ANNUAL REPORT 2021

TANZANIA URBAN RESILIENCE PROGRAM

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Tanzania Urban Resilience Program 2021

ANNUAL REPORT 2021

TANZANIA URBAN RESILIENCE PROGRAM

TANZANIA
URBAN RESILIENCE
PROGRAMME

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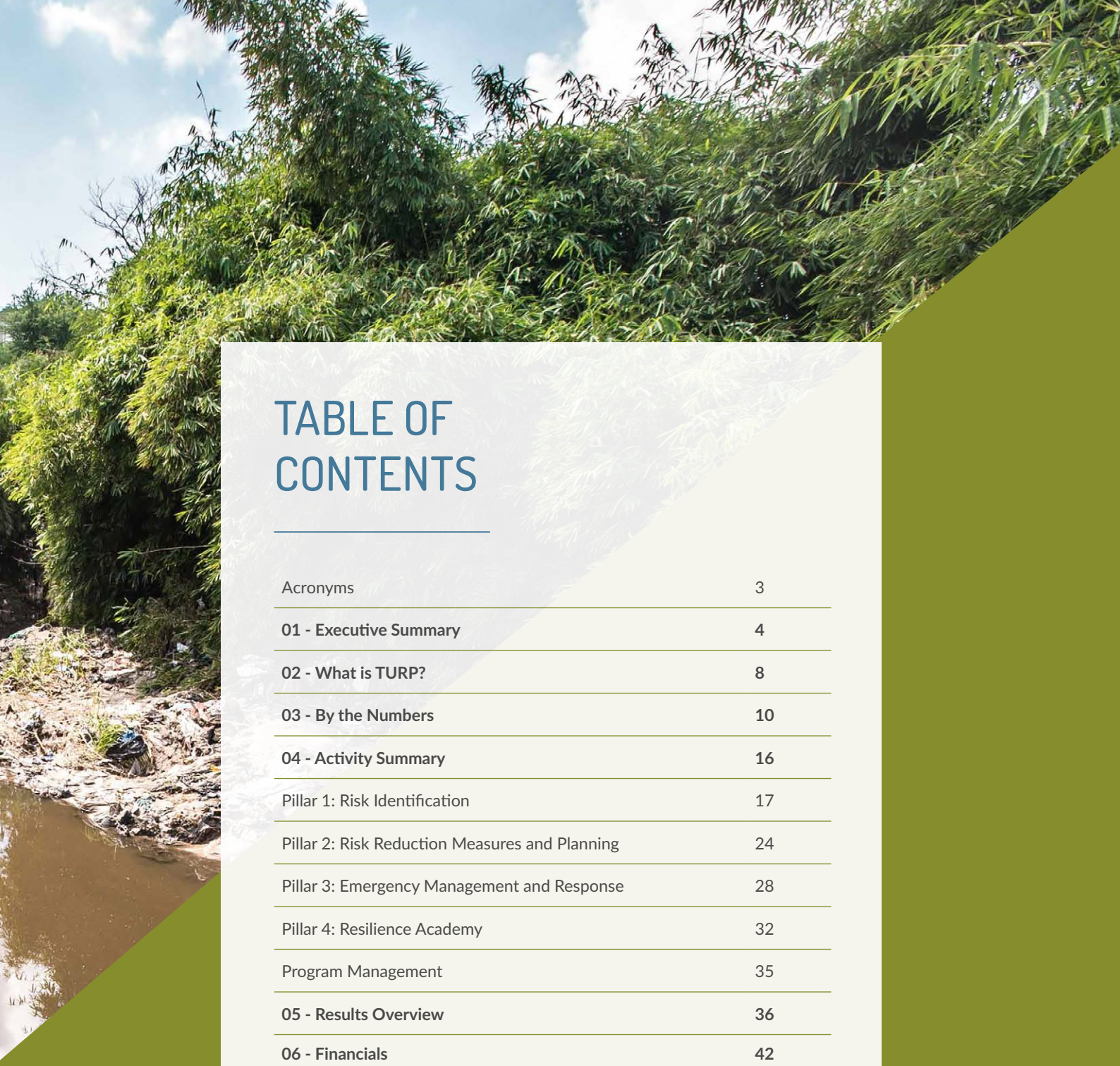
Tanzania Urban Resilience Program (TURP) was established in 2016 from a partnership between the Foreign, Commonwealth and Development Office (FCDO) of the UK Government and the World Bank to support the Government of Tanzania in its endeavor to increase resilience to climate and disaster risk.



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MOTOROLA

ACRONYMS

ARU	Ardhi University
COLA	Zanzibar Commission for Lands
COVID-19	Coronavirus Disease 2019
CRD	Climate Risk Database
DarMAERT	Dar es Salaam Multi-Agency Emergency Response Team
DCC	Dar es Salaam City Council
DRM	Disaster risk management
DRMI	Disaster Risk Management Index
DPRP	Disaster Preparedness and Response Plan
DRRP	Disaster Risk Reduction Plan
DTM	Digital terrain model
EMI	Earthquakes and Megacities Initiative
EMIS	Emergency Management Information System
EOC	Emergency Operations Center
EOCC	Emergency Operations and Communications Center
FCDO	United Kingdom Foreign, Commonwealth and Development Office
FY	Fiscal year
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic information system
ICF	Investment Climate Facility
IT	Information technology
KMC	Kinondoni Municipal Council
LiDAR	Light detection and ranging
NEOCC	National Emergency Operations and Communication Center
PO-RALG	President's Office – Regional Administration and Local Government
PMO-DMD	Prime Minister's Office – Disaster Management Department
RA	Resilience Academy
RAS	Regional Administrative Secretary
RDNA	Rapid Damage and Needs Assessment
SUA	Sokoine University of Agriculture
SUZA	State University of Zanzibar
SWIFT	Survey of Wellbeing via Instant and Frequent Tracking
SWM	Solid waste management
TAHMO	Trans-African Hydro-Meteorological Observatory
TED	Training, Exercises, and Drills program
TF	Trust fund
TURP	Tanzania Urban Resilience Program
UAV	Unmanned aerial vehicle
UDSM	University of Dar es Salaam

01

EXECUTIVE SUMMARY

The Tanzania Urban Resilience Program (TURP) is a multi-year, strategic technical assistance program funded by the Foreign and Commonwealth Development Office (FCDO) of United Kingdom. The program's main objective is to support Tanzania's national and local governments in better managing climate risk in cities and enabling climate-resilient urbanization across the country.

TURP has four main pillars: 1) Risk Identification; 2) Risk Reduction; 3) Emergency Preparedness; and 4) the Resilience Academy. These pillars complement each other, providing a comprehensive approach to the climate risk challenges Tanzania cities are facing.

PILLAR 1
Risk Identification

PILLAR 2
Risk Reduction

PILLAR 3
Emergency Preparedness

PILLAR 4
Resilience Academy

As detailed in a TURP-funded report on Tanzania's urbanization trends, climate-related hazards are expected to increase – a serious threat to Tanzania, which is already the most flood-affected country in East Africa.[1] Floods affect people in informal settlements, destroy infrastructure, cut off critical facilities such as schools and hospitals, and create major disruptions in traffic, preventing people from reaching jobs and amenities. Almost every Tanzanian city suffers from intense rainfall events during the rainy seasons, and this challenge is likely to become more acute. By the 2080s, according to climate model projections, "mean annual and seasonal temperatures for East Africa will increase by 3.2°C, and by 2100, the region will see an increase in mean annual rainfall of up to 18–28 percent. Precipitation is projected to become more volatile, and flooding is expected to increase in frequency and severity."[2]

The challenge is particularly severe in Dar es Salaam, the most populous city in Tanzania. Currently home to an estimated 6 million residents, by 2030, Dar es Salaam is expected to grow to more than 10 million residents and achieve megacity status. Its fast-growing population is highly exposed to climate-related flood risk. Before the end of the century, "mean rainfall could increase during the longer rainy season by up to 6 percent" as a result of climate change,[3] a trend that is already in evidence. Seven out of the last 10 years saw major flood events in the city, with floods affecting at least 39 percent of residents (2 million people), and disproportionately impacting poor, vulnerable, and female-headed households, which lack the resources to cope with flooding effects. In April 2018, a "single flood event affected between 900,000 and 1.7 million people."[4]

Dar es Salaam is not the only Tanzanian city growing quickly; indeed, almost all Tanzanian cities are experiencing high growth rates. These cities must tackle issues of risk management and urban development early on to minimize the negative impacts of rapid population growth, which could outpace service delivery and eventually lead to crowded, disconnected, costly, and vulnerable communities.

Given the scale of the risks, Tanzanian cities will need to learn from acute shocks and chronic stresses, and adapt to climate-change effects. In a complex context of rapid growth and urbanization, investments in climate adaption projects are critical to address the interlinked challenges in urban development and climate risks.

TURP has informed key investments in both ex-ante and ex-post climate adaptation measures. Technical assistance – around risk-informed planning, identification of climate adaptation investments, and improved early warning systems – has been instrumental in strengthening capacity and informing large adaptation and resilience projects. In the past fiscal year, TURP has also played a leading role in bringing the resilience lessons learned in Dar es Salaam to Tanzania's secondary cities.

TURP has continued to advance the resilience agenda to enhance both the availability of actionable data and information; and the capacity of institutions to operationalize the guidelines and protocols developed by the program. Despite the COVID-19 pandemic, the project has made significant progress in several areas.

[1] World Bank, Transforming Tanzania's Cities: Harnessing Urbanization for Competitiveness, Resilience, and Livability (Washington, DC: World Bank, 2021)
[2] World Bank, Transforming Tanzania's Cities: Harnessing Urbanization for Competitiveness, Resilience, and Livability (Washington, DC: World Bank, 2021)
[3] World Bank, Transforming Tanzania's Cities: Harnessing Urbanization for Competitiveness, Resilience, and Livability (Washington, DC: World Bank, 2021)
[4] World Bank, Transforming Tanzania's Cities: Harnessing Urbanization for Competitiveness, Resilience, and Livability (Washington, DC: World Bank, 2021)

Pillar 1, which focuses on innovative methods for the collection and dissemination of actionable climate risk data, continued to inform risk-reduction and response measures. For instance, this fiscal year saw the completion of community mapping of Urban Risk in Mwanza. The objective of this technical assistance project was to produce up-to-date, open, and accurate data on exposure to floods and rockfalls, suitable for modelling flood risk and generating flood scenarios. The project leveraged partnerships with universities: 79 students contributed to data collection and participated in a two-month-long industrial training program.

The Ramani Huria 2.5 project was also finalized in fiscal year 2020/21 (FY21). Despite the COVID-19 pandemic, the project has successfully enabled communities and authorities to access high-quality data that can inform their development and risk-management decisions. As with the Mwanza project, part of the work was done by university students – more than over 103 students from Ardhi University and the University of Dar es Salaam (UDSM). These students worked with 362 community members from 29 wards in Dar es Salaam to collect information on the extent and depth of floodwater.

Efforts to reduce data noise and disturbance in the Zanzibar terrain data continued under the Zanzibar Processing of Digital Terrain Models (DTM) project. Unprocessed photogrammetry data (images acquired by drones) shows leaves, vegetation, and trees in the terrain data, which causes unrealistic bumps and does not reflect the actual contours of the bare earth. Tree canopies in Zanzibar city were successfully digitized, enabling the removal of vegetation noise from the terrain data. The result is a smooth data set that will allow for reliable hydrological modelling of Zanzibar City.

A Risk-informed Project Planning and Supervision Tool was also piloted to help with project identification and the implementation of urban infrastructure works. Under this activity, open-source tools are customized for web-based devices and mobile applications, and the project is piloting the mainstreaming of low-cost, open-source mapping and data collection and management tools utilized for the Ramani Huria project into the operations of other World Bank–financed projects. So far, geographic information system (GIS) layers for 13 cities have been consolidated into a geonode linked to a mapping platform accessible via the project planning and supervision tool. Layers are highly relevant to risk mitigation for urban management and infrastructure planning; they include existing and planned land uses and natural and man-made drainage networks, as well as steep slopes and flood-prone areas where available.

Pillar 2, designed to fill gaps in the planning and coordination of risk-reduction activities in Tanzania, delivered new insights and community engagements in FY21. To strengthen flood preparedness, response capacity, and overall community resilience, 12 wards in Kinondoni Municipal Council and Dar es Salaam City Council, formerly known as Ilala Municipality, finished developing their Community Disaster Risk Reduction Plans (DRRPs) under the Jipange project. The plans aim to guide the wards in applying low-cost flood risk reduction measures that can be implemented by the communities with minimal assistance from outside. The development of the DRRPs was accompanied by training for the Ward Disaster Management Committee on basic disaster risk management and how to develop the plans. Ramani Huria maps were instrumental in determining flood-prone areas, assets, and threats, and in guiding the wards in selecting targeted risk reduction measures for specific challenging areas.

