CITY WATER RESILIENCE ASSESSMENT

WATER RESILIENCE PROFILE
KIGALI

ACKNOWLEDGEMENTS

The CWRA project team for Kigali includes Oana Baloi (Bantu Design), Katrin Bruebach (R-Cities), Louise Ellis (Arup), Lina Gast (Bantu Design), Fitsum Gelaye (R-Cities), Flavia Gwiza (Bantu Design), Louise Kennedy (Arup), Costanza La Mantia (Bantu Design), Marc Manyifika (WRI), Tina Nyunga (Bantu Design), Dana Omran (R-Cities), Smita Rawoot (WRI), Martin Shoulder (Arup), Phillipa Stanley (Arup) and Meghan Stromberg (WRI).

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ACRONYMS

100RC	100 Resilient Cities pioneered by the Rockefeller Foundation
AUWR	Africa Urban Water Resilience
BMZ	German Federal Ministry of Economic Cooperation and Development
CWRA	City Water Resilience Approach
CWRF	City Water Resilience Framework
CoK	City of Kigali
EICV4	Integrated Household Living Conditions Survey 4
GGGI	Global Green Growth Institute
IDS	Integrated Development Strategy
KCSS	Kigali Centralized Sewage System
KMS	Kigali Master Plan
MICE	Meetings, Conferences and Exhibitions (economic) Sector
MINAFFET	Ministry of Foreign Affairs and Cooperation
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic Planning
MINEDUC	Ministry of Education
MINICOM	Ministry of Trade and Industry
MININFRA	Ministry of Infrastructure
MoE	Ministry of Environment
MINISANTE	Ministry of Health
NBSs	Nature Based Solutions
NST1	National Strategy for Transformation (2017 - 2024)
NISR	National Institute of Statistics of Rwanda
NWRMP	National Water Resource Master Plan
PPP	Public Private Partnership
RHA	Rwanda Housing Authority
R-Cities	Resilient Cities Network
REMA	Rwanda Environment Management Authority
RWB	Rwanda Water Resources Board
SDGs	Sustainable Development Goals
WASAC	Water and Sanitation Corporation
WRI	World Resources Institute
WWTP	Waste Water Treatment Plant

LETTER FROM THE CITY OF KIGALI

Kigali's topography and unique urban landscape makes the City prone to several water related shocks including flooding, water scarcity, and landslides. These shocks are further exacerbated by population growth, climate change, and infrastructure damage, among others.

The City of Kigali is committed to building a water resilient city by working to ensure that its urban development and planning decisions are in line with natural water flows to sustain the City's water resources. The City recognizes that many of its water stresses and risks can be avoided through holistic and integrated planning both within the City boundary and the watersheds the City is dependent on. Through its work as part of the Urban Water Resilience in Africa Initiative (UWRI), Kigali has taken stock of its challenges and key needs to build water resilience.

Stakeholders from various water and urban development sectors including City, National and Regional agencies, civil society, community groups and private sector were engaged to identify key areas of action to improve the City's water resilience. Ten vision areas and 30 actions have been identified in the following Kigali Water Resilience Profile and Action Plan. These include actions to improve data governance in the water sector, especially around water quality and pollution; develop guidelines to restore and maintain Kigali's water bodies while supporting livelihoods; integrate resilience criteria into water and wastewater infrastructure design and investments; and increase community and civil society engagement in the water sector.

As part of the initial UWRI cohort of six Cities, Kigali is taking proactive action to build a resilient water future for all. On behalf of the City of Kigali, I would like to thank the World Resources Institute, Arup, the Resilient Cities Network, and the Resilience Shift for facilitating this project, and the diverse groups of stakeholders in Kigali who contributed their time and input to this process.

Pudence RUBINGISA
Mayor of City of Kigali

LETTER FROM PARTNERS

The City of Kigali has taken various steps in its resilience planning journey and is the first city in Rwanda to place holistic urban resilience thinking at its core. However, at the same time, the city faces various challenges that impact its ability to recover and respond to particularly water-related shocks and stresses. These challenges include limited livelihoods around water bodies, lack of shared quality data, vulnerable water-related infrastructure, ineffective development and enforcement of water service regulations, among others. To address these challenges in a sustainable, inclusive, and resilient manner, the city has taken important steps to develop the Kigali Water Resilience Profile and Action Plan.

The World Resources Institute, together with the City of Kigali Chief Resilience Officer, Arup, the Resilient Cities Network, The Resilience Shift, and Bantu Design, has collaborated with key stakeholders in Kigali not only to advance the city's responses to addressing its water risks and vulnerabilities but also to utilize its very own capacities and strengths. This process, facilitated by the City Water Resilience Approach (CWRA), and integrated with research and spatial analysis, has moved the highlighted challenge areas in Kigali to identified place-based actions aimed specifically at improving the city's urban water resilience. The project team looks forward to continuing the work with city stakeholders to prioritize actions and advance them towards implementation. The Urban Water Resilience in Africa Initiative will additionally support knowledge exchange between the cohort of African cities each developing their own distinct action plans. Support for this initiative is provided by the German Federal Ministry for Economic Cooperation and Development (BMZ).

On behalf of the project partners, we would like to thank the City of Kigali and everyone who has engaged throughout the planning, assessment and visioning processes to develop this Water Resilience Profile and Action Plan.

Arup, Bantu Design, Resilient Cities Network, the Resilience Shift, WRI

ARUP

RESILIENT CITIES NETWORK

THE RESILIENCE SHIFT

WORLD RESOURCES INSTITUTE

EXECUTIVE SUMMARY

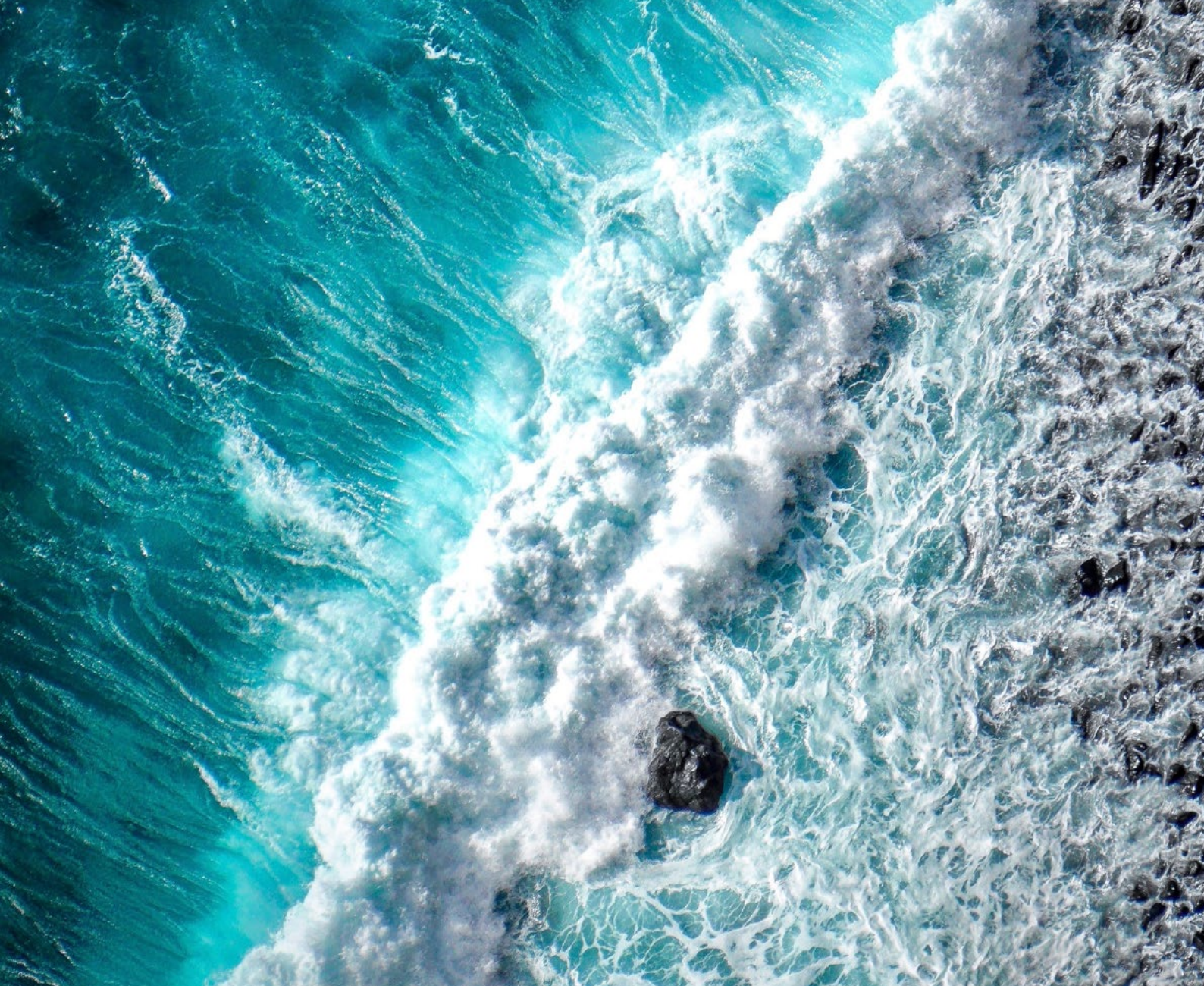
"Urban water resilience means equitable access to safe, reliable, and affordable drinking water and sanitation; flood-protected neighborhoods; and healthy regional watersheds resulting from water-sensitive infrastructure and aligned city and regional development, enabled by governance, planning, and finance systems that continually adapt to changing local contexts and climate risks"

