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72
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Climate Resilience in Developing Cities: Msimbazi Basin, Dar es Salaam

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Executive summary

In Dar es Salaam, the Msimbazi Basin is one of the fastest growing and most rapidly urbanising areas. This, coupled with insufficient service provision, high poverty levels and frequent floods, has a significant impact on the population. To address the multitude of challenges, the Tanzania Urban Resilience Programme (TURP) was established with the aim of supporting flood mitigation efforts and taking an integrated approach to ensuring rehabilitation and building urban resilience. This programme, as well as Tanzania's approach to building urban resilience, provides useful lessons to other developing cities. These lessons include moving away from hard-engineering approaches and investing in nature-based interventions, relying on in-depth and targeted stakeholder engagement, and packaging and framing projects in a manner that targets a multitude of funds. Such a holistic approach is critical to ensuring climate adaptation and building climate resilient cities.

Introduction

Urban centres are the areas with the greatest demographic growth, economic productivity and asset bases. This is particularly the case in developing countries, where people are consistently migrating to urban centres in search of ways to improve their lives. As a result, according to the UN, 95% of urban expansion in coming decades will take place in the developing world.[1] Of the 20 fastest growing cities in the world, 16 are in Africa.[2] Dar es Salaam, Tanzania's largest city, is one of Africa's fastest growing metropolitan areas. It is expected to become a mega city (10 million plus people) by 2030.[3]

> Dar es Salaam is expected to become a mega city of 10 million plus people by 2030

In Dar es Salaam, the Msimbazi Basin is one of the fastest growing and most rapidly urbanising areas. The rate of service provision in the basin, however, has not kept up with the rate of urbanisation, resulting in high poverty rates and low living standards. Added to this, during the rainy season the basin often floods, which has a significant impact on the

1 UN, Sustainable Development Goals, 'Goal 11: Make cities inclusive, safe, resilient and sustainable', https://www.un.org/sustainabledevelopment/cities/, accessed 5 June 2019.

2 *Ibid*.

3 Mshana A, *DarMAERT: Emergency Preparedness and Response Plan*, Presentation at the 'Understanding Risk in Tanzania' (UTRZ) conference, Dar es Salaam, 29–30 August 2018.

population.[4] Owing to urbanisation pressures and climate change, this flood risk is likely to increase over time.

Studies of the basin have helped to build an understanding of the complexity and interconnected nature of the system,[5] underscoring the urgent need to implement measures that address these challenges in a holistic manner. The aim of this policy insight is to investigate and outline Tanzania's path towards building resilience,[6] highlight key lessons that can be learned from the country's approach to this issue, and make recommendations for local and regional stakeholders on further strengthening urban resilience. This includes prioritising nature-based approaches to climate adaption and building climate resilience through an in-depth and targeted stakeholder engagement process. Added to this, the policy insight highlights the importance of project packaging and framing in the quest for project finance.

Population growth, socio-economic development and climate change

In 2018 Dar es Salaam's estimated population was 6 million people.[7] Its population growth rate is one of the highest in the world.[8] It is also East Africa's largest and fastest-growing capital city, believed to be expanding at around 8–12% per year.[9] The city's growth is largely centred along the Msimbazi Basin – 27% of its population lives in the basin and along its tributaries, which flow through the heart of Dar es Salaam, the commercial capital of Tanzania.[10] The basin is therefore important to the city's development, environment and economy.

> Dar es Salaam's growth is largely centred along the Msimbazi Basin, where 27% the population live. The basin is important to the city's development, environment and economy

4 World Bank, *The Msimbazi Opportunity: Transforming the Msimbazi Basin into a Beacon of Urban Resilience. Volume B: Detailed Plan for the Lower Basin*. Washington DC: World Bank Group, 2019a.

5 World Bank, *The Msimbazi Opportunity: Transforming the Msimbazi Basin into a Beacon of Urban Resilience. Volume A: Strategy and Management Framework*. Washington DC: World Bank Group, 2019b.