During FY21, the Ministry of Finance and Planning endorsed the Lower Msimbazi Upgrading project. The project is proceeding with preparation of feasibility studies, detailed engineering designs, cost estimation, bidding documents, and environmental and social assessment for Lower Msimbazi Upgrading Project.

In Zanzibar, a technical assistance contract on solid waste management (SWM) optimization was awarded and the project officially began. Its objective is to help municipalities optimize both their operations and finances to deliver an acceptable level of service. TURP also supported a technical assistance project on SWM services in Zanzibar and Arusha in order to understand how information is used, and the processes and relationships of information flows. The goal is to perform a comprehensive IT business analysis that will feed into the design of IT systems facilitating SWM operations in Arusha and Zanzibar, further enhancing the municipalities' capacity to manage solid waste.

Pillar 3, which is dedicated to improving emergency management across the country, strengthened response capacity and installed standardized systems in FY21. The Dar es Salaam Rapid Damage and Needs Assessment (RDNA) was conducted to determine the impact of the floods that occurred on October 13 and 15, 2020.

Through the RDNA, the Dar es Salaam regional government and its stakeholders had an opportunity to learn practically how to quantify impacts of disasters.

TURP serviced existing and new emergency communication equipment, efforts that included handing over the equipment to the Dar es Salaam Multi-Agency Emergency Response Team (DarMAERT) and running a virtual training of 63 emergency responders from different government agencies to use the equipment effectively. Additionally, the program trained 25 members of the 12-ward Disaster Management Committees that helped develop the Community Disaster Preparedness and Response Plans; participants were taught to use the FloodTag tool to communicate and report real-time flood information to other committee members. With the Disaster Preparedness and Response Plans (DPRPs), wards now have a clear list of actions to help them prepare for and respond to flooding, making coordination at a community level possible.

During FY21, Emergency Preparedness and Response support was extended to the national level, where key emergency response documents (the Tanzania Emergency Preparedness and Response Plan of 2012 and the Tanzania Disaster Communication Strategy) are being updated under the leadership of the Prime Minister's Office – Disaster Management Department (PMO-DMD).

The Flood Awareness Campaign "Usipime Nguvu ya Maji" was relaunched on May 3rd, 2021, for the March–May rainy season. The campaign included posters and videos that aimed to reduce the number of deaths by educating the community on the risks of crossing moving water. At the campaign's launch, the Regional Commissioner addressed the flooding risks still facing Dar Es Salaam and asked for the support of the media in publishing and airing the educational materials, saying, "it is good for us to give continuous education so that citizens can take precautions." Flood awareness videos and posters were successfully published and aired on about 15 media platforms, including Mtanzania Digital, EFM, Azam TV, Habari Leo, Uhuru FM, Star TV, and Clouds.

Pillar 4, or the Resilience Academy, focused in FY21 on consolidating the knowledge created under TURP and ensuring the sustainability of the program. The Resilience Academy continued to curate data, tools, and models created by the program into a local academic and technical platform – the Climate Risk Database (CRD). The CRD offers university experts, students, and other partners access to key data. The database was also used during the data visualization challenge, in which more than 200 students participated.

As part of the Resilience Academy, an industrial training program was conducted in cooperation with the local coordinators of the universities involved (UDSM, Ardhi University, Sokoine University of Agriculture - SUA, and the State University of Zanzibar). The program imparted basic skills training to 150 students via in-person sessions or online learning, using materials that were developed by the Resilience Academy experts. Students were able to participate in data collection using mobile phones. The combination of theoretical and practical experiences provided the students the confidence to apply tools and technologies to find solutions to urban challenges.

The Resilience Academy is also promoting research and innovation activities related to urban resilience. One major initiative was a micropayment pilot project that aimed to i) create high quality geographic data that can be used to inform future urban planning and disaster risk reduction efforts, while also ii) creating employment opportunities for vulnerable youth in Tanzania and iii) providing learning opportunities on valuable digital skills and geospatial technology.

Additional activities in the Research and Innovation program included engaging Tanzanian researchers and selected Master of Science students on learning to conduct research based on TURP data and emerging topics. Fifteen research topics have been developed, and each university will get up to three research topics to give to students. The effort offers students an opportunity to be exposed to the research and to explore the use of current data, new tools, and skills.

02

WHAT IS TURP

Activities supported by the World Bank through the TURP Trust Fund are organized into four pillars.

PILLAR 1 – RISK IDENTIFICATION

This pillar strengthens the identification and understanding of climate risk and uncertainty in the local context and enhances the linkages and coordination between risk-management stakeholders. A thorough understanding of disaster and climate risks and their implications in the local context is vital to make decisions that ultimately strengthen physical, social, and financial resilience. To this end, Pillar 1 increases access to comprehensive information about physical and societal exposure to climate risks, which inform the implementation of structural and non-structural mitigation measures.

Key activities in this pillar are the collection and organization of climate risk data and the development of visualization tools and risk models. TURP gathers crucial socioeconomic data, including mapping people, assets such as houses or critical infrastructure, and urban services and livelihoods. Environmental data and models produced under this pillar include historical data on and current monitoring of hydrometeorological phenomena, the geophysical characteristics of the urban environment (soil types, land use, river basin profiles), and application of the best climate models to identify the future impacts of climate change.

PILLAR 2 – RISK REDUCTION

Guided by the data and management tools of Pillar 1, Pillar 2 strengthens cities' capacity to plan for and reduce climate risk through both structural and non-structural measures that address long-term systemic risk. In partnership with government entities, civil society, and the private sector, activities supported by Pillar 2 focus on reducing the vulnerability of people, households, and communities. They provide analyses of non-structural resilience measures, offering new or improved policies and legislation, better land use planning, environmental protection and basin plans, hazard zoning and building codes, and the design of risk-reduction works, such as drainage upgrades, ponding schemes, slope stabilization, and retrofitting or reinforcement programs.

The activities support communities, planning entities, and works authorities, helping develop a pipeline of investments to reduce urban risk. These investments support the resilience of critical infrastructure, and specifically target measures that aim to protect priority river basins and improve flood management infrastructure.

PILLAR 3 – DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT

Pillar 3 supports all stakeholders involved with short-term disaster events, helping improve preparedness for specific emergency scenarios. Also guided by Pillar 1 data, scenarios of city risk collected under Pillar 3 will be used to establish best practices around identifying and preparing vulnerable groups, developing emergency response plans, and establishing an operations center. They will provide inputs for the design of early warning systems; clarify requirements for equipment, tools, and infrastructure; and inform simulations, drills, and damage assessment capacities. Stakeholders in this workstream are concerned with civil protection, disaster management, community volunteers, coordination for response, and recovery actions.

PILLAR 4 – RESILIENCE ACADEMY

The thematic content of the Resilience Academy is embedded as a knowledge-transfer function within the activities of Pillars 1 through 3. The Resilience Academy is an evolving virtual program anchored in Tanzanian universities and training institutes that delivers digital curricula, practical experience, training placements and courses, and equipment to support survey, maintenance, risk-monitoring, and analysis activities.

Under Pillar 4, TURP transfers data sets and risk analysis tools to university programs, and leverages yearly placements in industry programs to provide university students with real-world experience in collecting, analyzing, and applying risk data. The Resilience Academy's goals are to foster a legacy for skills and tools developed through TURP and to build partnerships between academia and practitioners that enhance the sustainability of risk-management practices and data sets in Tanzania.

03

BY THE NUMBERS

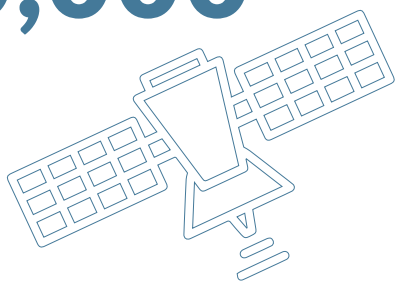
PILLAR 01 – RISK IDENTIFICATION

MWANZA URBAN RISKS MAPPING

79 **university students** captured more than

300,000

buildings using satellite imagery



15,868,183

square meters of **flood prone area** mapped in **14 wards**

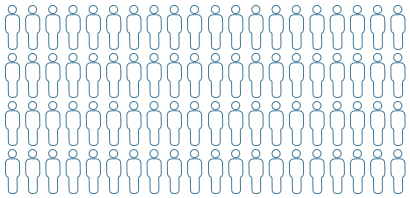
923,914

square meters of **rock-fall prone area** mapped in **12 wards**

177 km

of **drainage** mapped in **18 wards**

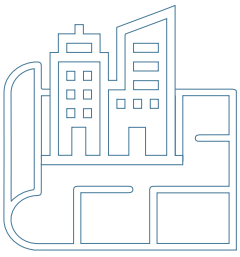
RAMANI HURIA 2.5



More than 103 university students
from Ardhi University and the University of Dar es Salaam worked with
362 community members
(216 male and 146 female) from 29 wards in Dar es Salaam to collect data on the extent and depth of flooding

318,237 buildings

were added to OpenStreetMap, and extant data was updated with more recent 2020 Maxar imagery, bringing the total mapped buildings in the city to **1,301,015**



DISASTER RISK MANAGEMENT INDEX (DRMI)

32 **representatives** (13 males, 19 females) from 5 municipalities, DarMAERT, and the Disaster Management Department participated in DRMI activities

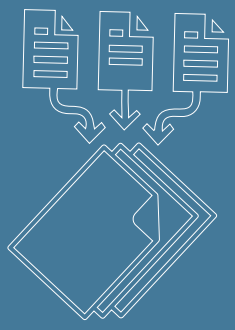
DAR ES SALAAM AND ZANZIBAR CITY PROBABILISTIC FLOOD RISK MODELLING AND EVALUATION

40 **individuals** participated in **8 virtual workshops** focusing on 4 aspects of the probabilistic flood model dashboard: *Investment Case; Planning Case; Knowledge Case; and Disaster Preparedness Case*

PILLAR 02 – RISK REDUCTION

IT BUSINESS ANALYSIS FOR SOLID WASTE MANAGEMENT SERVICES FOR ZANZIBAR AND ARUSHA CITY

2 **inception reports** were developed

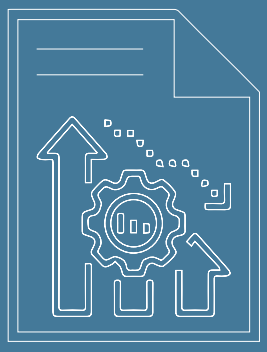


1 **desk review** on solid waste management for Arusha city was conducted

COMMUNITY RISK REDUCTION PLANS

12 **Ward Disaster Risk Reduction Plans** were completed in English and Swahili and handed over to the respective wards, Dar es Salaam City Council, and Kinondoni Municipal Council

12 **Ward Disaster Management Committees** (WDMCs) comprising 55 Sub-Ward Disaster Management Committees were trained in basic DRM knowledge and development of DRRPs



316 **community members** (201 male, 115 female) participated in the development of DRRPs

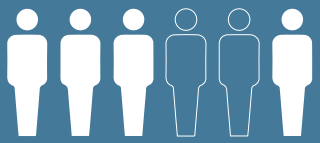
PILLAR 03 – DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT

EMERGENCY MANAGEMENT INFORMATION SYSTEM (EMIS)

49+ **stakeholder contact details** were obtained

1 **Emergency Response Plan** was digitized

Spatial data on **95+** administrative areas and **600** health facilities was loaded into EMIS



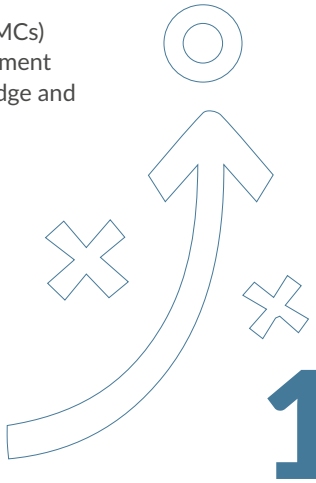
6 **officers were trained** on EMIS (3 information and communications technology officers, 1 GIS officer, 2 communication officers)

COMMUNITY DISASTER PREPAREDNESS AND RESPONSE PLAN

12 **Ward Disaster Management Committees** (WDMCs) and members of 55 Sub-Ward Disaster Management Committees were trained in basic DRM knowledge and development of DRRPs

12 **Ward Disaster Preparedness and Response Plans** were completed in English and Swahili and handed over to the wards, DCC and KMC

25 **members** of WDMCs were trained to use FloodTag to report and communicate real-time flood situations to the wards and other community members



316 **community members** (201 male, 115 female) participated in the development of DRRPs

1 **toolkit** for developing DPRPs and DRRPs was completed in both English and Swahili

RAPID DAMAGE AND NEEDS ASSESSMENT FOR OCTOBER 2020 FLOOD

33 **people** (11 female and 22 male) participated in developing a RDNA

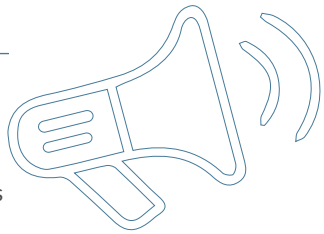
The estimated recovery needs according the RDNA is

T Sh 76.1 billion

(US$33.1 million)

FLOOD AWARENESS CAMPAIGN

15 **media outlets** aired a campaign on flood risk and safety measures



PILLAR 04 – RESILIENCE ACADEMY

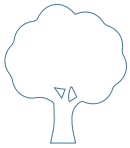
RESILIENCE ACADEMY INDUSTRIAL TRAINING PROGRAM 2020

Information on

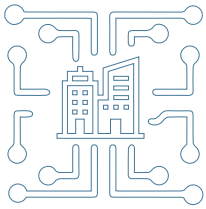
318,237 buildings

was collected to generate high-quality roof print polygons in machine-readable GIS format

1,360 flood affected buildings mapped.