- (World Resources Institute, 2021).

The concept[1] of a water resilient city can be grasped as a city that can survive and thrive in the face of shocks and stresses related directly or indirectly to water - ranging from drought to flooding, water infrastructure damage, and poor water quality - and adequately mitigate the impacts of all shocks and stresses on the urban water system (e.g., the impact of landslides on key water infrastructures or contamination of water sources by heavy metals, etc.). A water resilient city is capable of providing access to high quality WASH (water, sanitation and hygiene) services for all residents, businesses and industries, and it minimizes water-related hazards ensuring the protection of the natural water cycle.

Because overall city resilience, water resilience and catchment level resilience are mutually interdependent, an assessment of urban water resilience cannot be thought of in isolation from its hydrological context, including the basins' upstream and downstream areas, the built infrastructure, and the socio-political and economical context. A holistic approach to resilience is therefore key to designing interventions that make systems resilient. As water is used every day in formal and informal ways, resilience needs to be grounded in the existing decision-making processes around the socio-political, economical, and hydrological contexts where the city lies. One fundamental challenge for most cities is that water governance functions are often siloed, with limited coordination, collaboration and knowledge sharing between actors working in the water system. It is therefore important to clearly identify the responsibilities of all involved stakeholders when planning interventions to build water resilience. New initiatives must strengthen existing infrastructure assets and systems, but also address the duplications, overlaps and gaps in the roles of the stakeholders across multiple levels and sectors. In addition, any response on the urban scale (though not confined to city limits) must be oriented towards actions that can be performed at this level and seek to strengthen the symbiotic relationship between the city and its catchment, connecting the range of stakeholders and systems that bridge natural and urban systems.

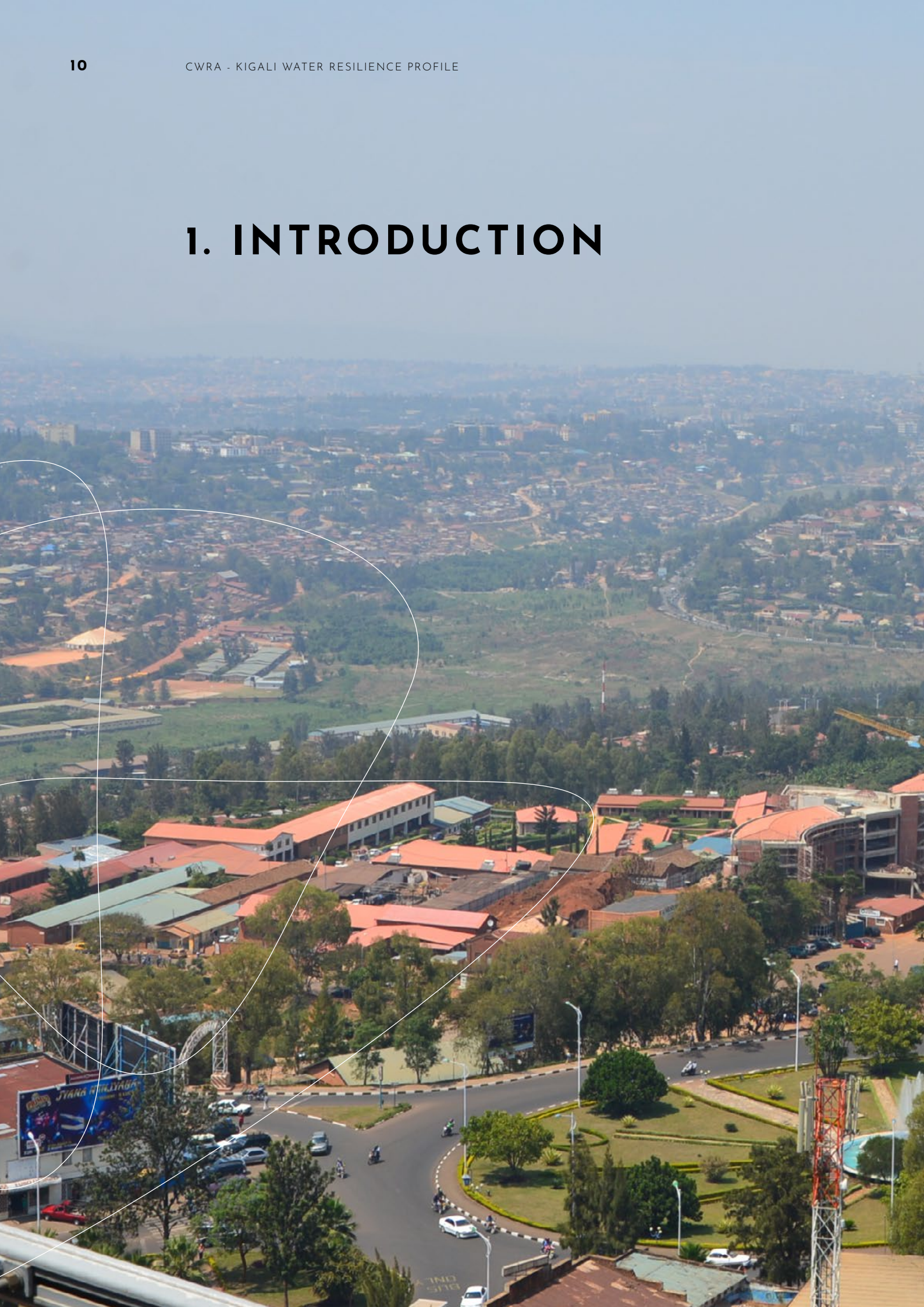
The City Water Resilience Approach (CWRA) assesses the resilience of urban water systems with consideration of upstream and downstream issues. In Kigali, the CWRA process allowed stakeholders to better understand the interlinkages between water and urban systems and the shocks and stresses these systems face. It also provided guidance to strengthen water governance and management and more effectively adapt to water-related risks. The outputs from the assessment outlined in this



report will allow the City of Kigali to optimize its development trajectory by adapting to current and future water challenges. Utilizing the City Water Resilience Approach, as part of the Urban Water Resilience in Africa Initiative, six pilot cities will build an initial network of actors to increase ambition to build urban water resilience across the continent.

Kigali's Water Resilience Profile and Action Plan builds upon Kigali's resilience journey that started in December 2014, when Kigali was selected to join the 100 Resilient Cities Network – now known as the Resilient Cities Network. Preliminary research that concluded in the Kigali City Characterization Report was undertaken in by Bantu Design, in close collaboration with the Chief Resilience Officer. In parallel, the World Resources Institute (WRI) developed a series of spatial narratives for the city and a framing paper for Urban Water Resilience in Africa. A CWRA partner team consisting of the Resilient Cities Network, Arup, and the Resilience Shift, alongside WRI and Bantu, then worked closely to develop this water resilience profile and action plan that builds on the outcomes of the assessment and visioning workshops conducted in Kigali during 2021. Both the assessment and the visioning workshops, as well as this profile, constitute fundamental moments of informed discussion with local experts and stakeholders that allowed for a deeper understanding and a collective framing of Kigali's water resilience.