6 A resilient city can adapt to a variety of changing conditions and withstand shocks and stresses while still providing essential services to its residents.

7 World Bank, 2019b, *op. cit.*

8 *Ibid.*

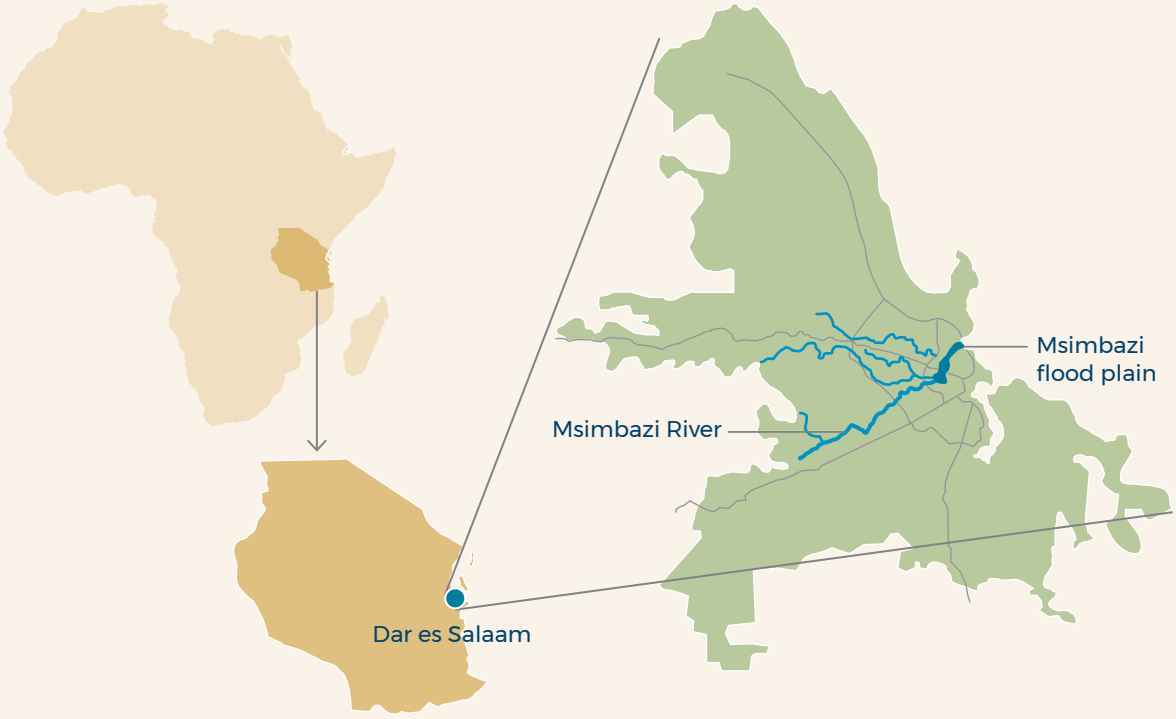
9 Zolli A, 'Monitoring Urban Growth', Presentation at the UTRZ conference, Dar es Salaam, 29–30 August 2018.

10 World Bank, *The Msimbazi Opportunity: Transforming the Msimbazi Basin into a Beacon of Urban Resilience. Executive Summary*. Washington DC: World Bank Group, 2019c.

With a growth rate of 6%, the catchment area's population is currently close to 1.6 million and is expected to grow to 2.5 million people in 2030 (more than double the 2011 population of 1.2 million people).[11] Unfortunately, service provision in the basin has not kept up with the rate of urbanisation, resulting in unplanned settlements, sanitation challenges, pollution, inadequate infrastructure and erosion. Over 70% of the city's residents live in such conditions.[12]

During the rainy season, the basin experiences torrential rains that often cause floods. It is estimated that the basin sustains average annual losses of $47 million owing to flooding.[13] The city's most severe flooding takes place in the Msimbazi flood plain (in the Lower Msimbazi Basin), putting residents, livelihoods, properties and critical infrastructure at risk. (See Figure 1). Severe floods in 2009, 2010, 2011, 2014, 2015, 2017 and 2018 have shown