1,258 **trees** were mapped within the Mazimbu campus



Physical attributes of over

4,000 **digitized buildings** in Nungwi were captured by a survey

150 **students** from 4 universities participated

RESEARCH AND INNOVATION

15 **research topics** were developed

CASH FOR DIGITAL WORK – Microtasking for Urban Extent in Tanzania

120 **students** participated in microtasking

159,490 **tasks** from **79,745** **raw images** were completed by students

04

ACTIVITY SUMMARY

PILLAR 1: RISK IDENTIFICATION

OBJECTIVE

To strengthen the identification and understanding of climate risk and uncertainty in the local context.

OVERVIEW OF PROGRESS

In FY21, activities under Pillar 1 continued to expand data collection and risk identification efforts. The scope of work has been expanded beyond flood resilience to cover a broader set of data needed for sustainable urban planning and upgrading. Technical assistance on probabilistic flood risk modeling has been advanced, and hazard data sets have been shared with stakeholders. This fiscal year saw the completion of the Zanzibar Local Area Development Mapping project, the Disaster Risk Management Index, the Mwanza Urban Risk Mapping project, and Rumani Huria 2.5. Based on these experiences, the program plans to expand data collection activities to more cities, including Kahama, Kigoma, and Morogoro. The Zanzibar Solid Waste Value Chain Optimization study, which aims to help municipalities make informed decisions about their capital and operations investments, was launched during this reporting period.

The COVID-19 pandemic caused delays in Pillar 1 project activities and completion, mainly due to restrictions on face-to-face meetings and field visits. Consultations and workshops had to be conducted virtually for the most part, and when they were conducted in person, they had a limited number of participants. Travel restrictions also prevented contracted firms and consultants from traveling to Tanzania. Contractors and the World Bank team adopted virtual methods of implementing activities, which have so far worked satisfactorily.

Looking ahead, we expect that Pillar 1 activities and data will inform preparations for upcoming government-executed projects like Tanzania Cities Transforming Infrastructure and Competitiveness (TACTIC).

ACTIVITY	STATUS	PROGRESS
Zanzibar Local Area Development Mapping	**COMPLETED**	Relevant data sets and information (buildings, businesses, amenities, roads, and trees) were successfully collected.
Disaster Risk Management Index (DRMI)	**COMPLETED**	The 2020 DRMI Assessment was completed.
Dar es Salaam and Zanzibar City Probabilistic Flood Risk Modelling and Evaluation	**ONGOING**	The hydrological and hydraulic model and the flood hazard data sets for Dar es Salaam are completed. The beta version of the dashboard is completed; finalization of the dashboard and the Zanzibar component are still ongoing. The technical assistance is scheduled to be finalized by January 2022.
Zanzibar Solid Waste Management Value Chain Optimization Study	**ONGOING**	A consulting firm has been contracted and the first mission was organized in October 2021.
Processing of Digital Terrain Models (DTM) from Unmanned Aerial Vehicles in Zanzibar	**ONGOING**	The Zanzibar DTM was completed after a long and challenging process. The Nungwi component is ongoing and is expected to be completed by the end of November 2021.
Ramani Huria 2.5	**COMPLETED**	29 wards in Kigamboni and Temeke municipalities were mapped and uploaded on OpenStreetMap.
Mwanza Urban Risks Mapping	**COMPLETED**	Mapping exercise was completed.
Risk-informed remote supervision tool	**ONGOING**	An alpha version of the tool has been developed and GIS layers for 13 cities have been consolidated into a geonode and made accessible through the tool.
Hydrological and sedimentation monitoring study	**ONGOING**	Instruments have been installed and initial data collected. Experts from the Wami-Ruvu basin office were trained and the technical assistance is in the final stages.

ZANZIBAR LOCAL AREA DEVELOPMENT MAPPING

The Zanzibar Local Area Development Mapping work will provide data and information necessary for developing a comprehensive development plan. It also complement the government-implemented Boosting Inclusive Growth for Zanzibar project.

Fifty students from the State University of Zanzibar participated in a six-week-long industrial training program. The students learned about the theoretical and practical aspects of community mapping, including a wide range of soft skills, such as communication and community management, which are critical in a practical work setting. Using smartphones, handheld GPS devices, and high-resolution drone imagery, the students mapped over 600 businesses, 465 amenities, 4,000 trees, and over 38 kilometers of roads in Nungwi on Unguja island.

The students manually added 500 buildings to the existing digitized data set of about 4,800 buildings in Nungwi, updating and improving the data set's quality. A comprehensive survey further captured 62 tourism-related facilities, 99 restaurants, and 47 craft workshops. Working with local historians, the students mapped 23 places of cultural significance in collaboration with the Ministry of Finance and Planning team and a heritage expert from the Zanzibar Urban Services Project (ZUSP).

The project was finalized with the collection of data sets on urban infrastructure, building attributes, solid waste management, flood history, transport, and tourism. TURP has helped make these data sets available to inform decision-making and future projections.

DISASTER RISK MANAGEMENT INDEX

"Each assessment criteria helps the municipalities to identify gaps in their present organization's structure."

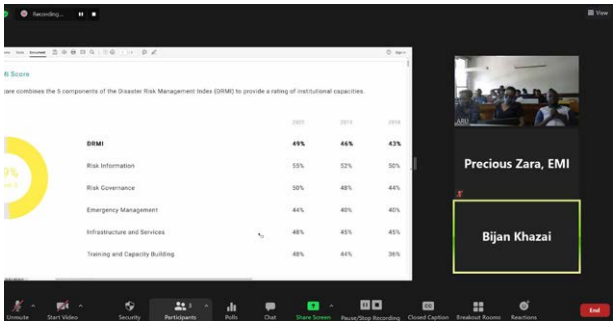
Grace Mawalla, Dar es Salaam Regional Coordinator, Tanzania Red Cross Society

The World Bank procured the services of the Earthquakes and Megacities Initiative (EMI) in partnership with Ardhi University to develop and apply a Disaster Risk Management Index (DRMI) in the Dar es Salaam Region for the years 2018 (baseline), 2019, and 2020. The DRMI toolkit and software application is a participatory tool that has been developed to capture, through a comprehensive self-assessment, the capacities of the Region to identify, reduce, manage, and finance disaster risk, and its performance in doing so.

During FY21, a total of 32 representatives from five municipalities, DarMAERT, and the Prime Minister's Office – Disaster Management Department (PMO-DMD) participated in DRMI activities to complete the 2020 assessment. A final validation and post-assessment workshop was carried out from March 12 to 19, 2021, to conclude the 2020 assessment. (Due to COVID-19 restrictions, which forbade large group meetings, the workshop for the 2020 assessment was carried out through individual meetings with Municipal Councils by the Ardhi University team.)

The 2020 DRMI assessment results reveal that the Dar es Salaam Region is in a transitional state from Level 2 ("early stage of awareness") to Level 3 ("state of engagement, commitment, and direct interventions") on the DRMI scale. The largest increase in scores from 2019 to 2020 are observed in the "Training and Capacity Building" and "Emergency Management" components of the DRMI, substantiating the impact of TURP activities in these areas.

Alongside key counterparts, TURP prepared a draft road map for the continuity of the annual assessments. The DRMI Roadmap consolidates the findings of interviews with Municipal Councils. It aims to, on the one hand, address the larger sustainability context and scaling of DRMI, and, on the other, ensure institutional support and endorsement for the DRMI from the Regional Administrative Secretary (RAS) and the PMO-DMD.



The annual DRMI assessments enable the Regional Authority and the Municipal Councils to collectively establish a baseline on the current state of disaster risk management (DRM) and track the effectiveness of efforts to scale up DRM in Dar es Salaam. The 2020 DRMI assessment may also inform resilience strategies that the Regional Secretariat and other key agencies can adopt with the participation of local government institutions, national agencies, and other concerned stakeholders. At the policy level, the DRMI is expected to facilitate the monitoring and evaluation of local government capacities concerning priorities identified in the Tanzania National Plan 2015–2020, as well as key objectives of the global Sendai Framework for Disaster Risk Reduction and the Regional Sendai Framework for Africa.

DAR ES SALAAM AND ZANZIBAR CITY PROBABILISTIC FLOOD RISK MODELLING AND EVALUATION

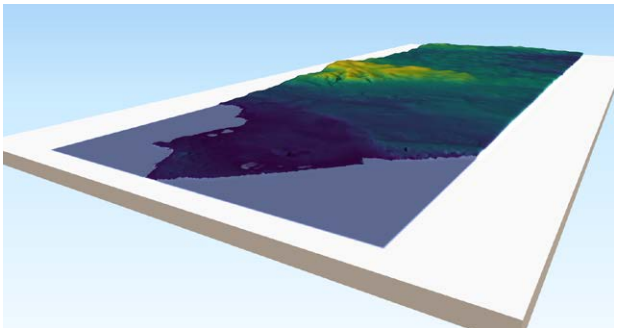
Despite the COVID-19 pandemic, the project has made progress in a number of areas. During FY21, the scope of the project was broadened slightly to include a probabilistic risk assessment of Zanzibar City, and an additional set of tasks was introduced to improve the digital terrain model (DTM) for Zanzibar.

The probabilistic flood risk model will help determine potential losses resulting from floods of different return periods and under various climate change projection scenarios. The model aims to inform high-level policy decisions on risk management, urban development, and settlement, among other issues. To facilitate the use of the tool and ensure that no specific expertise is required to run the model, a user-friendly dashboard has been developed, which will allow government agencies to conduct flood impact analysis by simply changing return periods and climate scenarios. When developing the dashboard, TURP consultated with users to ensure the functionality and user experience were driven by user needs. A final version will be available with full functionality and real data by the beginning of 2022.

The risk assessment for Dar es Salaam has progressed well, with the successful review and approval of key stages, including a flood hazard assessment and deterministic risk assessment. The flood hydrology for Dar es Salaam was finalized in February 2021, and the Deterministic Hazard Data Report and the Flood Risk Assessment and Scenarios Report for Dar es Salaam were delivered in June 2021.

The development of the Risk Assessment for Zanzibar has been held up by issues with the DTM – particularly in Stone Town, where the very narrow streets and crowded buildings make it very difficult to create an accurate ground surface DTM, which is needed for flood modelling. This obstacle has required some groundbreaking and innovative data processing, which has delayed progress slightly.

ZANZIBAR DTM PROCESSING (PROCESSING OF DIGITAL TERRAIN MODELS FROM UNMANNED AERIAL VEHICLES)



"To my knowledge, this is the single largest civilian drone imagery data set that has ever been processed to an elevation model. The technical lift on this project alone is unprecedented."