1. INTRODUCTION




access

CONTEXT

THE URBAN WATER RESILIENCE IN AFRICA INITIATIVE

The Urban Water Resilience in Africa Initiative (UWRI) is a three-year program that aims to address water risks and vulnerabilities in six African cities towards a water resilient recovery post COVID-19. This work is generously supported by the German Federal Ministry of Economic Cooperation and Development (BMZ) through a grant of 3 million Euros (from January 1, 2020, to December 31, 2022). The UWRI program is led by the World Resources Institute (WRI). The program consists of a 3-part action plan.

COMPONENT 1: RESEARCH ON CHALLENGES AND PATHWAYS

WRI has worked with research partners to develop a report on urban water resilience, with a pan-African perspective, that identifies key pathways to address water scarcity, inadequate access, and flooding challenges in African cities. This report has been developed in partnership with African water experts and researchers with deep knowledge of the state of water and current practices in Africa. The report includes case studies of seven African cities and a spatial assessment of key urban growth trends, including an overlay assessment of how urban growth is impacting the increase in impervious areas, loss of blue and green cover and the impacts on city water basins. The report titled "Water Resilience in a Changing Urban Context: Africa's Challenge and Pathways for Action" is available online at: https://www.wri.org/research/urban-water-resilience-africa.

COMPONENT 2: DEVELOP URBAN WATER RESILIENCE ACTION PLANS IN CITIES

The second component of the work involves partnering with cities to assess the stresses and shocks to the city's water system and identify interventions to address the city's specific resilience needs (through policy, program, and infrastructure interventions). This work is being developed through facilitated, multi-stakeholder planning processes using tools such as the City Water Resilience Approach (CWRA) informed by spatial analysis that examines the inter-relationship between urban systems and water systems. It is being implemented in six African cities including Addis Ababa and Dire Dawa in Ethiopia; Kigali and Musanze in Rwanda; and Johannesburg and Gqeberha in South Africa. WRI is partnering with Resilient Cities Network (R-Cities, formerly 100 Resilient Cities), the Resilience Shift, and ARUP (International Engineering Consulting Firm) to co-implement this strategic planning process to develop city water resilience action plans specific to each city-region. The CWRA process will help city stakeholders to develop a shared understanding of their water system, the shocks and stresses the city faces, its resilience, and pathways for change (i.e., policy, planning and governance interventions). Addis Ababa and Kigali are the first two cities beginning this work in 2020-2021. The initiative also aims to catalyse implementation of priority actions identified in the action plans through various capacity building initiatives including technical assistance and knowledge exchange modules.

COMPONENT 3: BUILD A PAN-AFRICAN COALITION FOR COLLECTIVE ACTION ON URBAN WATER RESILIENCE ALONG WITH ESTABLISHING A CATALYTIC FUND

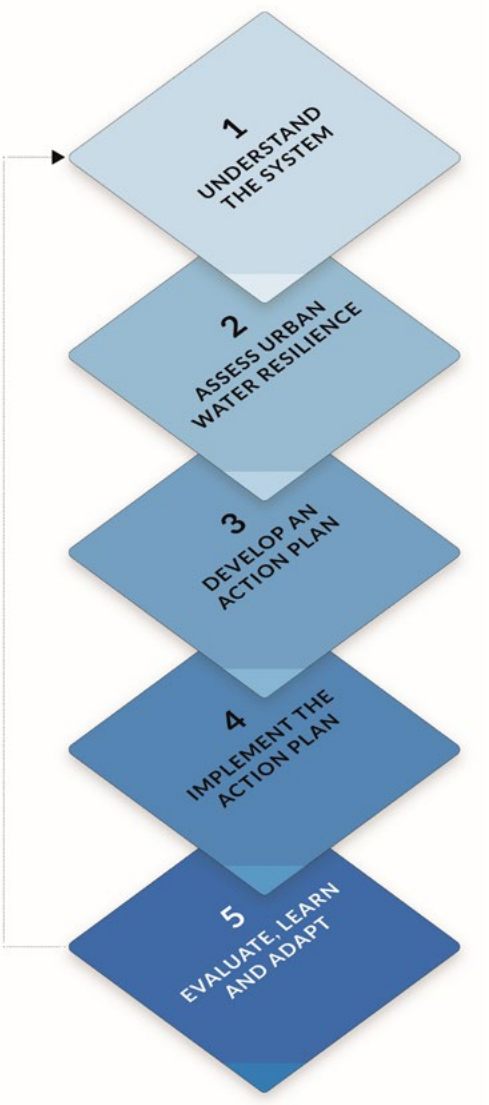
The third component of the program will work to create a larger coalition of partners to articulate a joint action agenda for urban water resilience in Africa. This joint agenda will act as an advocacy document to be used by a wide group of interested coalition partners to elevate the criticality of urban water resilience to the African development agenda. It will identify specific priority changes i.e., practice shifts needed to better align and connect the urban, water and climate agendas at the local, national, regional, and ultimately global scales. This agenda will showcase a bottom-up approach to building these integrated agendas. The consultations that lead to the development of this joint agenda are aimed at gathering policy and investment commitments from national stakeholders, regional institutes and financial institutions to enable and scale city actions on urban water resilience. The final piece of the UWRI program is to promote and scale up quality, sustainable investments in cities in Africa. The Catalytic Fund will be designed to inject greater public and private financial resources to jumpstart transformative projects on the ground starting first in the six cities that are developing action plans and then scaling to other cities by 2030.

THE CITY WATER RESILIENCE APPROACH

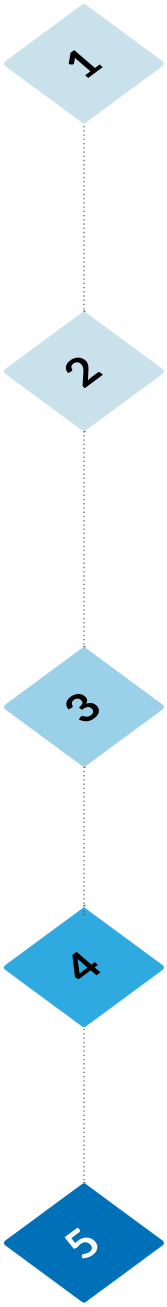
THE CITY WATER RESILIENCE APPROACH

The City Water Resilience Approach (CWRA) responds to a demand for new approaches and tools that help cities grow their capacity to provide high quality water resources for all residents, and to protect them from water related hazards ("provide and protect"). The CWRA process outlines a path for developing urban water resilience and provides a suite of tools to help cities survive and thrive in the face of water-related shocks and stresses.

The CWRA is based on fieldwork and desk research, collaborative partnerships with subject matter experts, and direct engagement with city partners. The approach was developed, through investigations in eight cities and consultation with over 700 individual stakeholders, by Arup — working with the Stockholm International Water Institute (SIWI), Resilient Cities Network, the Organization for Economic Co-Operation and Development (OECD) and in close collaboration with city partners from Cape Town, Amman, Mexico City, Greater Miami and the Beaches, Hull, Rotterdam, Thessaloniki, and Greater Manchester. Each partner city confronts persistent water-related shocks or suffers chronic water-related stresses and is committed to co-creating water resilience approaches.



The approach outlines five steps to guide partners through initial stakeholder engagement and baseline assessment, through action planning, implementation and monitoring of new initiatives that build water resilience:



Understand the system - the city's unique context is appraised to understand shocks and stresses, identify system interdependencies, convene local stakeholders and map key infrastructure and governance processes. This first step of the CWRA process results in City Characterisation Reports that summarize the results of this research.

Assess urban water resilience - the city's current practices are assessed using the City Water Resilience Framework to identify areas of existing strength and weaknesses and establish a baseline against which progress is measured. This second step results in a City Water Resilience Profile, which summarizes the assessment process and outlines potential actions to build resilience.

Develop an action plan - based on the city assessment, an action plan is developed for realizing interventions that develop water resilience. The action plan is based on holistic evaluation of anticipated benefits and costs and prioritization of projects identified in the previous step.

Implement the action plan - actions agreed upon during the previous step are implemented according to best practices. In this step, the CWRA provides best practice guidance for how ongoing actions can be monitored to ensure objectives are met, and resources are used appropriately.

Evaluate, learn and adapt – implementation is evaluated. Adjustments are made to the implementation plan to account for new developments or changing circumstances in the city, and to align with updated objectives for the next period.