Figure 1 Location of the Msimbazi River and the Msimbazi Flood Plain (Lower Msimbazi Basin), central Dar es Salaam



Source: Axi K, *Msimbazi Wetland Park: Restoration of an Urban Flood Plain in Dar es Salaam, Tanzania*, Swedish University of Agricultural Sciences, 2016, https://stud.epsilon.slu.se/8890/2/axi_k_lindstrom_e_160307_appendix.pdf, accessed 11 July 2019

11 World Bank, 2019a, *op. cit.*
12 Zolli A, *op. cit.*
13 World Bank, *Tanzania Urban Resilience Program: Annual Report 2018*. Washington DC: World Bank Group, 2018.

how vulnerable communities are that have settled in the unplanned and un-serviced riverine lands and valley edges.[14] Major flood events also have negative health effects, as contaminated floodwaters continue to affect the population months after having subsided.[15]

As a result of climate change and urban intensification, it is expected that flood risks and health hazards in the Msimbazi Basin will only increase in the coming decades. Climate change vulnerability and adaptation studies show that the city is already seeing heavier rainfall, heavier flooding and higher mean temperatures than in previous decades.[16]

As a result of climate change and urban intensification, it is expected that flood risks and health hazards in the Msimbazi Basin will increase in the coming decades

In addition to the rapidly growing population and climate-related impacts, Dar es Salaam struggles with governance challenges such as inadequate urban and land-use planning systems and processes, as well as inadequate attempts to address climate impacts. Added to this, existing infrastructure is under severe strain because of underinvestment. There is also a lack of data and information, particularly on local-level climate impacts, population growth and spatial distribution, which is critical for ensuring a holistic understanding of challenges and developing appropriate strategies. The magnitude of these challenges places a burden on government planning processes, particularly in terms of strategic prioritisation and funding allocation.

Building climate resilience

Prioritising holistic climate strategies that focus on addressing social issues

With the aim of supporting flood mitigation efforts in the Msimbazi Basin and taking an integrated approach to rehabilitation and building resilience, the government of Tanzania, in partnership with the World Bank and the UK Department for International Development (DFID), established the Tanzania Urban Resilience Programme (TURP) in 2016.[17] The

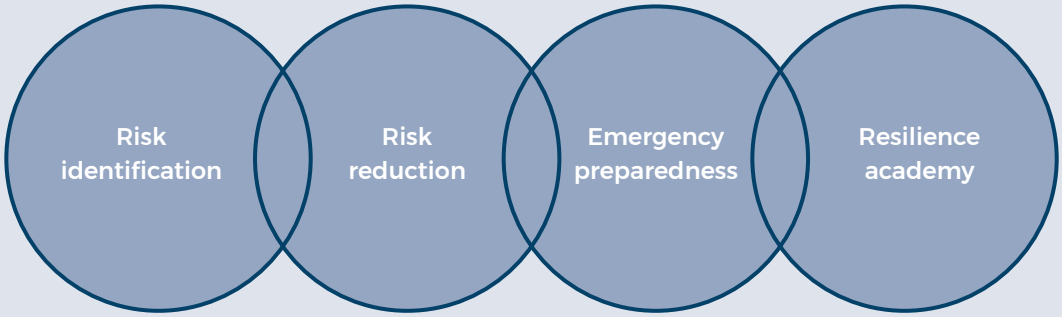
14 World Bank, 2019c, *op. cit.*
15 World Bank, 2019a, *op. cit.*
16 World Bank, 2019b, *op. cit.*
17 World Bank, 2019b, *op. cit.*

programme consists of four pillars (see Figure 2), which together are aimed at ensuring that Tanzania can adequately address current and future climate-related impacts and develop relevant and realistic climate adaption strategies. These will not only ensure that the city is able to respond to climate impacts but will also build a climate-resilient urban population.