Stephen Mather,
Drone Specialist at Cleveland Metroparks

Over the last fiscal year, TURP's technical consultants and Cleveland Metroparks continued their efforts to reduce noise and disturbance in the terrain data. Unprocessed photogrammetry data (images acquired by drones) leaves vegetation and trees in the terrain data, which causes unrealistic bumps and does not reflect the actual contours of the bare earth. By working together and testing new ideas, the technical team of local and international consultants managed to remove vegetation noise from the terrain

data, with three TURP consultants supporting Cleveland Metroparks in digitizing tree canopies in Zanzibar City. Additionally, a surveying firm based in Dar es Salaam was contracted to measure 34 ground control points in Zanzibar to ensure that the data was vertically correct. The results of these activities were incorporated in the data during the last half of the fiscal year, and the final data set was completed in August 2021.

The result is a smooth data set that will allow for reliable hydrological modelling of Zanzibar City. TURP has engaged both local surveying firms and GIS experts to complete the project. Unfortunately, the pandemic prevented the team from re-flying over problematic areas, which has introduced flaws in the final product. Nevertheless, the final model will be the first high-resolution terrain data of Zanzibar City, and will be based entirely on locally acquired data. The data will be shared with COLA (the Zanzibar Commission for Lands) and other beneficiaries.

RAMANI HURIA 2.5

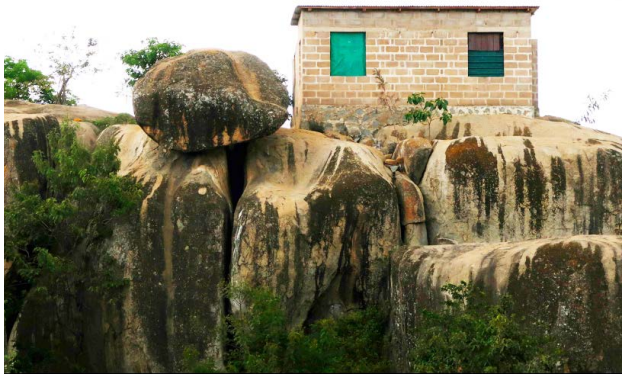
Following Ramani Huria 2.0, the Humanitarian OpenStreetMap Team was contracted to perform additional data collection in Dar es Salaam, notably in the Kigamboni and Temeke municipalities, which were not covered by Ramani Huria 2.0. The project was completed successfully and the consultant provided a final report, as well as 2020 building roof prints digitization data, flood depth data, and a Household Incidents Flood Map. The data collected will add to existing information from river cross-section surveys, helping develop a flood model of the city that will aid in future flood prediction and preparedness.

More than 103 university students from Ardhi University and the University of Dar es Salaam worked with 362 community members (216 male and 146 female) from 29 wards in Dar es Salaam to collect data on the extent and depth of floodwater. Approximately 318,237 buildings were added to OpenStreetMap.

MWANZA URBAN RISKS MAPPING

Spatial Collective was commissioned to carry out the community mapping of urban risk in Mwanza. It partnered with the Humanitarian OpenStreetMap Team and OpenMap Development Tanzania as well as with the Mwanza Regional Commissioner's Office. This project was intended to showcase how locally accessible, low-cost technology can produce high-quality spatial information to support resilience building and urban development planning. University students and government officials were trained in community mapping so they could coordinate community mapping engagements in pre-selected wards in Mwanza. The goal was to produce up-to-date, open, and accurate data on exposure to floods and rockfalls, suitable for modelling flood risk and generating flood scenarios.

With the aid of community members and 79 university students, the project used satellite imagery to capture more than 300,000 buildings in two municipalities, Nyamagana and Ilemela. About 15,868,183 square meters of flood prone area were mapped in 14 wards, 923,914 square meters of rockfall prone area were mapped in 12 wards and 177 kilometers of drainage were mapped in 18 wards using a combination of mobile phones and Do It Yourself Real Time Kinematic GPS.



Using a mixed-method approach – digitizing satellite imagery, collecting mobile and GPS field data, consulting with the community, and meeting with stakeholders – the students gained fundamental knowledge in organizing community mapping projects. The data sets produced will benefit both Mwanza's local authorities and other stakeholders as they undertake infrastructure improvement projects. The project highlights the potential of innovative technologies, when paired with local capacity building, to provide stakeholders with timely and accurate information

COVID-19 delayed a stakeholders' workshop, which was conducted at the end of the project with a limited number of participants per session. Nevertheless, the project was successfully finalized.

HYDROLOGICAL AND SEDIMENTATION STUDY AND MONITORING

The Delft University of Technology and the Trans-African Hydro-Meteorological Observatory (TAHMO) led the installation of additional monitoring stations in the Msimbazi basin valley. These include four new Automatic Weather Stations that report every five minutes, and five new hydrological stations comprising a radar sensor (RQ30) and four ultrasonic water-level sensors (Ijinus) to measure water level and flow. The data will enhance the flood early warning system dashboard developed by other partner organizations.[5]

Prior to the installations, a feasibility study was carried out to determine the optimal locations for sediment sampling. A sediment sampling protocol was also developed to guide sediment monitoring in the basin. The data assessment and final report are currently in the final stages of development.

To ensure the sustainability of the program, a training workshop (adhering to COVID-19 protocols) was organized on May 20 and 21, 2021, at the Water Institute in Dar es Salaam. The workshop was attended by fourteen participants (four female and 10 male): eight engineers from Wami-Ruvu Basin Water Board in Morogoro, Dar es Salaam, and Dodoma; two technicians from OpenMap Development Tanzania; one student from the University of Dar es Salaam; and three facilitators from TAHMO (two of whom participated virtually). The session aimed to train participants on tools and software systems used in weather and river observation within the Msimbazi Valley. The program included both in-class training and field training, in addition to the on-the-job training offered to some staff of the Wami-Ruvu basin during station installations. To ensure effective knowledge transfer, participants agreed to have organizers conduct follow-up training and coaching to enhance understanding and extend the use of tools and technologies to other regions and to climate hazards.

[5] See blog on the observations and analysis of flooding in April 2021, which was enabled by the monitoring stations and dashboard: https://rainbowsensing.com/index.php/2021/04/29/rainfall-and-river-flow-during-the-event-of-29-april-2021/.

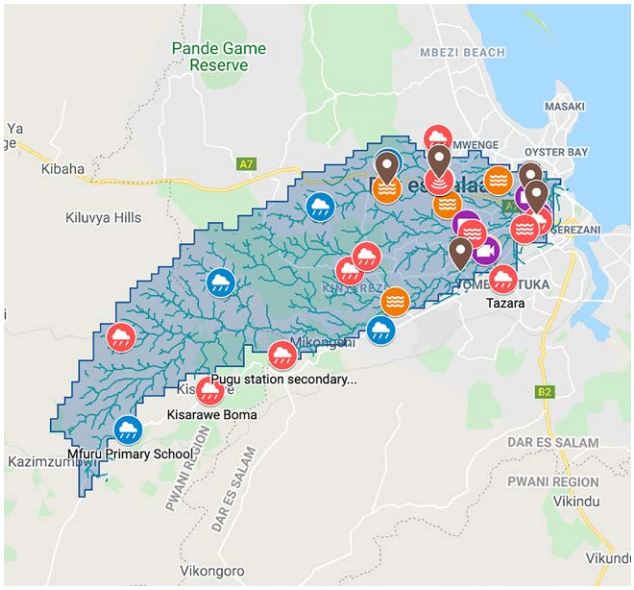
SEDIMENT MONITORING STUDY

This activity involves two sub-activities: developing a summary note on comprehensive sediment management and conducting a sediment monitoring study. The Summary Note on Comprehensive Sediment Management has now been fully completed. The sediment monitoring study has been initiated as part of the TAHMO contract and will be further extended into the Msimbazi Feasibility and Detailed Design Study.

The Summary Note on Comprehensive Sediment Management has provided valuable guidance for the Msimbazi Opportunity Plan. Sediments both constitute the largest threat that must be mitigated in Msimbazi River Basin and offer an opportunity by supplying building materials that can be used in the realization of the Plan. As part of the TAHMO contract, sediment monitoring has been initiated through the purchase of sediment monitoring equipment (see table below) jointly with the installation of hydrological stations and associated training of staff of the Wami Ruvu Basin Water Board.

STATION TYPE	EQUIPMENT	NUMBER OF UNITS	COMMENT
Hydrological stations	Water level sensor (Ijinus 5)	5	Four installed, one awaiting new location
	Water flow sensor (Sommer RQ30 radar sensor)	2	Two installed, one awaiting configuration, one not active due to stolen solar panel
	Cameras	5	One installed, four kept at the ministry of water; investigation of safe installation sites is ongoing. Vandalism and theft is an issue.
	Sediment sampler	1	Transferred to wami ruvu basin water board
	Water sampler	3	Transferred to wami ruvu basin water board
	Dumpy level	1	Transferred to wami ruvu basin water board
Weather stations	ATMOS41 with CR300/CR850 Logger 5	5	Four installed, one awaiting new location

As of August 2021, four hydrological stations are continuously monitoring water levels and flows in the lower Msimbazi and uploading the data every hour to a File Transfer Protocol server set up for the Wami-Ruvu Basin Water Board. An overview of installed stations is presented on the map below.



https://www.google.com/maps/d/u/1/viewer?ll=-6.824919220366023%2C39.27443247801442&z=12&mid=1dR9SvFLRf2Io2ZAPaKwMzmptXCW7PXbb

Although the results of these measurements are expected to provide an insight into Msimbazi's suspended sediment concentrations, realizing the Msimbazi Opportunity Plan will require a higher accuracy quantification. In recognition of this need, several additional tasks have been defined in the terms of reference for the Msimbazi Feasibility and Detailed Design Study: 1) higher-accuracy suspended sediment sampling and analysis; 2) higher-accuracy discharge measurements; and 3) quantification of sediment loads by combining river flow records with sediment concentrations.

FINANCIALS

Pillar 1 projects have disbursed US$744,599 in FY21, bringing total Pillar 1 disbursements to US$5,060,344 since the program started. Financial summaries are detailed in Section 10.

PILLAR 2: RISK REDUCTION MEASURES AND PLANNING

OBJECTIVE

To strengthen cities' capacity to plan for and reduce climate risk through both structural and non-structural measures that address long-term systemic risk.

OVERVIEW OF PROGRESS

With three ongoing activities, Pillar 2 remained active in FY21. Significant progress has been made on the Msimbazi Upgrading Project. The Ministry of Finance and Planning sent a formal request for financing to the World Bank, triggering project preparations, with project appraisal expected to take place in December 2021. At a community level, 12 wards have finished developing their own Community Disaster Risk Reduction Plans to guide their flood risk reduction initiatives.

TURP continues to explore the use of technology to improve solid waste management (SWM) in urban areas. An information technology (IT) business analysis for SWM services in Zanzibar and Arusha was initiated to understand the flow and use of information in SWM processes.

Projects continued to advance despite the COVID-19 pandemic, which caused delays and uncertainties for projects that require fieldwork and extensive stakeholder engagement, such as the Msimbazi Community DRRP.

ACTIVITY	STATUS	PROGRESS
Community Risk Reduction Plans	**COMPLETED**	12 wards completed the development of Community Disaster Risk Reduction Plans.
Lower Msimbazi Upgrading Project	**ONGOING**	Project Concept Note was reviewed.
IT Business Analysis for SWM Services for Zanzibar and Arusha city	**ONGOING**	Inception report was submitted.
Zanzibar Solid Waste Management Value Chain Optimization Study	**ONGOING**	A consulting firm was contracted, and work began in October 2021.
Green Dar – Reducing flood severity in Dar es Salaam by improving infrastructure, planning, and services to reduce erosion, solid waste litter, and dumping.	**ONGOING**	An Expression of Interest for this study has been published to identify a consulting firm, and the procurement is expected to be finalized soon.

COMMUNITY DISASTER RISK REDUCTION PLANS

"The training was good because prior to the training I did not know that as a Ward we are capable of responding to disaster issues, or at least reducing impacts of disasters by planning different disaster management initiatives, such as putting in place drainage to direct water to the sea and preparing safe areas for victims to go to during disasters. Prior to the training, I thought responding to disasters was a national government issue."

Levina Assey, private sector representative

Twelve wards in the Kinondoni Municipal Council (KMC) and Dar es Salaam City Council (DCC), formerly known as Ilala Municipality, have completed developing their Community Disaster Risk Reduction Plans (DRRPs) under the Jipange project. The plans, which are available in Swahili and English, aim to guide the wards in applying low-cost flood risk reduction measures that can be implemented by the communities with minimal outside assistance. Ramani Huria maps were instrumental in determining flood-prone areas, assets, and threats, and guiding the wards in selecting targeted risk-reduction measures for specific challenging areas.