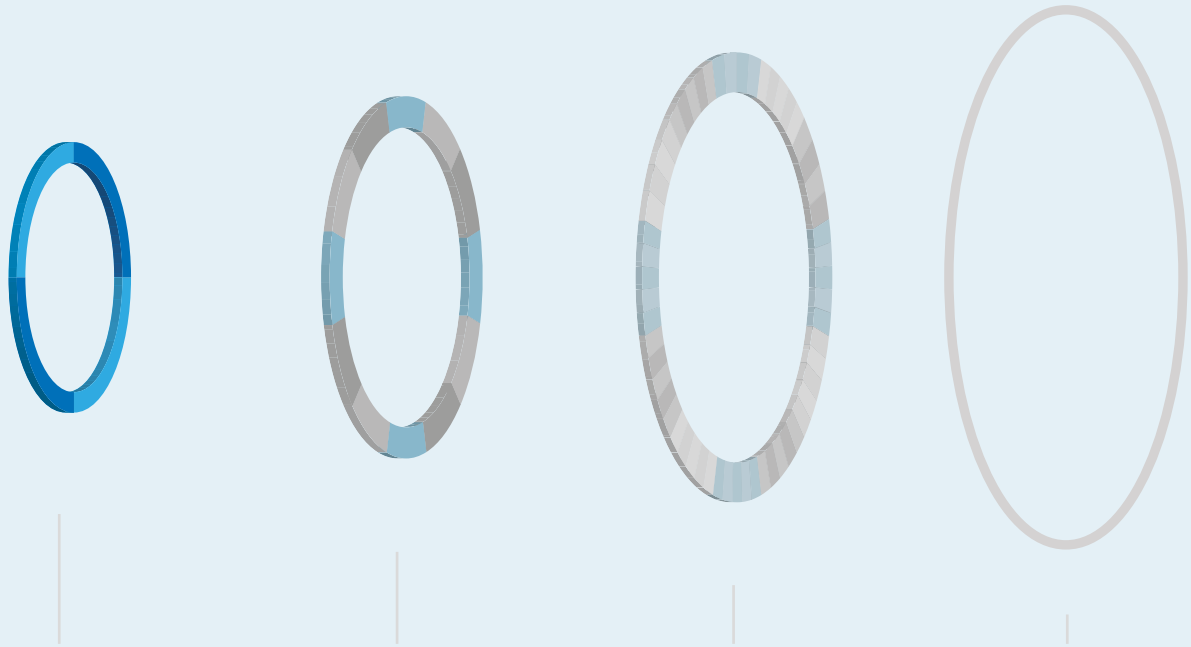
To guide cities through this process, the CWRA offers a suite of resources that target specific challenges identified by cities in their efforts to build water resilience:

- OurWater is a digital tool that helps cities better understand the types of shocks and stresses they confront, their impact on natural and man-made infrastructural systems, and the interaction between key stakeholders involved in urban water management. The OurWater tool is used in Step 1 of the CWRA to map the infrastructure and governance arrangements that define the urban water system.
- The City Water Resilience Framework (CWRF) assesses the resilience of a city to water-based shocks and stresses and allows the city to identify and prioritize future action. Understanding their resilience helps cities formulate a clear vision of what urban water resilience means to them, including what specific conditions must be in place to achieve this vision, what efforts will be required to build resilience and what actors are involved. The CWRF aligns with the second step of the City Water Resilient Approach, helping cities assess strengths and weaknesses in their water system, and generate a profile that aims to guide future developments around these issues.

The CWRF consists of three rings — dimensions, goals and sub-goals — that describe a holistic model for city water resilience. The innermost ring consists of four dimensions. Within each dimension are goals that indicate what needs to be achieved in that category. Hybrid goals are used where goals could logically be placed in more than one dimension and suggest how critical elements of water resilience often fall within multiple areas of influence. Sub-goals identify the critical elements for realizing each goal.

They provide additional detail and are referred to in guiding concrete actions that help realize their respective goals. The outermost layer of the CWRF wheel consists of indicators, a list of metrics used to measure how each city performs in each category. In answering indicator prompts, individual cities identify areas for improvement in cities' own water governance, measure their own progress over time, and make comparisons with peers around the world.

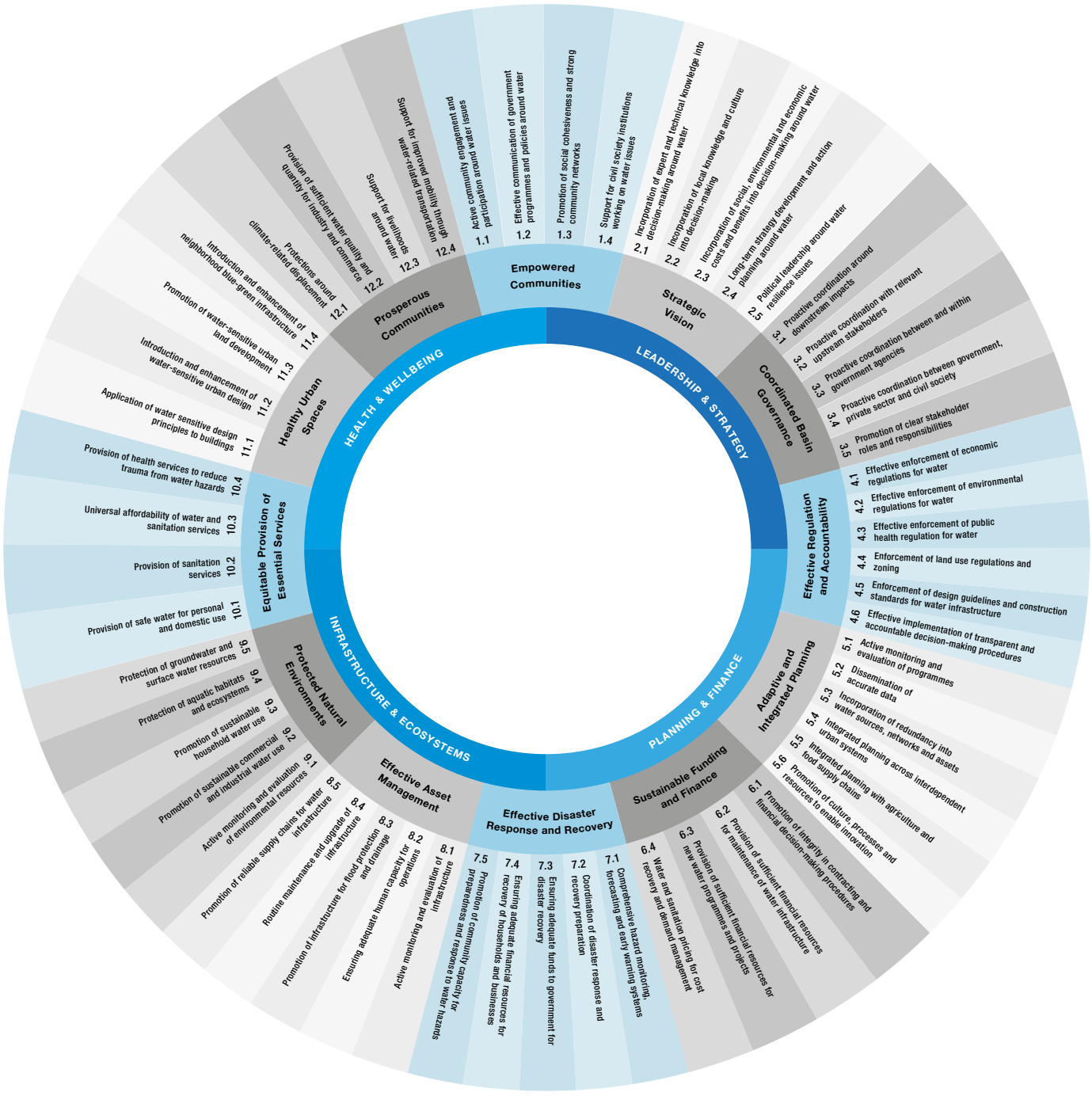
The CWRF can be broken down into dimensions, goals, sub-goals and indicators.