TURP aims to holistically address several critical issues, such as rapid and concentrated urbanisation, increased vulnerability to climate change, and the increasing occurrence of devastating flood events

The programme ultimately aims to holistically address several critical issues prevalent in Tanzania, particularly Dar es Salaam, such as rapid and concentrated urbanisation, increased vulnerability to climate change, and the increasing occurrence of devastating flood events.

Figure 2 The four pillars of the Tanzania Urban Resilience Programme



Source: Compiled by author

In order to ensure that Tanzania can build successfully towards climate resilience, the programme recognises the need to streamline risk assessment and risk management across all sectors. This approach ensures holistic climate change risk management and that the city is well adapted to climate change impacts. Importantly, effective risk management requires the involvement of communities and proper coordination among stakeholders.[18] Therefore, Tanzania's approach to building resilience is largely driven by in-depth

18 Ellias L, 'ICT + Risk Management', Presentation at the UTRZ conference, Dar es Salaam, 29–30 August 2018.

Effective risk management requires the involvement of communities and proper coordination among stakeholders

stakeholder engagement processes, such as the Msimbazi Charrette[19] and the Circle-Bao Tool[20] for risk identification. A key outcome of this in-depth stakeholder engagement is the development of a strategy and management framework for the Msimbazi Basin. The strategy and management framework focuses on addressing environmental restoration, resettlement and flood control in the whole basin (see Box 1).

Early successes of the programme include the establishment of actionable data and climate science for risk reduction, such as the instrumentation of the Msimbazi Basin with meteorological and hydrological sensors that have profiled the flood events of 2017/2018 in detail. In addition to hazard data collection, the programme has advanced the mapping of the urban environment by surveying buildings, infrastructure and community assets on the ground and from the air. The process has leveraged innovations in satellite, drone and community data collection to ensure low costs and address local skills and sustainability. In early 2018 the first Dar es Salaam Emergency Response Plan was launched, which supports the expansion of the emergency communications network and guides stakeholder agencies dealing with metropolitan level alerts, coordination, response and recovery actions.[21]

Despite these successes, managing complexity both in the breadth of institutions and in thematic areas has been a significant challenge for the programme, as it has many activities running in parallel, each with interrelated stakeholders and synergies. Coordination and communication are key to ensuring ambitious timelines and effective stakeholder engagement and results. In addition, expectations have been raised that the programme will deliver visible impacts in 2019, which is essential to maintain both high-level political ownership and stable financial resources.[22]

19 A charrette is a collaborative planning process that harnesses the talents and energies of all interested parties to create and support a master plan that represents transformative community change. The Msimbazi Charrette was a nine-month process that involved the engagement of approximately 60 institutions and community representatives/leaders. Stakeholders spanned government, civil society, academia and community-based organisations. The charrette involved over 35 workshops and meetings, and its aim was to design solutions together with stakeholders, to come up with a roadmap and to help build a project to address flooding in the worst-affected part of Dar es Salaam.

20 The Circle-Bao Tool for risk identification uses multiple stakeholder inputs to identify the linkages between various sectors, and the strengths of those linkages. This enables an indication of how the disruption of one sector during a flood event will impact another sector.

21 World Bank, 2018, *op. cit.*

22 *Ibid.*

Box 1 Strategy and Management Framework [23]

The Msimbazi Charrette process resulted in the Strategy and Management Framework for the Msimbazi Basin. The vision of the strategy is 'transforming the Msimbazi Basin into a beacon of urban resilience'. As part of the strategy, the stakeholders envisaged four strategies to redesign the Msimbazi: mitigate, protect, transform and govern. The final outcome encompassed four strategies, 10 strategy components (SCs) and 48 interventions.