Ward Disaster Management Committees and some Sub-ward Disaster Management Committees from the following wards worked together to develop these plans: Jangwani, Vingunguti, Mnyamani, and Mchikichini from DCC, and Kigogo, Tandale, Kawe, Mzimuni, Mwananyamala, Magomeni, Ndugumbi, and Mbweni from KMC.

Development of the DRRPs began in 2019 and was accomplished in phases. The pilot was performed between May and June 2019 for three wards (Kigogo, Kawe, and Tandale), and the rollout for the remaining nine wards took place between November 2019 and March 2020. A total of 316 community members (201 male, 115 female) participated in the development of the plans, which was accompanied by training for the Ward Disaster Management Committees on basic DRM and how to develop the plan using a specific toolkit.

In May 2021, the DRRPs were officially handed over to the 12 wards, DCC, and KMC in the presence of the Dar es Salaam RAS. Jangwani, Vingunguti, Mnyamani, and Mchikichini wards from DCC have approved and signed the plans, which are now regarded as government official documents; the KMC wards are in the process of officially approving the plans.

This project enabled the Disaster Management Committees to understand their key responsibilities, and created the foundation from which the wards can start to implement those responsibilities. By identifying flood risk reduction measures, the communities have learned that flood protection is as much their responsibility as that of the higher levels of governments, such as Municipal Councils and the central government.

LOWER MSIMBAZI UPGRADING PROJECT

"I want you to make sure this Project for development of Msimbazi River valley starts immediately without usual bureaucracy for the realization of intended benefits."

Honorable Ummy Mwalimu, Minister of State, President's Office – Regional Administration and Local Government (PO-RALG). addressing PO-RALG and Dar es Salaam Region Officials on July 12, 2021

During FY2021, the Ministry of Finance and Planning endorsed the Msimbazi Upgrading Project and formally requested World Bank financial support for its implementation. The Project Concept Note review was conducted in April 2021. PO-RALG has finalized the terms of reference for consultancy services for carrying out feasibility studies, preparing preliminary and detailed engineering designs, cost estimates, and bidding documents, and performing environmental and social due diligence for the Lower Msimbazi Upgrading Project.

Due to the financial downturn caused by COVID-19, FCDO will no longer provide a grant of US$20 million for the Msimbazi Project. However, it will continue to support World Bank–executed activities that will help realize the plan. In October 2020, the new British Ambassador to Tanzania, David Concar, visited the Msimbazi valley project area to get a firsthand understanding of the challenges in the Msimbazi valley.

Cost estimates for the Msimbazi project have been revised upward to around US$250 million dollars instead of the initial US$120 million. The increase is due to the high cost of bridge construction. The project appraisal is expected to occur in December 2021, at which point the parties will agree to final details and financing.

INFORMATION TECHNOLOGY BUSINESS ANALYSIS FOR SOLID WASTE MANAGEMENT SERVICES FOR ZANZIBAR AND ARUSHA CITY

This project aims to increase understanding of how information is used in SWM services in Zanzibar and Arusha, and the processes and relationships of information flows. The resulting comprehensive IT business analysis will feed into the design of IT systems facilitating SWM operations in Arusha and Zanzibar to further enhance the municipalities' capacity to manage solid waste.

The inception report was submitted in April, and the IT Business Baseline Assessment and SWM Service Baseline Assessment are currently underway. The next steps are to enhance SWM service design and program business processes based on the assessments.

The COVID-19 pandemic limited physical meetings that were organized to better understand SWM processes and how they are carried out in Arusha and Zanzibar, and delayed activity execution and site surveys.

ZANZIBAR SOLID WASTE MANAGEMENT VALUE CHAIN OPTIMIZATION STUDY

A consulting firm has been contracted to carry out a thorough assessment of the SWM value chain in Zanzibar in order to identify the most viable SWM service chains for urban, peri-urban, poor urban, and rural areas (based on classification in the Solid Waste Strategy Report). Where no financially viable service chains can be identified, the study will quantify the financial subsidy required to make the service viable, while identifying local opportunities for improved SWM (i.e., local waste management as required). The study also aims to estimate costs and identify financing options to establish the optimized SWM value chain models.

The contract has been awarded to an international consulting firm, and work on the study has begun. The consulting firm's proposal has incorporated robust COVID-19 mitigation measures to ensure the study is successfully implemented, including integrating COVID-19 and other risk response mechanisms into the Program Quality Management System.

GREEN DAR – I REDUCING FLOOD SEVERITY IN DAR ES SALAAM BY IMPROVING INFRASTRUCTURE, PLANNING, AND SERVICES TO REDUCE EROSION, SOLID WASTE LITTER, AND DUMPING.

By replacing conventional drainage channels with sustainable alternatives that increase on-site infiltration, governments can reduce the financial and environmental costs of drainage infrastructure. However, project-level efforts to control erosion, both during projects (such as road or drainage construction) and after execution, have revealed systematic shortcomings in how these approaches are implemented. The shortcomings – in technique, choice of vegetation, and management of the planting process – point to a need for a deeper understanding of the challenges around sustainable infrastructure, and of possible solutions.

Research, capacity building, and ongoing technical assistance are needed to build a sufficient understanding about available infrastructure options, and to ensure they are designed for and ultimately piloted and implemented as intended. An Expression of Interest for this study has been published to identify a consulting firm, and the procurement will be finalized in November 2021.

FINANCIALS

Pillar 2 projects have disbursed US$443,489 in FY21, bringing disbursements to a total of US$2,985,691 since the program started. Financial summaries are detailed in Section 10.

PILLAR 3: EMERGENCY MANAGEMENT AND RESPONSE

OBJECTIVE

To strengthen the capacity of stakeholders involved in preparedness and short-term disaster events to cope with specific emergency scenarios.

OVERVIEW OF PROGRESS

Emergency Preparedness and Response support has been extended to the national level in this fiscal year. Key national emergency response documents (the Tanzania Emergency Preparedness and Response Plan of 2012 and the Tanzania Disaster Communication Strategy) are being updated under the leadership of the Prime Minister's Office – Disaster Management Department (PMO-DMD). The Dar es Salaam Multi-Agency Emergency Response Team (DarMAERT) continues to benefit from Pillar 3's capacity-building initiatives, which specifically focus on: i) enhancing the Emergency Operations Center (EOC); and ii) developing key emergency response documents to complement the updated DarMAERT Emergency Response Plan (2020) and other deliverables of the Training Exercise and Drill (TED) program that closed in 2020. At a community level, capacity-building activities on flood preparedness and response were concluded in 12 wards. A flood awareness campaign was also launched to educate the community on the dangers of crossing moving water during heavy rains and floods.

ACTIVITY	STATUS	PROGRESS
Strengthening Emergency Preparedness and Response Capacity in DarMAERT and PMO-DMD	**ONGOING**	All deliverables were drafted and reviewed by the World Bank, and are awaiting finalization.
Servicing Emergency Communication Equipment	**COMPLETED**	Power backup was installed and all equipment was serviced.
Rapid Damage and Needs Assessment for October 2020 Flood	**COMPLETED**	RDNA results were presented to the Dar es Salaam RAS and submitted to municipalities.
Community Disaster Preparedness and Response Plan	**COMPLETED**	12 wards have completed development of their Community Disaster Preparedness and Response Plans.
Flood Awareness Campaign	**COMPLETED**	The Flood Awareness Campaign was launched by the Dar es Salaam Regional Commissioner.
Developing (or Operationalizing) the Emergency Management Information System (EMIS) for the Emergency Operations and Communications Center EOCC	**FINALIZING**	EMIS is being used by the DarMAET EOC in its daily operations. EMIS for flood response has been completed.

STRENGTHENING EMERGENCY PREPAREDNESS AND RESPONSE CAPACITY IN DARMAERT AND PMO-DMD

Building on the work supported under TURP to strengthen DarMAERT's emergency response capacity – which was mainly undertaken through the Training, Exercises, and Drills Program (TED, 2018–2020) – the following main tasks were initiated during FY21 and are expected to be completed in FY22:

i) Developing and testing the Flood Contingency Plan, Tsunami Contingency Plan, and Pandemic Continuity of Operations Plan to complement the updated DarMAERT Emergency Response Plan 2020.

ii) Developing and testing Emergency Response Functions and preparing specific standard operating procedures for each one.

In addition, technical support was provided for strengthening Tanzania's emergency preparedness and response capacity at the national level. Technical assistance activities are co-funded by the Global Facility for Disaster Reduction and Recovery (GFDRR) and TURP. The main government counterpart is the PMO-DMD, which formally requested such capacity-building support from the Bank. The following tasks are in progress and are expected to be completed by January 2022:

i) Conducting a study on the legal and institutional arrangements in DRM

ii) Reviewing and updating the Tanzania Emergency Preparedness and Response Plan (2012)

iii) Reviewing the Tanzania Disaster Communication Strategy

iv) Conducting a Capacity Needs Assessment of the National Emergency Operations and Communication Center (NEOCC)

To promote ownership of the deliverables, the consultant worked with PMO-DMD to validate and improve the templates for each of the deliverables. The PMO-DMD also advised on how best to conduct the activities virtually.

The consulting firm facilitated an EOC learning exchange on April 21, 2021, between the Tanzania Disaster Management Department, key stakeholders, and the Philippine Office of Civil Defense-EOC. The exchange provided the Tanzanian team with a different perspective on EOC operations, which was useful during the validation of the NEOCC Capacity Needs Assessment.

The World Bank has already reviewed and provided feedback on the drafts of the deliverables, all of which were developed in collaboration with DarMAERT and PMO-DMD, with guidance from the Earthquakes and Megacities Initiative (EMI) and Ardhi University. A series of co-design workshops, consultations, working sessions, and simulation tabletop exercises were instrumental in developing these deliverables.

SERVICING EMERGENCY COMMUNICATION EQUIPMENT

TURP installed a power backup and console system to monitor emergency radios, and serviced emergency communication equipment at 10 sites. The equipment servicing included the replacement of defective equipment and the relocation of some equipment to improve the system's functionality. TURP also conducted a virtual training on the uses of the equipment, which was attended by 63 emergency responders from different agencies, including the Regional Commissioner's Office, hospitals, the Tanzania Police Force, the Tanzania Fire and Rescue Force, and the Tanzania Red Cross Society. Due to COVID-19 restrictions, practical training on dispatching ambulances and fire trucks had to be conducted virtually, which affected the quality of the training.

RAPID DAMAGE AND NEEDS ASSESSMENT FOR OCTOBER 2020 FLOOD

"The assessment will set standards of the details required in the future disasters damage and needs assessments."

Abubakari Kunenge,
Dar es Salaam Regional Commissioner

Upon formal request from the Regional Administrative Secretary (RAS), TURP supported the Dar es Salaam Regional Authority in conducting a Rapid Damage and Needs Assessment (RDNA) for the floods that occurred on October 13 and 15, 2020. The main objectives of the assessment were to build the capacity of the regional government to conduct similar assessments of localized disasters on its own in the future, to estimate the physical and economic impact of the flood, and to inform short, medium, and long-term interventions to strengthen recovery, reconstruction, and resilience-building interventions.

The assessment covered all five councils of the Dar es Salaam Region – namely, Dar es Salaam City Council (formerly Ilala Municipal Council) and Kinondoni, Temeke, Ubungo, and Kigamboni Municipal Councils. It also covered various sectors affected by the flood: the productive sector (industry and commerce), the infrastructure sector (transportation, water sanitation and hygiene, electricity), the social sector (education, housing), and crosscutting sectors (environment, disaster risk reduction).

The RDNA was conducted in November 2020 and its preliminary results were presented to RAS in January 2021. Thereafter, the reports were sent to the municipalities and the final report was submitted to RAS in May 2021.

Initial results estimated that the flood caused damages of T Sh 63.266 billion (US$27.507 million) and losses of T Sh 7.547 billion (US$3.281 million). The recovery cost was estimated to be T Sh 76.108 billion (US$33.09 million). During the RDNA process, TURP helped build the capacity of 33 representatives from the government and private agencies who can continue to support the Regional Authorities on similar assessments in the future.

The assessment was challenging and unconventional, as it was conducted in the middle of the rainy season and the team could not conduct face-to-face consultations because of the COVID-19 pandemic. Most consultations were done virtually and by phone, a relatively new practice in Tanzania, but the assessment team managed to cope and achieve full participation.