DIMENSIONS **GOALS** **SUB-GOALS** **INDICATORS**

(Qualitative and Quantitative)

The City Water Resilience Framework 2022



WORKSHOP METHODOLOGY

Two types of workshops were held in Kigali in order to develop this Resilience Profile and Action Plan: an assessment workshop and a visioning workshop. This section describes both methodologies and presents a brief overview of the sessions held in Kigali. The outcomes of both workshops helped to spur the actions compiled in this document. All the actions presented in this Resilience Profile and Action Plan aim to strengthen resilience-building efforts for the city of Kigali.

WATER RESILIENCE ASSESSMENT WORKSHOP

The two-day workshop held online, was attended by a wide range of stakeholders from different sectors and levels of government. The objective of the two-day Assessment Workshop was to assess the current situation of the city's water system, according to the City Water Resilience Framework (CWRF). Once scored, the measured indicators informed the baseline assessment against which Kigali's progress on building water resilience could be measured. Additionally, the analysis and findings of the assessment workshop contributed to the identification of existing strengths and weaknesses to be taken forward in the visioning workshop.

STAKEHOLDERS

A detailed stakeholders mapping was undertaken before the workshop to identify all relevant sectors/agencies/organizations that needed to be engaged in the assessment process. Six stakeholder categories were identified: 1) Government Institutions; 2) Civil Society Organizations; 3) Development Partners; 4) Academia; 5) Intergovernmental Organizations; and 6) Private Sector. All were invited to participate in the assessment workshops. In total more than 60 participants, representing all identified categories, took part in the workshops. Prior to the workshop, participants were assigned to a specific small group for discussion to ensure that each goal and indicator of the City Water Resilience Framework (CWRF) was assessed by the most relevant stakeholders from the pool of participants.

GENERAL CONSIDERATIONS

Due to local COVID-19 restrictions at the time, in-person workshops were not possible. For this reason, two online workshops were held on June 29th and 30th 2021. Each of the parallel groups, that were held during both days had a virtual facilitator and a note-taker. The discussions were held in English and participants used the Miro® Online Collaboration Platform as a visual aid during the sessions. Each workshop had six small group discussions running in parallel and every small group covered two different resilience goals and indicators that are part of the CWRF. This process ensured that over the course of the two days, all the resilience goals and indicators were assessed and given a performance score by city stakeholders. In total 12 goals and 56 indicators were assessed by participants in Kigali.

SESSION OUTLINE

The assessment workshop was separated into three separate segments. All participants joined the workshop in a beginning plenary session. In the second segment, participants were divided into parallel small discussion groups, six in total. In the third segment, the session was unified back into a final plenary. This outline was consistent over the two days of the workshop.

Part 1

1. Welcome and introduction to the workshop by Jean Maurice Muneza from WRI, including the presentation of the agenda for the day.
2. Short overview of the Urban Water Resilience in Africa Initiative by Aklilu Fikresilassie, WRI Africa Director of Thriving and Resilience Cities.
3. Welcome from Japheth Habinshuti, Chief Resilient Officer for the city of Kigali.
4. Introduction to the City Water Resilience Framework and the Assessment process by Louise Ellis from Arup.

Part 2

5. Introduction to the break-out groups: as mentioned previously, attendees were split into small groups based on their area of expertise and to reflect a range of diverse perspectives in each group.
6. CWRF Indicator Assessment

- The facilitator introduced participants to the framework's wheel, the goal and sub-goals that were going to be assessed.
- The facilitator described the indicator and its guiding criteria, and answered, when needed, explanatory questions.
- The facilitator asked each participant to provide an initial score on how they feel Kigali is performing against that specific indicator.
- Once all participants gave an initial score, the facilitator invited all participants to share and discuss their reasoning for their scoring, as well as any underlying issues.
- The facilitator then asked participants to provide a final score based on the group's discussions. All final scores were recorded with the reasons for the modification of the initial score, if any.
- The discussion for each indicator took approximately 15 minutes, and this process was repeated until all of a goal's indicators had been assessed.

Part 3

7. Summary of the discussions that were held in each of the parallel groups were shared in the plenary session.
8. Following the reflection from the assessment, next steps were shared by Martin Shouler, London Water Leader at Arup.

After the workshop

9. The recorded scores were compiled and presented across the wheel.
10. All facilitators and notetakers convened to reflect on the workshop and the scores for preliminary analysis. Through analysis of these results, the project team then developed ten (10) problem statements that reflected the critical challenges identified by Kigali's stakeholders.

VISIONING WORKSHOP

The objective of the visioning workshop is to facilitate a deeper understanding of the outcomes of the initial assessment process. The workshop also aims to facilitate the collaborative development of water resilience initiatives by relevant stakeholders to collectively improve the resilience of the city's water systems. Several follow-up sessions with specific stakeholders were then held to collect further insights and inputs on identified topics.

STAKEHOLDERS

All participants from the assessment workshop were invited back to participate in the visioning workshop. All confirmed participants were preassigned to a specific focus group for discussion, this ensured that each identified challenge was further developed into an opportunity by the most relevant stakeholders from the pool of participants.

GENERAL CONSIDERATIONS

Due to local COVID-19 restrictions at the time, in-person workshops were not possible. For this reason, an online visioning workshop was held on August 19th, 2021. Prior to the visioning workshop confirmations from stakeholders were positive. However, connectivity issues in Kigali the day of the event, together with a series of other factors, caused a relatively low attendance. The team overcame this issue by rescheduling with stakeholders in a series of small sessions over the course of a week (August 30th to September 3rd, 2021).

SESSION OUTLINE

The visioning workshop consisted of three segments. All participants joined the workshop in a plenary session. In the second and third segments, participants were divided into parallel small discussion groups, one group per challenge, with 10 groups in total. Described below are all the three segments of the workshop and the outputs from each segment.

Part 1

1. Welcome and introduction to the workshop, including the presentation of the agenda for the day.
2. Short overview of Kigali's City Characterization Report. This presentation included an overview of strengths and resilience vulnerabilities. Participants were reminded of the diverse shocks and stresses specific to the city of Kigali, and they were asked to consider the full range of these shocks and stresses when developing actions to build resilience.
3. Challenge statement presentation. This presentation shared the assessment workshop outputs. Participants were taken through all ten challenge statements that were developed based on the assessment.

Part 2

4. Introduction to the Challenge Statement: Participants were given the opportunity to choose the challenge statement they felt to be most relevant to them. Attendees were then split into small groups based on their choice, area of expertise and to reflect a range of perspectives in each group. Ten challenge statements were developed for the city of Kigali, which meant that ten small groups were formed.
5. Root Cause Analysis: Participants were presented with a "fish diagram" to identify the root causes of the challenge against thematically identified social, financial, technological, political, environmental, and other causes. The stakeholders were then asked to define a needs statement based on the root causes identified.