- The **Mitigate** strategy aims to limit the severity of flood hazards and comprises four SCs and 19 interventions in the long and short term:
  - SC 1: Restore the natural ecosystem and make room for the river;
  - SC 2: Increase water retention and harvest rainwater;
  - SC 3: Control erosion and sedimentation; and
  - SC 4: Enhance water conveyance capacity.
- The **Protect** strategy aims to establish location-specific protection of people, livelihoods and assets from flood exposure, and comprises two SCs and 10 interventions:
  - SC 5: Protect against flooding; and
  - SC 6: Resettle people and businesses.
- The **Transform** strategy aims to convert the most flood-prone areas of the river valley into a city park and redevelop surrounding neighbourhoods. It comprises three SCs and 15 interventions:
  - SC 7: Improve Msimbazi River water quality;
  - SC 8: Improve solid waste management; and
  - SC 9: Develop city parks.
- The **Govern** strategy seeks to put in place a planned and coordinated process of integrated governance and thus stop the current uncontrolled urbanisation process that is making the river valleys and basin unsafe and unhealthy for human activity. It comprises:
  - SC 10: Good governance for coordination, cooperation, communication and finance.

23 World Bank, 2019c, *op. cit.*

After the completion of the strategy, Selemani S Jafo, Minister of State in the President's Office (Regional Administration and Local Government), said,[24]

> We now have the opportunity to mitigate the chronic issue of flooding in the Msimbazi valley. At the same time, we can breathe new life into the city by restoring the ecological functions of the river basin, and by unlocking development potential by transforming parts of the currently hazardous lowlands into safe, buildable space within the core of Dar es Salaam.

Nature-based solutions to climate change

As part of the strategy and management framework, a city park is planned for the lower Msimbazi Basin (see Box 2) to manage floodwaters (as a main priority). Instead of building a drainage channel to transport floodwaters from the upper basin to the ocean, which is a hard-engineering intervention that only addresses the issue of flooding, a greener (more natural/environmentally friendly) approach was selected. This hybrid intervention, combining ecosystem-based adaptation (EbA)[25] and hard engineering, is a more holistic approach to addressing climate impacts as well as socio-economic and environmental challenges in the basin.

The advantage of combining EbA with hard-engineering approaches is that it can enhance the effectiveness of climate change adaptation strategies through the important role it plays in protecting infrastructure and improving human security.[26] This is because EbA promotes healthy ecosystems that provide multiple benefits to both nature and people, thereby contributing to three outcomes simultaneously: socio-economic benefits, climate change adaptation (risk and vulnerability reduction) and biodiversity conservation.[27]

> EbA promotes healthy ecosystems that provide multiple benefits to nature and people, thereby advancing socio-economic benefits, climate change adaptation and biodiversity conservation

24 World Bank, 2019b, *op. cit.*

25 Ecosystem-based adaptation (EbA) is often referred to as 'natural solutions to climate change'. According to the Convention on Biological Diversity, EbA is the use of biodiversity and ecosystem services as part of an overall adaptation strategy. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to the adverse effects of climate change.

26 South Africa, DEA (Department of Environmental Affairs) & SANBI (South African National Biodiversity Institute), *Strategic Framework and Overarching Implementation Plan for Ecosystem-Based Adaptation (EbA) in South Africa: 2016–2021*. Pretoria: DEA, 2016.

27 Swanepoel E & S Sauka, 'Ecosystems-based Adaptation in South African Coastal Cities', Occasional Paper 297. Johannesburg: SAIIA (South African Institute for International Affairs), 2019.

EbA is thus likely to have a wide range of co-benefits in addition to climate change adaptation, including conservation of threatened species, livelihood benefits, sustainable utilisation of natural resources and the maintenance of essential ecosystem services[28] such as water and food security.

Box 2 Msimbazi Basin City Park, Dar es Salaam

TURP's vision is to transform part of the Msimbazi River Basin into a city park that will provide much-needed public space in the city. The park will not only provide recreational activities but will also support ecosystem services that contribute to human well-being by directly or indirectly supporting survival and quality of life. Importantly, the park will have flood control measures and, by widening the river channel (by dredging the current riverbanks), will give room for the Lower Basin to respond to the severe peaks of water (and floodwaters) that it transports from the upper catchment to the ocean.