OPERATIONALIZING THE EMERGENCY MANAGEMENT INFORMATION SYSTEM (EMIS) FOR THE EMERGENCY OPERATIONS CENTER (EOC)

EMIS is a collaborative platform that can facilitate communication, planning, and action before (to mitigate and prepare), during (to improve response), and after (to aid recovery) a disaster. Its components collectively provide data and tools to process and analyze emergency responses. It facilitates the dissemination of warnings, associated actions to be taken, and the collection of feedback from emergency responders.

EMIS is user centric and has been developed in consultation with DarMAERT, its main user. During FY20, EMIS was installed in the DarMAERT EOC and customized to dispatch and track ambulances to support COVID-19 response in Dar es Salaam. During FY21, the team resumed the development of EMIS for flood response. The team is planning to hand over EMIS and its user and technical manuals to DarMAERT by December 2021.

COMMUNITY DISASTER PREPAREDNESS AND RESPONSE PLAN

"The training was really good and productive. We have benefited a lot from the training, and we will be able to help our community based on the training. We have a better understanding of infrastructure, environment, flood-affected areas, evacuation procedures, and identified safe evacuation routes for rescuing people and other disaster-related issues. We thank the facilitators for providing us with the knowledge. As I leave this training, I have a greater understanding of disasters and their impact."

Dr. Maneno A. Tamba, training participant

To build flood preparedness, response capacity, and community resilience, 12 wards comprising 55 sub-wards in Kinondoni Municipal Council (KMC) and Dar es Salaam City Council (DCC, formerly known as Ilala Municipality) have successfully completed development of Community Disaster Preparedness and Response Plans (DPRPs). These plans focus on

guiding the flood preparedness and response actions of the Ward and Sub-ward Disaster Management Committees and community members. They were developed by the Ward Disaster Management Committees together with members of the Sub-Ward Disaster Management Committees, in a process facilitated by the Jipange project team and volunteers from the Tanzania Red Cross Society. The DPRPs were developed in parallel with Disaster Risk Reduction Plans (DRRPs), a process in which a total of 316 community members (201 male, 115 female) participated. Participating wards included Jangwani, Vingunguti, Mnyamani, and Mchikichini from DCC, and Kigogo, Tandale, Kawe, Mzimuni, Mwananyamala, Magomeni, Ndugumbi, and Mbweni from KMC.

A toolkit for developing DPRPs and DRRPs, which was used during the project, has also been completed and can now be used in other wards outside the project area.

Since the DPRPs and DRRPs were developed in parallel, the project proceeded in several phases. The pilot occurred between May and June 2019 for three wards (Kigogo, Kawe, and Tandale) and the rollout for the remaining nine wards took place between November 2019 and March 2020.

To facilitate rapid flood response, 25 members of the Ward Disaster Management Committees from the 12 wards were trained on using the FloodTag tool to communicate and report real-time flood information to other committee members. An infographic poster on communicating flood preparedness and response actions to communities was also prepared.

The DPRPs were officially handed over to the 12 wards, DCC, and KMC in the presence of the Dar es Salaam Regional Administrative Secretary on May 11, 2021. Jangwani, Vingunguti, Mnyamani, and Mchikichini wards from DCC have approved and signed the plans, which are now regarded as government official documents; the KMC wards are in the process of officially approving the plans.

Project completion was delayed because of the COVID-19 pandemic, which restricted face-to-face meetings and slowed down the validation of information included in the plan for some of the wards, particularly during the pilot phase in August 2020. While this process could have been done virtually, the lower levels of government have no mechanism for conducting virtual meetings.

FLOOD AWARENESS CAMPAIGN

"Because we still get heavy rains and flooding, we saw it fit to have a flood awareness campaign that is continuous … it is good for us to give continuous education so that citizens can take precautions; anytime that the Tanzania Meteorological Association announces expected heavy rainfall, this campaign should be aired."

Abubakr Kunenge, Dar es Salaam Regional Commissioner

TURP worked with DarMAERT to develop the "Usipime Nguvu ya Maji" campaign, which translates to "Do not test the strength of water." The campaign aims to educate the public on the risk of floodwater, which regularly causes accidents, injuries, and deaths. The campaign was first launched by the then–Regional Commissioner of Dar es Salaam, Abubakr Kunenge, in November 2020 for the October–December rainy season, and later relaunched on May 3, 2021, for the March–May rainy season.

Roughly 30 executives and editors from major media houses in Tanzania attended the relaunch, at which the Regional Commissioner asked for the support of the media in publishing the campaign's educational posters and videos. The materials were successfully published and aired on about 15 media platforms, including Mtanzania Digital, EFM, Azam TV, Habari Leo, Uhuru FM, Star TV, and Clouds. In addition, the videos and posters were shared through social media platforms, including WhatsApp and Instagram, by the members of the DarMAERT.

The Regional Commissioner will re-launch this campaign at the beginning of every rainy season to remind the public of its crucial message and ensure its warnings are heeded.

FINANCIALS

Over FY21, Pillar 3 projects disbursed US$688,829 in funding, bringing total program disbursement to date for this pillar to US$2,927,599. Financial summaries are detailed in Section 10.

PILLAR 4: RESILIENCE ACADEMY

OBJECTIVE

To maximize program impact and sustainability through the establishment of university partnerships that transfer skills and risk management tools to the next generation of urban planners.

OVERVIEW OF PROGRESS

The Resilience Academy continues to provide a platform for Tanzanian youth in universities to enhance their digital skills and find innovative solutions for urban resilience challenges. In the 2020 industrial training program, university students learned about spatial data collection, processing, and digitization. A microtasking and micropayment pilot also supported youths to not only learn digital skills but also earn stipends during the COVID-19 pandemic, when mobility was limited.

The Climate Risk Database, which hosts the data produced under TURP, continues to be useful to not only students but also researchers and development partners. Through a data visualization challenge, students visualized relevant data to present solutions to real-world problems. A number of research topics and various e-learning materials have also been developed based on these data sets.

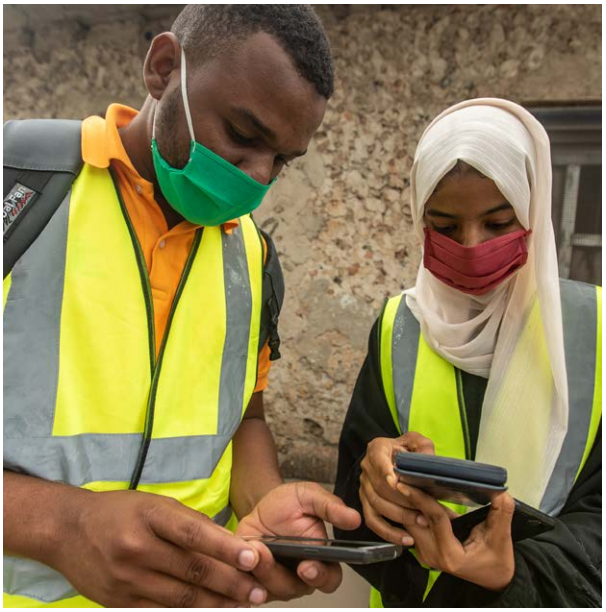
ACTIVITY	STATUS	PROGRESS
Innovation Week: Resilience and Tech Solutions for the Urban Future	**COMPLETED**	As part of Innovation Week Tanzania 2021, the Resilience Academy (RA) hosted a session on Resilience & Tech: Solutions for the Urban Future.
Climate Risk Database (CRD)	**ONGOING**	The CRD is continuously being enhanced.
Resilience Academy Industrial Training Program 2020	**COMPLETED**	A total of 150 students (50 from SUZA, 50 from SUA, 25 from ARU, and 25 from UDSM) participated in the 2020 industrial training program.
Research and Innovation	**ONGOING**	RA experts from UDSM, ARU, SUA, and SUZA developed 15 research topics.
Cash for Digital Work – Microtasking for Urban Extent in Tanzania	**COMPLETED**	The microtasking pilot was completed.

INNOVATION WEEK: RESILIENCE AND TECH- SOLUTIONS FOR THE URBAN FUTURE

"Access to accurate data sets has led … Green WastePro Ltd and the Ilala Municipality to register a 129% increase in identified service users across three wards in the city center."

Alex Magai, Green WastePro Ltd Operations Manager

As part of Innovation Week Tanzania 2021, organized by Ukaid's Human Development Innovation Fund, the Resilience Academy (RA) hosted a session on Resilience & Tech: Solutions for the Urban Future on May 20, 2021. This session explored how localized community data collection and management with affordable technology is having a direct impact on disaster risk reduction and urban resilience in Tanzania. The session examined how to scale up and apply these efforts to flood management, water supply and sanitation, solid waste management (SWM), and forestry.



The SWM breakout session focused on the value of data and maps in SWM service provision and revenue collection. It provided a valuable opportunity for open dialogue between key stakeholders involved across the SWM value chain to discuss data needs and availability. The dialogue was supported by a case study of how service providers have used data and maps to enhance operations and revenue collection in both planned and unplanned settlements in Dar es Salaam. For example, digitizing data on service users within three wards in the city center led to a 129 percent increase in identified service users, a 55 percent increase in revenue collection coverage, and many other positive impacts resulting from the optimization of data-driven internal management.

CLIMATE RISK DATABASE (CRD)

"Data access is important for decision-making. CRD gives access to data to university partners for research and decision-making."

Massoud Hamad, State University of Zanzibar

The Climate Risk Database (CRD) is a digital asset management system that includes digital geospatial data, tools, and metadata. CDR's main objective is to curate high-quality open geospatial data for urban planning and research by engaging local communities in the process of data collection and use.

The Climate Risk Database and the data producers govern the data quality protocol, which ensures that data produced can reliably be used in planning, research, education, and decision-making. Systematic data quality protocols are applied at every stage of the data lifecycle. The CRD is being used to develop training materials for the RA. Five modules have thus far been developed:

- **Module 1:** Geospatial Content Management System – Geonode
- **Module 2:** Geospatial Data Quality and Management
- **Module 3:** Geospatial Data Visualisation
- **Module 4:** Flood Mapping, Modelling, and Predictions
- **Module 5:** Community Mapping for Improved Resilience Planning

During FY21, more than 100 students from the University of Dar es Salaam (UDSM), Ardhi University (ARU), and the State University of Zanzibar (SUZA) were trained on Module 1. About 60 sets of vector data, 11 sets of raster data, three thematic maps, and 33 documents have been produced, and 22 data managers have been trained. The CRD continues to provide access to data to support training for experts, students, and partners on geospatial data. It has also been used in the Data Visualization Challenges, in which more than 200 students participated in visualizing the data.

Due to COVID-19, the modules have been developed into an e-learning platform to allow students and other university partners to access training and data online.

RESILIENCE ACADEMY INDUSTRIAL TRAINING PROGRAM 2020

"The combination of theoretical and practical experiences provided to students gives them confidence to use current tools and technologies to find solutions to urban challenges."

Raya Idrissa Ahmada, State University of Zanzibar

The 2020 Industrial Training Program involved 150 students from four universities: UDSM, ARU, SUA and SUZA. The program exposes students to real- world problems and improves problem-solving skills as well as increasing students' capacity for self-employment. The 2020 program was carried out between September 7 and October 23, 2020, subject to each university's programs.[6] They digitized 318,237 buildings to generate high-quality building roof print polygons in machine-readable GIS format, and they mapped 1,360 buildings affected by flooding. A tree mapping pilot was also carried out and a total of 1,258 trees were mapped within the Mazimbu Campus in Morogoro. Additionally, a building survey was conducted to capture the physical attributes of over 4,000 digitized buildings in Nungwi.

Due to COVID-19, training materials for both the trainers and the university students have been produced and made available through an e-learning platform. The objective is to allow students and other university partners to access training and data using online tools such as Digicampus.

RESEARCH AND INNOVATION

"[The] research and innovation component provides students an opportunity to be exposed to the research that explores the use of current data, the use of new tools, and enables acquiring new skills for research."

Dr. Ernest Mauya, Sokoine University of Agriculture

The Resilience Academy is promoting research and innovation activities related to urban resilience by networking with international universities, TURP stakeholders, and relevant actors. The goal is to identify data gaps and research topics that will enrich the state-of-the-art use of digital geospatial technologies and tools in DRM. Activities in the research and innovation program include engaging Tanzanian researchers in TURP activities and selected Master of Science students on learning to conduct research based on TURP data and emerging topics.

In collaboration with RA experts from UDSM, ARU, SUA and SUZA, TURP has developed 15 research topics. Each university will get up to three research topics to give to students.