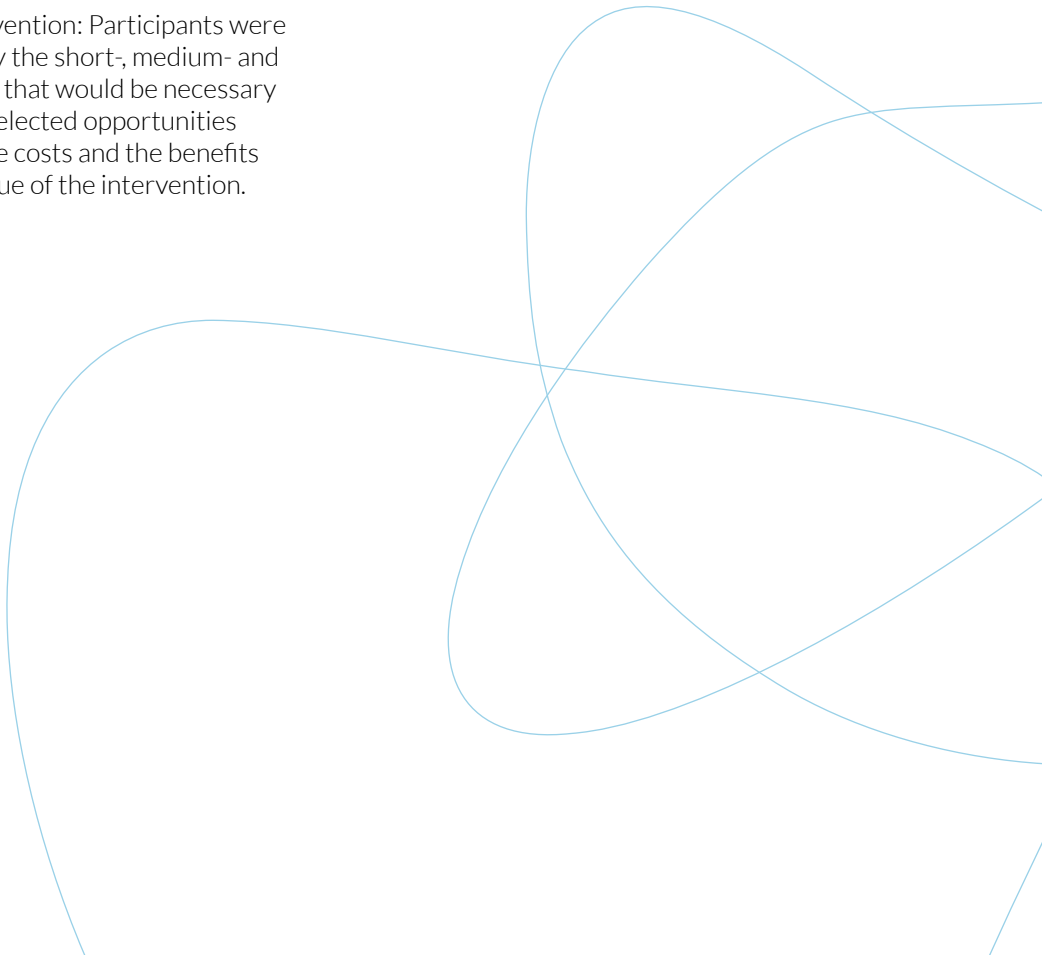
6. Opportunity Listing: Participants were invited to brainstorm how to transform the needs statement into specific opportunities for the city of Kigali. Facilitators invited participants to identify the challenge's specific needs and to list opportunities for the challenge. A list of potential interventions and opportunities were created that considered not only the areas of deficiency, but also incorporated the areas in which Kigali is performing well. Each group selected two prioritized opportunities for further discussion and development during the session. Facilitators then invited participants to vote on one of the prioritized opportunities to begin designing the opportunity. This process includes outlining who benefits, who acts, who are the enablers, and what are the next steps to move forward this opportunity in part 3 of the small group activity.

Part 3

7. Proposed Intervention: Participants were asked to identify the short-, medium- and long-term steps that would be necessary to achieve the selected opportunities and estimate the costs and the benefits or resilience value of the intervention. Alongside the costs and benefits, participants identified the barriers and enablers to the progression of the intervention and the actors who will need to be engaged throughout the process.

After the workshop

8. All facilitators and notetakers convened to reflect on the workshop and possible synergies between groups and the opportunities defined. Through analysis of these results, the project team developed ten (10) opportunity write-ups that reflected the visions and priorities for the resilient future outlined by Kigali's stakeholders. These inputs guided the development of Kigali's Water Resilience Profile and Action Plan.



2. THE WATER RESILIENCE ASSESSMENT

The water resilience assessment workshops engaged subject matter experts from government, academia, civil society, and the private sector in roundtable discussions on the city's water resilience challenges. The following section presents the outputs of the resilience assessment workshops, organized under the four dimensions of resilience as defined in the CWRF. Additionally, it provides a summary of the key themes and scores identified for each indicator during the roundtable discussions.

INDICATOR SCORES

Indicators are a means of capturing a complex reality into a construct that presents the ideal scenario. The score provided for each indicator reflects how well Kigali is currently performing when compared against that ideal scenario. For example, participants in the assessment workshop were asked to reflect on whether the statement, "Economic regulations of water and sanitation services and water resources is performed effectively, resulting in adequate provision of key services, and high customer satisfaction" accurately describes the current practices in Kigali. To help facilitate discussions, a series of guiding criteria were provided to participants. Guiding criteria have been based on desktop research and expert inputs, and they identify important considerations for each indicator. Additionally, they establish a common language and frame of reference for workshop participants who often bring different perspectives, interests, and expertise to the conversation. As multiple indicators were required to assess each resilience sub-goal, each indicator was discussed by the group separately. All indicator statements are provided in the following section, organized according to specific sub-goals.

The CWRF wheel provides a snapshot of strengths and weaknesses for Kigali in building its resilience to water-related shocks and stresses. It describes how a specific area performs against a best-case scenario for each of the 62 sub-goals. Scores for all resilience sub-goals are provided along the outer edge of the CWRF wheel, while averaged scores for resilience goals are shown in the inner ring.

Detailed results for each resilience indicator are provided in the next section, along with a summary of key points identified during the roundtable discussions. The themes identified in each discussion and the qualitative scoring results for indicators reflect the opinions of individual participants. A strong effort was made to bring together participants with diverse technical expertise and knowledge of the subject areas.

INDICATOR SCORES

4.5-5.0 Optimal

The indicator fully reflects conditions in the city. No improvement is required.

3.5-4.4 Good

The indicator mostly reflects conditions in the city. Minimal improvement is required.

2.5-3.4 Fair

The indicator somewhat reflects conditions in the city. Some improvement is required.

1.5-2.4 Low

The indicator mostly does not reflect conditions in the city. Significant improvement is required.

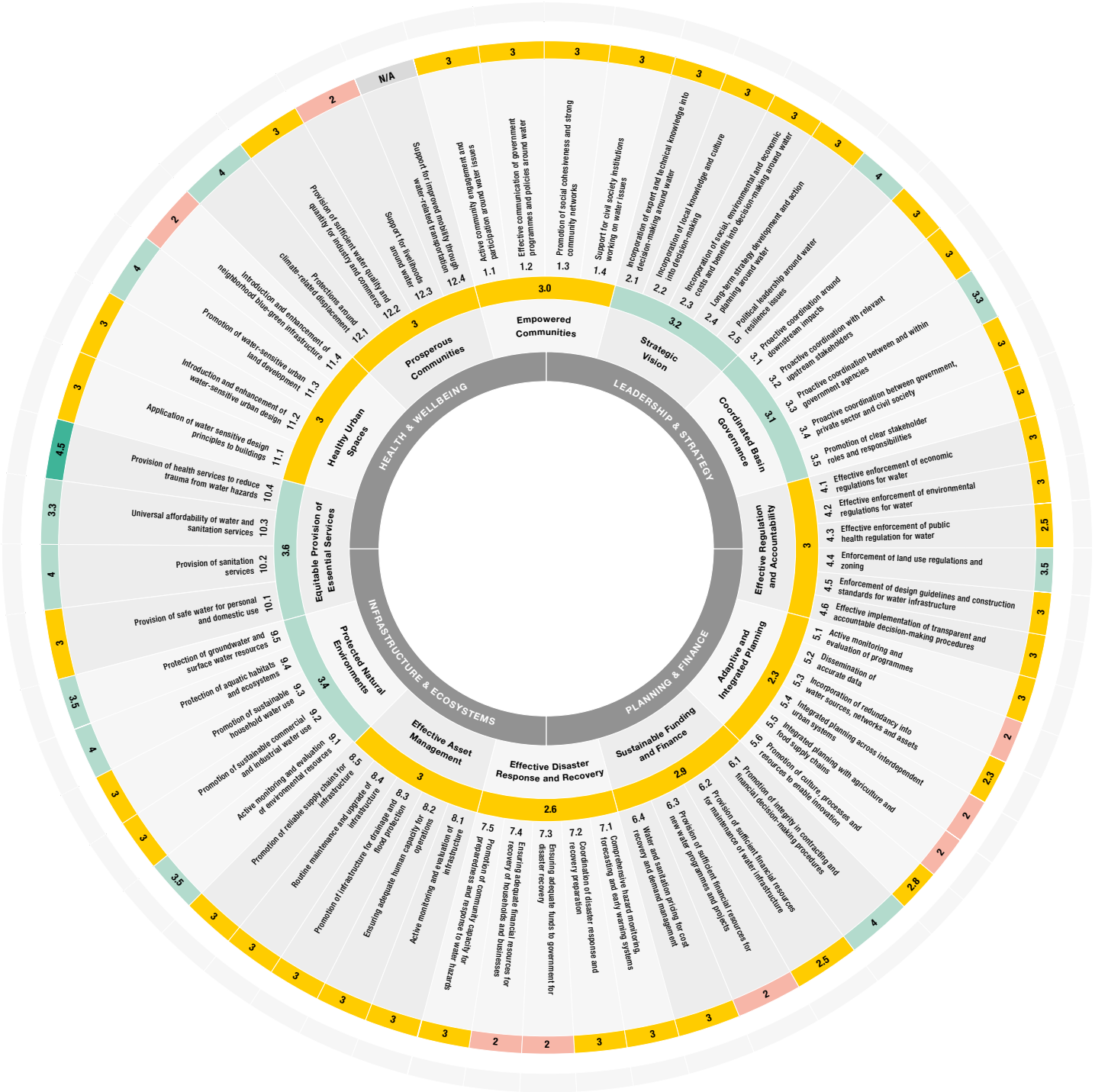
1-1.4 Poor

The indicator does not at all reflect current conditions in the city.