The park will consist of wetlands and a mangrove forest on the flood plain area, with recreational functions at the terrace levels. The core of the city park is the central area of the Lower Basin, where most functions and activities for people are concentrated. These include various leisure functions such as sport fields, footpaths and an amphitheatre. At the edges are residential and mixed-use areas (created by using dredged material placed along the riverbank to build up the ground level), including housing blocks and urban development areas.[29]

Financing interventions that build climate resilience

To implement the strategy and management framework (and begin construction of the Msimbazi Valley City Park), the government of Tanzania sourced $20 million in finance from its project partners (ie, the World Bank and DFID). It was able to access significant funding by promoting the venture as an 'urban planning, restructuring and resilience' project rather than purely a flood-risk management project. This illustrates that in seeking project finance, it is essential that project design and framing are prioritised, as the manner in which a project is packaged determines whether it can access specific pots of funding, particularly funding streams not directly allocated to nature-based approaches, disaster risk reduction

28 Ecosystem services are the direct and indirect contributions of ecosystems to human well-being. They directly or indirectly support our survival and quality of life and can be categorised as: provisioning (eg, production of food), regulating (eg, control of climate and natural disasters), habitat (eg, promoting biodiversity and supporting the nutrient cycle) or cultural services (eg, recreational and religious benefits).

29 World Bank, 2019a, *op. cit.*

or climate adaptation. It is also necessary to target social-economic development project funding sources for projects that build climate resilience and ensure disaster risk reduction and climate adaption. To achieve this, projects must be designed using cross-sectoral teams that can highlight the multi-facetted benefits that can be realised by different sectors, particularly socio-economic benefits. By highlighting the different components of the projects as well as the various benefits, it is possible to access funding that is targeted at any one of those functions/aspects.[30]

> To access different funding sources, projects must be designed using cross-sectoral teams that can highlight the multi-facetted benefits that can be realised by different sectors

Additional funding for the interventions will come from investments by various actors, including government, private sector and development partners. This additional funding will be critical for ensuring that the programme is sustainable and that its objectives are met. To improve their financial sustainability, innovative national and international approaches to climate finance should be explored, for example:

- implementing financing mechanisms through partnerships (with different stakeholders);
- exploring payments for ecosystem services;
- designing funds that ensure sustainable long-term project funding;
- implementing incentive schemes (such as directly supporting coastal rehabilitation and conservation, or offering rewards for socially and ecologically sustainable practices); and
- going into partnership with the insurance industry, as it is well versed in evaluating coastal risks.

This is key to ensuring that sufficient and sustainable funding is available to effectively implement interventions.[31]

Conclusion

Tanzania's approach to building urban resilience provides useful lessons to other developing cities. This includes an emphasis on holistic approaches to building urban

30 Swanepoel E & S Sauka, *op. cit.*
31 *Ibid*.

resilience. Added to this, there is a need to move away from purely hard-engineering approaches towards nature-based or hybrid solutions.

The Tanzanian experience illustrates the need for in-depth and targeted stakeholder engagement, and the crucial role this can play in shaping the policy landscape and the strategic prioritisation process. Finally, the manner in which projects are packaged and framed has a significant impact on the extent and nature of funding that can be obtained. When sourcing funding, it is important to move away from climate adaptation-focused project funding and also target 'socio-economic development' project funding, particularly for projects that build climate resilience and ensure disaster risk reduction and climate adaption.

This holistic approach is critical in ensuring climate adaptation and developing climate-resilient cities. It will prove useful for developing cities engaged in the development of national climate adaptation and disaster risk reduction/management strategies, plans and/or policies. Successful implementation of holistic resilience interventions will enable rapidly urbanising African cities that are frequently exposed to flood events (such as Mombasa, Maputo, Beira and Johannesburg) to adapt to increasingly adverse climate impacts while building a climate-resilient urban population. This is particularly important since developing cities have to manage/address multiple issues while faced with competing priorities and limited budgets.

Author

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Cover image

A man uses a rubber dinghy to navigate through the flooded Jangwani neighbourhood in Dar es Salaam, Tanzania, May 2015 (Daniel Hayduk/AFP/Getty Images)

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