CASH FOR DIGITAL WORK – MICROTASKING FOR URBAN EXTENT IN TANZANIA

"[The] micropayment pilot project was a good example project to give students an opportunity to work online and get paid using mobile payments."

Mahadia Tunga, Lecturer, University of Dar es Salaam

This project was a pilot that aimed to build on the success of the Resilience Academy and Open Cities program. It specifically targeted those who have lost income due to COVID-19 mobility restrictions. The objectives of the microtasking pilot project were to: i) create-high quality geographic data that can be used to inform future urban planning and disaster risk reduction efforts, while also ii) creating employment opportunities for vulnerable youth in Tanzania and iii) providing learning opportunities on valuable digital skills and geospatial technology. Task-based micro-work can be the first step in developing more advanced digital skills, which, when linked to micro-credentialing, can lead to future work prospects.

The microtasking pilot used data from the World Settlement Footprint 2019, which was developed by the German Aerospace Agency and supported by the World Bank. The data captures the spatial distribution and pace of urban exposure growth. The German Aerospace Agency provided the data provider for this pilot, and the results of the pilot were used to validate the World Settlement Footprint 2019

FINANCIALS

Over FY21, Resilience Academy projects disbursed US$577,946 in funding, bringing total program disbursement to date for this pillar to US$2,090,292. Financial summaries are detailed in Section 10.

[6] See http://industrialtraining.utu.fi/ for a demographic breakdown of participants and details on the program. See https://resilienceacademy.ac.tz/150-university-student-to-attend-industrial-training/ for more information on the 2020 program.

PROGRAM MANAGEMENT

OBJECTIVE

This component of the program is intended to support: program governance arrangements and Trust Fund–related meetings; the development of work plans and budgets; communication management; the dissemination of lessons learned; progress reports; and monitoring and evaluation of the program.

OVERVIEW OF PROGRESS

During FY21, the global economic downturn caused by COVID-19 had major impact on TURP. Given the economic impact of the pandemic on the United Kingdom's public finances, FCDO informed the World Bank and the Government of Tanzania that it no longer will be able to provide the approximately $20 million that was earmarked to co-finance the Dar es Salaam Metropolitan Development – Msimbazi Basin Development. This decision came following months of uncertainty around both TURP's funding and its closing date. Initially, the program was designed to close in November of 2021. However, FCDO was able to make £1.650 million (approximately US$2.22 million) in additional funding available for the remainder of the program, which allowed TURP to be extended by 18 months.

COVID-19 also had a significant effect on the Understanding Risk conference, which usually takes place in the fall. The Understanding Risk conference brings together experts and representatives from the government, universities, and civil society organizations, and has been a major platform for knowledge sharing and communication. During this fiscal year, TURP participated in a virtual global Understanding Risk conference that was originally slated to take place in Singapore. TURP's presentation, "Doing drainage differently: Tackling urban flooding in the future mega-city of Dar es Salaam, Tanzania," focused on the Msimbazi project. The panelists for the event included the World Bank Country Director, a real estate developer from the private sector, and a government official.

ACTIVITY	STATUS	PROGRESS
Participation in the global Understanding Risk conference	**COMPLETED**	Presenting to a global audience, TURP discussed lessons learned from the years of analytics and planning that went into the development of the Msimbazi Basin project.
Steering Committee Meeting	**COMPLETED**	Two steering committee meetings were held covering activities in FY21. During these meetings, the work plans were reviewed and endorsed by the committee.
Annual Review and Annual Work Plan Update	**ONGOING**	The annual work plan has been finalized and approved. The Annual Review was completed in November 2021.

COMMUNICATION

During this fiscal year, two videos on TURP's work were created and shared on the World Bank's corporate YouTube channel: "Tanzania Urban Resilience Program: Digital Microtasking to reduce Climate Risk in Zanzibar"[7] and "The Resilience Academy: Building the Next Generation of Urban Planners."[8] The videos enabled TURP to share its efforts with a broader public.

Additionally, an article in the Tanzanian Daily News highlighted TURP's work with the 12 wards in Dar es Salaam that developed Disaster Preparedness and esponse Plans (DPRPs) and Disaster Risk Reduction Plans (DRRPs).[9]

FINANCIALS

Over FY21, Program Management activities disbursed US$123,893 in funding, bringing total program disbursement to date for this pillar to US$1,486,244. Financial summaries are detailed in Section 10.

[7] World Bank, "Tanzania Urban Resilience Program: Digital Microtasking to reduce Climate Risk in Zanzibar," YouTube video, 2:19, March 29, 2021, https://www.youtube.com/watch?v=Rpf8GKv8_YM.
[8] World Bank, "The Resilience Academy: Building the Next Generation of Urban Planners," YouTube video, 6:54, March 29, 2021, https://www.youtube.com/watch?v=IbURhIc5VFY.
[9] James Kamala, "Dar Wards Polished on Rescue Mission Skills," Daily News, May 12, 2021, https://dailynews.co.tz/news/2021-05-12609be7559282c.aspx.

05

RESULTS OVERVIEW

The following log frame was agreed upon by the World Bank and FCDO to track TURP's progress. This chapter documents the program's achievements in FY21.

IMPACT LEVEL

The program aims to contribute to the following long-term impact statement: Urban areas in Tanzania are more resilient to current climate variability and future climate change, and capable of more sustained patterns of economic growth and poverty reduction.

Impact Indicator 1: Extent to which Investment Climate Facility (ICF) intervention is likely to have a transformational impact

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Achievement of level 3: "Tentative evidence of change – transformation judged likely."**	TURP experienced major changes in FY21. The significant funding cut to the Recipient-Executed part of the program had a direct impact on the Msimbazi Valley Basin project, which aims to reduce flooding in the lower Msimbazi valley. Despite the funding cut, the government is committed to addressing the flood problems in lower Msimbazi. The preparation of the project is moving forward with the expectation that alternative funding resources will be available to fill the gap. This project will ensure that the long-term flood adaptation plans supported by TURP will be achieved. Regarding capacity building and sustainability, in FY21, TURP has put particular emphasis on ensuring that programs that were initiated under its auspices can continue after TURP closes. For example, a roadmap is being developed for the Disaster Risk Management Indiex (DRMI) to ensure that municipalities will be able to continue assessing their progress toward comprehensive resilience on their own. Similarly, several consultation and capacity-building exercises were carried out to strengthen the National Emergency Operations and Communication Center and to update critical national emergency response plans. All of these efforts have expanded TURP's engagement to the national scale and will help ensure both sustainability and replicability of the various initiatives carried out at city level. The new work program will build on these activities and develop an emergency response guideline that other cities can use to replicate the work that was done in Dar es Salaam. FY21 provided an opportunity to test the efficacy of the investments made in emergency response under TURP. During the October 2021 floods, DarMAERT was able to effectively activate the emergency response protocols and alert local residents about the floods in a timely manner. Finally, in FY21, TURP explored novel ways of processing digital terrain models (DTM) from large-scale drone maps. Lessons learned from this process will be summarized and documented and will prove valuable for programs in Tanzania and beyond.

Impact Indicator 2: Improved capacity of government agencies to identify, reduce, finance and cope with disaster risks

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**DRMI score of 47%**	This fiscal year, the average DRMI score of Tanzanian municipalities increased from 45% to 47%. TURP learned a number of lessons during the process of measuring municipalities' progress. First, the process of scoring has as much or even more value than the final score itself, as the audit process forces officials to assess gaps and plan ahead on needed actions. Second, it became evident that it is easier to move from score 2 to 3 than from 3 to 4; hence, there is significant room for continued improvement on how municipalities integrate the resilience agenda in their planning and operations.

OUTCOME LEVEL

Outcome Indicator 1: Number of persons benefiting from improved flood resilience as a result of ICF support

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**1 million indirect beneficiaries of risk mapping** **750,000 indirect beneficiaries of risk response planning (12 wards)**	Approximately 1.2 million people have indirectly benefited from the exposure mapping completed in Dar es Salaam, Zanzibar, and Mwanza. In addition, more than 750,000 people have indirectly benefitted from the risk response plans completed in 12 wards.

Outcome Indicator 2: Number of Wards planning or implementing flood risk reduction and response measures

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Risk response measures used by 3 wards**	The response plans were used widely during the floods of October 13–15, 2020, in Dar es Salaam, which affected all five municipalities (88 sub-wards in 39 wards). The event lead to 12 deaths and significant damage of infrastructure and housing. The Dar es Salaam Emergency Operations Center was fully activated to coordinate flood response within the city and all municipalities used the response plan, including for coordinating door-to-door evaluation and for assessing damage after the event.

Outcome Indicator 3: Climate risk data in sustainable use

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Probabilistic flood risk analysis results used by at least 2 agencies**	The hydrological and hydraulic model for Dar es Salaam and the flood hazard data sets were completed and shared with all relevant agencies. The beta version of the flood hazard and risk visualization and analysis dashboard has been completed and will be presented to participating agencies. The Zanzibar model has faced delays because of challenges in processing large-scale drone data to develop DTM. Ultimately, the data was processed using several novel approaches. The lessons learned from this experience will be invaluable for many projects, both in Tanzania and beyond, and the approach will be separately published because of its potential contributions to the field.

OUTPUTS

OUTPUT 1: INFORMATION AND DATA MANAGEMENT FOR CLIMATE RISK IDENTIFICATION

Output Indicator 1.1: Improved access to climate risk information in Dar es Salaam

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**DarMAERT and PO-RALG have access to a probabilistic data set of hazards, exposure, and risk information for decision-making**	All relevant data sets have been shared with more than 50 stakeholders from two dozen institutions. The use of these data sets will differ from one agency to another. One of the lessons learned during the process of developing the data sets is that some of the agencies are predominantly focused on disaster response, and the workshops thus needed to emphasize the relevance of these tools for ex-ante planning and for measuring progress toward resilience.

Output Indicator 1.2: Exposure or risk assessments applied in major cities

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Data relevant for risk management is in use by three cities** **Tanzania Urbanization Report launched**	Dar es Salaam, Mwanza, and Zanzibar are using data generated through TURP for risk management and infrastructure development projects. Data collected in Dar es Salaam continues to support flood adaptation strategies in the city. The data collected in Mwanza is enhancing decision makers' understanding of the risks of flooding and rock fall (landslides) and informing potential solutions. The data collected in Zanzibar is offering decision makers a spatial view of the city's economic activity and infrastructure to help inform investments. The Tanzania Urbanization Report, which provides a deep analytical understanding of urbanization trends in Tanzania, was finalized and published.

Output Indicator 1.3: Number of cities with risk-informed drainage studies

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Procurement launched for Risk Informed Drainage Studies**	The procurement of the first phase of risk-informed drainage studies was completed. The target cities for this activity are Kahama, Kigoma, and Morogoro. Data collection activities and the processing of DTM from UAVs are progressing well.

OUTPUT 2: DISASTER RISK REDUCTION PLANS DELIVERED

Output Indicator 2.1: Solid Waste Management Plans, GREEN Dar, and Area-Based Studies for Zanzibar delivered.

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Zanzibar Integrated Local Area Development Mapping Finalised, The Zanzibar Solid Waste and Green Dar studies are procured**	The Zanzibar integrated local area development mapping effort was successfully completed. This study will inform immediate urban development investments. Procurement is complete for the Zanzibar solid waste study, and a consulting firm has been hired. This study will complement significant capital investments in the solid waste sector in the next two years. The Green Dar study is ongoing. PAn Expression of Interest has been published and the procurement of a consulting firm will be finalized soon.

Output Indicator 2.2: Community risk reduction plans developed using improved risk information (cumulative number of wards and municipalities endorsing plans)

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Plans are in use in 9 wards (encompassing approximately 40 sub-wards)**	All community risk reduction plans in 12 wards were completed.

Output Indicator 2.3: Climate-resilient building and sustainable tourism supported in Zanzibar

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Procurement underway for building regulation and conservation consultants**	A consultant has been hired to review building codes and standards. In addition, the contract for a baseline survey of sustainable tourism has been awarded.

OUTPUT 3: EMERGENCY PREPAREDNESS AND RESPONSE MANAGEMENT

Output Indicator 3.1: Cities with emergency contingency plan (regional level)

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Standard operating procedures for all DarMAERT members approved.** **The program and government agree on one secondary city in which to continue work completed in Dar es Salaam.**	The standard operating procedures have been completed and are expected to be approved soon. After several consultation meetings with DMD, it was agreed that Ilemela Municipal Council in Mwanza will be a good candidate for replicating the work done in Dar es Salaam. A detailed work plan has already been developed and work began in October.