N/A

The indicator is not relevant to the city.

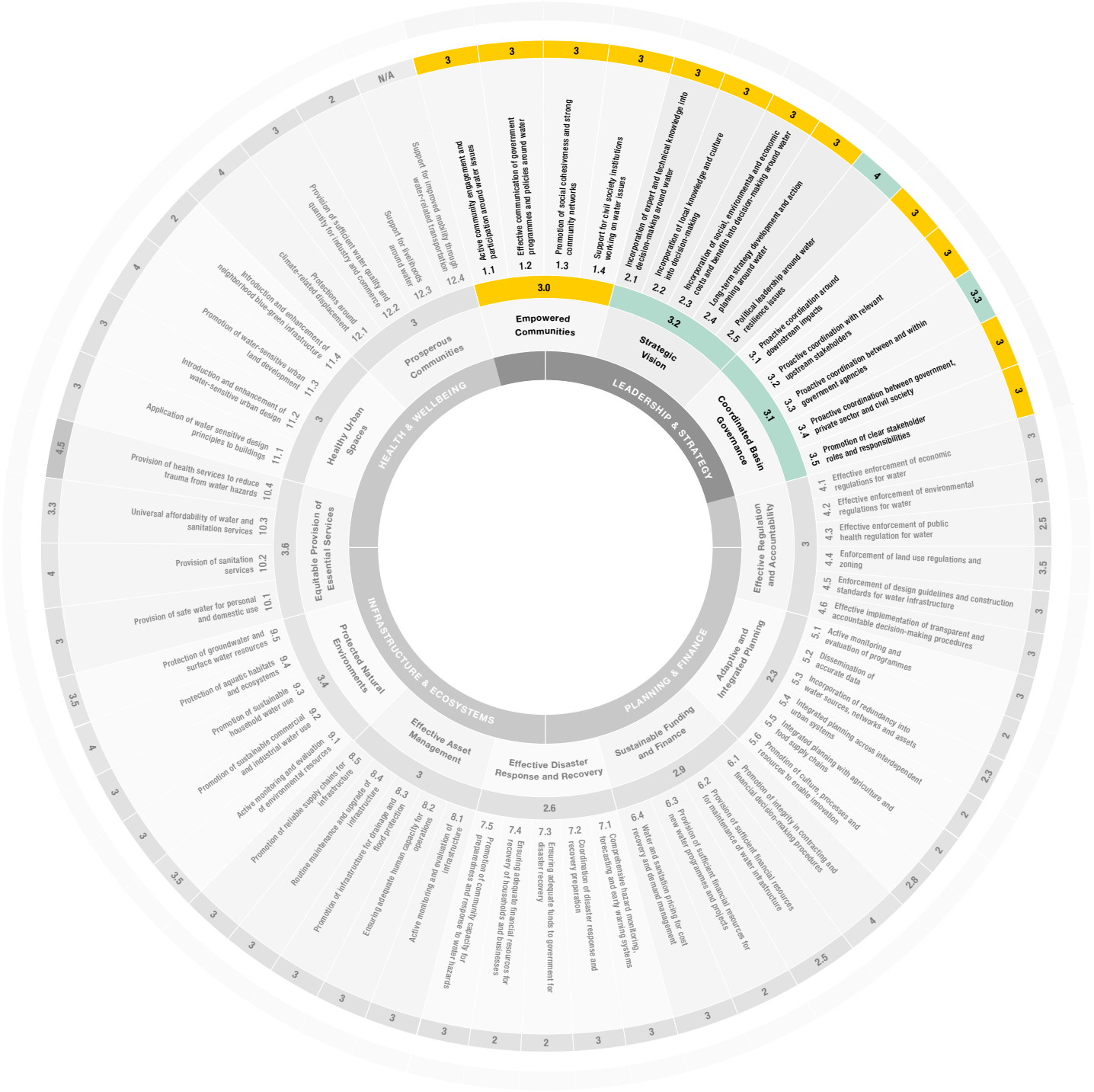
The City Water Resilience Framework qualitative scoring for Kigali



LEADERSHIP & STRATEGY

Leadership around water resilience in Kigali is subject to a strong central level governance structure. The institutional framework is not yet stabilized, as changes are still being implemented towards a more decentralized system. Two levels of governance, central and local, currently interact with each other to develop, manage, and protect the environment, land, green areas, stormwater, wastewater and solid waste, which are all connected to the city's water systems. Changes are anticipated in relation to the creation of new institutional arrangements, differentiation of roles for national and local levels of governance, and the emergence of inter-governmental thematic committees that are linking private sector, civil society organizations and community groups to the respective government institutions.

While this governance structure, and the foreseen changes, provide a good framework for coordinated actions across sectors, the water supply and sanitation sector remain defined and managed by a single national entity, the Water and Sanitation Corporation (WASAC). As the utility operates under the authority and regulations of the national government with inadequate oversight or mechanisms for coordination with the city government, the water supply and sanitation aspects risk not being coordinated with other city plans and priorities. This can be mitigated through improved and closer coordination between the city and WASAC. It is worth mentioning that the city is leading on the planning and implementation of aspects related to stormwater management which is a good opportunity for aligning with other plans if the required technical capacity at the city level is enhanced.


LEADERSHIP & STRATEGY
PLANNING & FINANCE
INFRASTRUCTURE & ECOSYSTEMS
HEALTH & WELLBEING
Empowered Communities
Strategic Vision
Coordinated Basin Governance
Effective Regulation and Accountability
Adaptive and Integrated Planning
Sustainable Funding and Finance
Effective Disaster Response and Recovery
Effective Asset Management
Protected Natural Environments
Equitable Provision of Essential Services
Healthy Urban Spaces
Prosperous Communities
3.0
3.2
3.1
2.3
2.9
2.6
3.4
3.6
3
Active community engagement and participation around water issues 1.1
Effective communication of government programmes and policies around water 1.2
Promotion of social cohesiveness and strong community networks 1.3
Support for civil society institutions working on water issues 1.4
Incorporation of expert and technical knowledge into decision-making around water 2.1
Incorporation of local knowledge and culture into decision-making 2.2
Incorporation of social, environmental and economic costs and benefits into decision-making around water 2.3
Long-term strategy development and action planning around water 2.4
Political leadership around water resilience issues 2.5
Proactive coordination around downstream impacts 3.1
Proactive coordination with relevant upstream stakeholders 3.2
Proactive coordination between and within government agencies 3.3
Proactive coordination between government, private sector and civil society 3.4
Promotion of clear stakeholder roles and responsibilities 3.5
Effective enforcement of economic regulations for water 4.1
Effective enforcement of environmental regulations for water 4.2
Effective enforcement of public health regulation for water 4.3
Enforcement of land use regulations and zoning 4.4
Enforcement of design guidelines and construction standards for water infrastructure 4.5
Effective implementation of transparent and accountable decision-making procedures 4.6
Active monitoring and evaluation of programmes 5.1
Dissemination of accurate data 5.2
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Integrated planning across interdependent urban systems 5.4
Integrated planning with agriculture and food supply chains 5.5
Promotion of culture, processes and resources to enable innovation 5.6
Promotion of integrity in contracting and financial decision-making procedures 6.1
Provision of sufficient financial resources for maintenance of water infrastructure 6.2
Provision of sufficient financial resource for new water programmes and projects 6.3
Water and sanitation pricing for cost recovery and demand management 6.4
Comprehensive hazard monitoring, forecasting and early warning systems 7.1
Coordination of disaster response and recovery preparation 7.2
Ensuring adequate funds to government for disaster recovery 7.3
Ensuring adequate financial resources for recovery of households and businesses 7.4
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Ensuring adequate human capacity for operations 8.2
Promotion of infrastructure for drainage and flood protection 8.3
Routine maintenance and upgrade of infrastructure 8.4
Promotion of reliable supply chains for infrastructure 8.5
Active monitoring and evaluation of environmental resources 9.1
Promotion of sustainable commercial and industrial water use 9.2
Promotion of sustainable household water use 9.3
Protection of aquatic habitats and ecosystems 9.4
Protection of groundwater and surface water resources 9.5
Provision of safe water for personal and domestic use 10.1
Provision of sanitation services 10.2
Universal affordability of water and sanitation services 10.3
Provision of health services to reduce trauma from water hazards 10.4
Application of water sensitive design principles to buildings 11.1
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Promotion of water-sensitive urban land development 11.3
Introduction and enhancement of neighborhood blue-green infrastructure 11.4
Protections around climate-related displacement 12.1
Provision of sufficient water, quality and quantity for industry and commerce 12.2
Support for livelihoods around water 12.3
Support for improved mobility through water-related transportation 12.4
N/A

