collection, children's play area and cafeteria.

Reviewer comments

All students groups demonstrated an excellent grasp of ecosystem services and showed skills in how they incorporated this new understanding into their urban designs for reimagining Tanga City. The detailed reviewer comments on each presentation is not shown here, but are summarised below to give the reader a succinct representation of how students were asked to strengthen their designs:

- In some cases, ecosystem services can be unpacked even further, in particular to create more diverse ecosystems and services in the urban environment: e.g. diversify tree species for timber production and medicinal uses;

- nurseries (cultivation of rare trees) and agricultural activities which could serve the community as well as protect the forest (i.e. forest stewardship), pollination, cultural services. In particular, food and culture can be very helpful to people to identify with a site. Students can show this more specifically.
- Good coverage of natural and man-made systems;
- Good incorporation of green infrastructure into design, e.g. emphasis on mangroves to show how green infrastructure protects the shoreline;
- Students can show more clearly how their new design links to existing human settlements, i.e. need to address issues of connectedness, proximity and access to ecosystem services;
- Note: Sometimes nature-based solutions can be located outside of the urban design area, e.g. protecting upstream forests to limit riverine flooding.

5. ALIGNMENT WITH LOCAL AND GLOBAL POLICIES AND STRATEGIES

This Dialogue illustrates the potential to incorporate ecosystem services thinking into urban design teaching at university level. The Thematic Atlas is shown to be a useful tool in facilitating such teaching.

This kind of biodiversity mainstreaming activity is also relevant at the global level in terms of efforts to support global biodiversity ambitions.

The 15th United Nations Convention on Biological Diversity Conference of the Parties (CBD COP15), which took place in 2022, contracting Parties finalized the Post 2020 Global Biodiversity Framework (GBF), the Kunming-Montreal Global Biodiversity Framework, charting a way forward for global action to halt biodiversity loss. The GBF seeks to catalyze impact, calling all governments to move towards transformative action where a 'whole of society' approach, which includes indigenous peoples, local communities, civil society, education institutions and the private sector, is used to act in unison towards achieving the outcomes it sets out in its vision, mission, goals and targets. The framework facilitates the implementation of the shared vision where, "By 2050, biodiversity

is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.” In particular, GBF Target 12 is specific to human settlements: “Target 12 urges for increasing the area, quality and connectivity, and improving access to and benefits from green and blue spaces in urban areas. This can be achieved by mainstreaming the conservation and sustainable use of biodiversity; ensuring biodiversity-inclusive urban planning; and enhancing ecological connectivity and integrity thereby improving human health and well-being and connection to nature, and contributing to inclusive and sustainable urbanization, and the provision of ecosystem functions and services.”

Mainstreaming biodiversity through tertiary education lays the foundation for instilling the value of biodiversity in young adults who are set to become tomorrow’s decision-makers. It represents a critical investment in future generations and enhances the likelihood of the long-term sustainability of urban nature initiatives.



COP15.

6. REFERENCES

- Ardhi University History. Online: https://en.wikipedia.org/wiki/Ardhi_University.
- Burgess N.D., G.P. Clarke and W.A. Rogers. 1998. Coastal forests of eastern Africa: status, endemism patterns and their potential causes. *Biological Journal of the Linnean Society* 64:337-367.
- Burgess, N.D., Malugu, I., Sumbi, P., Kashindy, A., Kijazi, A., Tabor, K., Mbilinyi, B., Kashaigili, J., Wright, T.M., Gereau, R.E., Coad, L., Knights, K., Carr, J., Ahrends, A. and Newham, R.L., 2017. Two decades of change in state, pressure and conservation responses in the coastal forest biodiversity hotspot of Tanzania. *Oryx*, 51(1), pp.77-86.
- Dasgupta, P. (2021), *The Economics of Biodiversity: The Dasgupta Review. Abridged Version.* (London: HM Treasury).
- IIED and UNEP-WCMC (2017). *Mainstreaming biodiversity and development. Guidance from African Experience 2012-2017.* Online: www.iied.org/nbsaps.
- Karutz R., Berghöfer A., Moore L.R., and van Wyk, E. (2019). *A Thematic Atlas of Nature’s Benefits to Dar es Salaam.* Leipzig and Cape Town: Helmholtz Centre for Environmental Research and ICLEI Africa Secretariat. 78 pages.
- Manuel, J. et al. (2016), “Key Ingredients, Challenges and Lessons from Biodiversity Mainstreaming in South Africa: People, Products, Process”, *OECD Environment Working Papers*, No. 107, OECD Publishing, Paris. <http://dx.doi.org/10.1787/5jlzgj1s4h5h-en>.
- Mittermeier R.A., Turner W.R., Larsen F.W., Brooks T.M. Gascon C. (2011). *Global Biodiversity Conservation: The Critical Role of Hotspots.* Chapter 1 in F.E. Zachos and J.C. Habel (eds.), *Biodiversity Hotspots*, DOI 10.1007/978-3-642-20992-5_1, # Springer-Verlag Berlin Heidelberg 2011.

- Myers, N., Mittermeier, R.A., Mittermeier, C.G., Da Fonseca, G.A. and Kent, J., 2000. Biodiversity hotspots for conservation priorities. *Nature*, 403(6772), pp.853.
- Puppim de Oliveira, J. A. ; Shih,Wan-yu; Moreno-Peñaranda, R.; Phillips, A. (2014). Integrating Biodiversity with Local and City Planning: The Experience of the Studios in the Development of Local Biodiversity Strategies and Action Plans – LBSAPs. Tokyo: UNU-IAS.

INTERACT-Bio project at a glance

Full title: Integrated subnational action for biodiversity: Supporting implementation of National Biodiversity Strategy and Action Plans through the mainstreaming of biodiversity objectives across city-regions

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