OUTPUT 4: RESILIENCE ACADEMY ESTABLISHED AND OPERATIONALIZED

Output Indicator 4.1: Cumulative number of students completing industry placement or similar skills building practicals (gender segregated)

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**150 students completing industry placements or similar skills-building practicals of at least 10 weeks; duration. 90 additional students included for August/September digital campaigns.**	A total of 150 students participated in the industrial training 2020 • 50 students from SUZA (23 female + 27 male) • 25 students from UDSM (12 female + 13 male) • 50 students from SUA (22 female + 28 male) • 25 students from ARU (11 female + 14 male)

Output Indicator 4.2: Climate Risk Data and Tools Use in approved curriculums

ASSESSMENT MONTH/YEAR	MILESTONE	FY2021 ACHIEVEMENTS
Nov. 2021	**Train-the-trainers course prepared for all 8 open online Resilience Academy Risk Mapping.** **New executive Risk Mapping course prepared.**	Online training materials have been finalized; 7 courses have been developed. Six out of the 8 train-the-trainers courses have been delivered to university partners. For FY21, 25 experts have been trained using the online training materials and 70 students have been trained in the university class program with the online training materials from the RA. The executive risk mapping course is yet to be prepared.

06

FINANCIALS

FINANCIAL OVERVIEW

To date, total disbursements from the trust fund amount to US$14,879,648. In FY21, US$2,578,756 was disbursed, with US$591,309 remaining available as of June 30, 2021. Outstanding commitments of US$1,393,893 were carried over into the next fiscal year.

REPORTING PERIOD ENDING JUNE 30, 2021 (US$)	
Total Funds Received from FCDO as of June 30, 2021	$ 16,864,850
Disbursements FY21	$ 2,578,756
Total TF Disbursements	$ 14,879,648
Outstanding Contract Commitments	$ 1,393,893
Cash Balance at the End of FY21	$ 591,309

DISBURSEMENTS

Reporting period ending June 30, 2021 (US$)

BETF ACTIVITY		TOTAL BUDGET ALLOCATED	TOTAL DISBURSED	FY21 BUDGET ALLOCATION	FY21 DISBURSED	COMMITTED	AVAILABLE	% TOTAL DISBURSED + COMMITTED
PILLAR 1: Risk Identification								
TF0A4139	Risk Evaluation and Information Management	$5,849,002	$4,911,010	$418,502	$744,599	$840,390	$97,602	98%
TF0A3559	Urban Exposure Mapping Data Services	$150,000	$149,333	$0	$0	$0	$667	100%
Total Pillar 1		**$5,999,002**	**$5,060,344**	**$418,502**	**$744,599**	**$840,390**	**$98,268**	
PILLAR 2: Risk Reduction								
TF0A4691	Risk Mitigation Planning	$2,530,000	$2,078,095	$320,000	$443,489	$217,063	$234,842	91%
TF0A3571	Msimbazi River Revitalization	$660,000	$659,753	$0	$0	$0	$247	100%
TF0A4575	Urbanization Review - Resilience Planning	$57,848	$57,848	$0	$0	$0	$0	100%
TF0A5676	SWIFT Surveys on Poverty and Floods	$190,000	$189,995	$0	$0	$0	$0	100%
Total Pillar 2		**$3,437,848**	**$2,985,691**	**$320,000**	**$443,489**	**$217,063**	**$235,094**	
PILLAR 3: Emergency Preparedness								
TF0A3828	Emergency Planning and Response	$3,125,000	$2,927,599	$290,000	$688,828	$104,163	$93,239	97%
Total Pillar 3		**$3,125,000**	**$2,927,599**	**$290,000**	**$688,828**	**$104,163**	**$93,239**	
PILLAR 4: Resilience Academy								
TF0A4238	Resilience Academy	$2,465,000	$2,090,292	$345,000	$577,946	$232,277	$142,431	94%
Total Resilience Academy		**$2,465,000**	**$2,090,292**	**$345,000**	**$577,946**	**$232,277**	**$142,431**	
Program Administration								
TF0A3742	Technical Review and Design	$340,000	$329,479	$10,000	$0	$0	$10,521	97%
TF0A2973	Secretariat and Conferences	$1,498,000	$1,486,244	$62,000	$123,893	$0	$11,756	99%
Total Administration		**$1,838,000**	**$1,815,723**	**$72,000**	**$123,893**	**$0**	**$22,277**	
OVERALL Total Activities		**$16,864,850**	**$14,879,648**	**$1,445,502**	**$2,578,756**	**$1,393,893**	**$591,309**	**96%**

DELIVERY CHAIN

PILLAR 1 - Risk Evaluation and Information Management (TF0A4139)	FY21 disbursements (US$)
Tanzanian consultants	$54,406
International consultants	$74,970
Spatial Collective Ltd	$207,615
Humanitarian OpenStreetmap Team	$16,665
Maxar Intelligence Inc	$31,275
OpenMap Development Tanzania	$2,519
Deutsches Zentrum für	$14,764
Hojung Solution	$35,000
Earthquakes & Megacities Initiative	$23,773
Stichting Deltares	$176,597
Delft University of Technology	$19,200
Famipox Engineering Company Limited	$9,200
TOTAL	**$665,984**

PILLAR 2 - Risk Mitigation Planning (TF0A4691)	FY21 disbursements (US$)
Tanzanian consultants	$159,185
International consultants	$31,309
Stichting Deltares	$79,740
Earthquakes & Megacities Initiative	$89,190
TOTAL	**$359,423**

PILLAR 3 - Emergency Prepardness (TF0A3828)	FY21 disbursements (US$)
Tanzanian consultants	$128,633
International consultants	$48,854
Studio 19 Ltd	$7,983
Earthquakes & Megacities Initiative	$258,591
Stichting Deltares	$152,539
OpenMap Development Tanzania	$7,625
iDev Tanzania Limited	$1,800
TOTAL	**$606,025**

PILLAR 4 - Resilience Academy (TF0A4238)	FY21 disbursements (US$)
Tanzanian consultants	$52,115
International consultants	$77,116
Stichting Deltares	$48,455
ICEYE Oy	$7,500
Spatial Collective Ltd	$45,000
University of Turku	$90,000
AIT Austrian Institute of Technology	$19,039
ITC	$40,146
Azavea Inc	$29,947
Techup (T) Ltd	$17,042
GeoSolutions S.A.S	$7,274
Studio 19 Ltd	$73,970
Greenstand	$20,000
TOTAL	**$527,602**

Secretariat (TF0A2973)	FY21 disbursements (US$)
Tanzanian Consultants	$6,126
International Consultants	$20,874
New Reality Technologies Pty (Ltd)	$28,515
Fraym, Inc.	$6,305
Total	**$61,819**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07

RISKS

STAKEHOLDER ENGAGEMENT AND PRIORITIES

Stakeholder engagement and consultations were continued under strict COVID-19 guidelines throughout the fiscal year. Almost all engagements and workshops were done in small focus-group settings and have been successful in informing the implementation of the various sub-activities. Given that international consulting firms were unable to travel, several of the technical assistances were restructured to require the local consulting firms to take the lead in organizing workshops with the government while the international team provided support virtually.

Given the funding cuts, and considering that the program is in the last stages of implementation, a series of prioritization and work plan discussions were conducted during the fiscal year. The prioritization was completed by ensuring the alignment of TURP activities with other World Bank–financed urban development and disaster risk management projects, and by leveraging the existing relationship between World Bank project teams and the stakeholders. Each activity under the work plan was then discussed as part of the project engagement with government counterparts.

FINANCIAL MANAGEMENT AND PROCUREMENT

The Bank-Executed Trust Fund portion of TURP was almost fully utilized last fiscal year. With the unexpected cut to the Recipient-Executed portion of TURP, the program was initially slated to close in November 2021. However, FCDO was able to provide additional Bank-Executed Trust Fund resources that have allowed TURP to continue for another 18 months, extending the program closing date to May 2023.

As of November 2021, approximately US$2 million in unallocated funds are available, which will allow TURP to finance the new work program. Given the large number of ongoing projects and the size of the new work program, part of the available funds will be earmarked for supervision and finalization of these projects. Since there is a need to invest in risk identification, risk reduction, and emergency response in secondary and tertiary cities, the new work program will focus on expanding TURP's work to additional cities and ensuring the sustainability of efforts after May 2023. As part of fiduciary risk management, the World Bank has provided all counterparts with information on how complaints about fraud or any other issue can be lodged anonymously to the either the World Bank or FCDO.

ENVIRONMENTAL, SOCIAL, AND SECURITY

Environmental and social risks are minimal under TURP given that all program activities are technical assistances. TURP has conducted several studies that contribute to a better understanding of environmental issues and risks, including risk mapping exercises in Dar es Salaam, Mwanzam and Zanzibar. The completion of these mapping exercises will help other World Bank–financed projects and the Tanzanian government to develop effective actions for risk reduction and environmental adaptation.

TURP has supported extensive emergency response programs that have had a significant and direct social benefit, especially to the segment of society vulnerable to natural hazards. The Resilience Academy data collection campaigns take place in the home cities and communities of the students. Students overnight at their own homes during the placement and work during the daytime, primarily on weekdays. Students are Tanzanian, and thus know their home environments, communities, and cultural expectations very well. In general, this situation lowers the social risks that may otherwise be associated with industrial placements focused on working in and with local communities.

08

LOOKING AHEAD

WORK PLAN OVERVIEW

To date, TURP has demonstrated marked success in its key pillars of Risk Identification, Risk Reduction, Emergency Management and Response, and the Resilience Academy in Dar es Salaam, Mwanza, Tanga, and Zanzibar. As the Government of Tanzania and the World Bank look toward the next generation of urban projects, a core priority is the mainstreaming of resilience into the infrastructure and institutional strengthening components of these major investments.

There are opportunities to mainstream the innovative data collection and planning techniques tested and refined under TURP in secondary and tertiary cities. One promising channel to achieve such mainstreaming is strengthening TURP's linkage to operations that invest heavily in improvements to urban infrastructure, basic services, and urban management. TURP activities on the themes of risk profiling, resilience database expansion, urban management, and urban greening would be timely inputs capable of establishing a project trajectory that keeps resilience concepts at the project's core.

Another major priority for the next phase of TURP is sustainability. TURP will focus on ensuring that the knowledge, data sets, and programs developed over the years are consolidated and documented in systematic way. TURP will work to ensure that the government is fully aware of, and will have access to, these outputs.

The priority activities are described in detail in the following sections.

Pillar 1 activities will focus on developing a risk-informed remote supervision tool and inputs to risk-informed drainage studies. The former will involve an integrated risk visualization, documentation, and project monitoring tool that can be used at the local government level. The drainage studies will build on previous similar activities and expand the baseline geographical data sets to be used in urban drainage models for Kahama, Kigoma, and Morogoro.

Pillar 2 activities will have broad coverage, primarily supporting Dar es Salaam and Zanzibar. The focus of these activities will be on the realization of investments under the Mzimbazi Opportunity Plan and the Zanzibar local area development mapping. The pillar will also support additional activities, such as a greening project in Dar es Salaam and the strengthening of heritage conservation and improvement of building codes in Zanzibar.

Pillar 3 activities will focus on supporting emergency planning and response in Mwanza and the development of national guidelines on emergency planning and response. The objective of the guidelines will be to consolidate the experience and knowledge created in Dar es Salaam and develop a broad framework that can be used by other cities in Tanzania.

Pillar 4 will primarily focus on consolidating the skills and training capabilities developed locally and aligning the program with government demand. The program will also work on sustainability to make sure that the universities are able to continue to provide similar services after TURP closes.

PILLARS	BUDGET (US$)
Pillar 1: Risk Identification	**450,000**
Risk-informed remote supervision tool	75,000
Inputs to risk-informed drainage studies	375,000
Pillar 2: Risk Reduction	**775,000**
Green Dar	275,000
Support to the realization of investments under the Msimbazi Opportunity Plan	150,000
Improvement of building codes and standards in Zanzibar	75,000
Sustainable tourism through conservation of heritage buildings vulnerable to climate risks	200,000
Support to the realization of investments for area-based urban upgrading projects	75,000
Pillar 3: Emergency Preparedness and Response	**170,000**
Strengthening emergency response coordination	170,000
Pillar 4: Resilience Academy	**450,000**
Fiscal year 2021	225,000
Fiscal year 2022	225,000
TOTAL	**1,845,000**

TANZANIA
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