EMPOWERED COMMUNITIES

1.1 Active community engagement and participation around water issues.

› QUALITATIVE INDICATOR:

Legal and institutional frameworks and mechanisms to promote active, free and meaningful participation around issues related to water supply, sanitation, drainage and flooding.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

While there was an overall agreement that in general good structures and governance mechanisms exist to engage communities and include them in decision making processes, there was also convergence around the fact that improvement is needed, specifically around water-related issues. Engaging communities in water resource planning, water supply infrastructure development planning and sanitation planning is important to enable true participation in decision making. Especially in terms of empowering communities to influence water plans, regulations and policies, and providing community members access to data/information in a more continuous and efficient manner. Stakeholders noted that since there is not enough data to share with people and even the available data is scattered, the aspect of data collection, processing and publication should be improved in order to help facilitate community participation.

1.2 Effective communication of government programs and policies around water

› QUALITATIVE INDICATOR:

Mechanisms ensure that comprehensive information on government programs and policies are disseminated to all stakeholders.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Participants agreed there is a lack of adequate financial resources to support data collection and communication. Certain water-related issues and risks, such as rationalization of water supply, the supply source and if it can be affected by drought, are not communicated widely and fast enough to the affected communities and water users. Proactive customer communication on water rationing programs and potential disruption in services needs to be improved and capacitated. Monitoring and evaluation results of how government programs are communicated were also scored as very weak.

Most of the policies, plans and programs related to water are only available on the websites of the concerned agencies, which are not widely accessible by all stakeholders. There is a need to develop appropriate communication channels to inform communities at the neighbourhood level of all planned initiatives relevant to their respective neighbourhoods.

1.3 Promotion of social cohesiveness and strong community networks

› QUALITATIVE INDICATOR:

Inclusive and participatory social networks (formal and informal) enable communities to learn from each other, self-organize and act collectively in times of need.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Overall, the city is performing well in terms of identifying stakeholders and supporting community leadership and communication during the planning processes, however this is not even across all planning areas. For example, the city is still far behind on community-based emergency preparedness planning. The main issues relate to early warnings and the sustainable, both socially and economically, relocation of high-risk communities. Relocation planning is especially weak at both the city level and lower village level due to the limited technical capacity to predict risks and the large number of people living in informal settlements located in high-risk zones. In addition, financial resources to implement resilience plans are inadequate. For example, relocation plans have been created to move people out of high-risk zones and resettle to safer areas, but funding is inadequate to implement these relocation plans. Current efforts to include the community

tend to focus on post-disaster response rather than disaster preparedness. Participants noted that umuganda is still a powerful way to engage communities but the COVID-19 pandemic has impacted the umuganda days significantly. As a result, community engagement remains low during this period. In the absence of government funding, funds need to be raised through external sources to successfully mobilize the community and improve resilience capacity and awareness.

1.4 Support for civil society institutions working on water issues

› QUALITATIVE INDICATOR:

Mechanisms ensure that financial, institutional and technical support is provided to civil society institutions working on water issues.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The number of NGOs specialized and/or working on water-related subjects is low, which results in scarce participation of civil society in water-related policies and projects. However, a platform for participation and exchange does exist, and all actors are invited to planning and implementation workshops. There are very limited civil society actors who are able to provide inputs and technical knowledge in project development and planning activities in the water sector in Kigali. Local civil society actors are not well funded nor organized, which limits their ability to contribute to projects effectively.

2 STRATEGIC VISION

2.1 Incorporation of expert and technical knowledge into decision-making around water issues

› QUALITATIVE INDICATOR:

Technical knowledge is available, understood and continuously incorporated by government into decision-making around water issues.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Main issues include the lack of a data management framework, well disseminated knowledge products, and experts well engaged in decision making on urban water related issues. While there is substantial water-related knowledge available, as well as a number of experts, information is scattered, and experts are not connected to each other. Increased contextual knowledge and specific data is needed for each neighbourhood/block. NISR data (on which most decisions are based) alone is not detailed enough to properly inform decision-making and action at the local level. In addition, there is often delay in obtaining and accessing this information.

Skills and capacity to utilize multiple data types is needed for resilience planning. This includes the use of meteorological data, hydrological data, climate change projections and modelling data, and socio-economic data. Ecosystem services analysis is poor compared to grey infrastructure engineering and traditional urban development planning. This challenges holistic assessment of risks and needs within the city. Universities can play an important role in supporting capacity development in these areas for both current graduates as well as for post-professional training by engaging with city government stakeholders working on current challenges related to water risks in the city.

2.2 Incorporation of local knowledge and culture into decision-making

› QUALITATIVE INDICATOR:

Local knowledge and cultural values of all population groups are referred to in government decision-making around water issues.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Within the city of Kigali there are many diverse groups, and all perspectives need to be taken into consideration and incorporated into decision-making. Even though the national identity and culture is the same ("we are one people"), some differences exist in water and sanitation matters because of different religious affiliations (for example, Muslim/Christian water practices). Existing civil society platforms focusing on the social aspect of the community can be systematically and consistently engaged in water related decisions for better community representation. In some instances, people's participation is not enough to influence decision-making processes, and vice-versa, participation is not enough to modify people's misconceptions (e.g., around recycled water) and customs. Public participation and engagement in city planning processes needs to be improved in order to ensure policy and programs are informed by cultural beliefs and misperceptions are addressed through information sharing and dialogue.

2.3 Incorporation of social, environmental, and economic costs and benefits into decision-making around water

› QUALITATIVE INDICATOR:

The social, environmental and economic impacts of increased water resilience are understood and incorporated into short, medium and long-term decision-making around water issues.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Considerations of social and environmental impacts are incorporated into decision-making processes through some guidelines set mostly by Ministry of Infrastructure (MININFRA) and Ministry of Environment (MoE) through their affiliated agencies. However, the understanding and incorporation of economic impacts can be improved, especially in terms of widening the conceptual definition of economic impacts. At the moment, there is not enough consideration of non-monetary values (e.g., social costs, environmental costs, ecosystem services costs, cultural costs, business disruptions costs) and how these manifest and affect economic impacts and costs in the short, medium, and long-term. More expertise and advanced definitions are needed in this area.

2.4 Long-term strategy development and action planning around water

› QUALITATIVE INDICATOR:

A long-term strategy is in place to guide projects and programs that build water resilience over time.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

While many planning and management aspects related to water are well taken care of by WASAC, there is a real need to develop and implement aspects related to resilience. Overall, there is a consistent gap between planning and implementation, as referred to in other indicator-related discussions. The city has invested in developing a stormwater master plan and a green city master plan, but efforts are needed to implement these plans and do so in an integrative manner to effectively build resilience for the city.

2.5 Political leadership around water resilience issues

› QUALITATIVE INDICATOR:

Political leadership promotes resilience as a priority issue in government decision-making.

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The city of Kigali's Resilience Roadmap is currently in progress. In addition, the national government has committed to a green growth strategy and a climate resilience strategy. These efforts are indicators of a strong political commitment to resilience. However, the coordination, funding, delivery, and implementation aspects of these plans need to be strengthened.

3 COORDINATED BASIN GOVERNANCE

3.1 Proactive coordination around downstream impacts

› QUALITATIVE INDICATOR:

Coordination between city stakeholders and relevant downstream stakeholders minimize downstream impacts.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There is low coordination around water issues between the city and downstream stakeholders due to the lack of a formal coordination framework. Although there is a provision in the 2018 water law to establish water resources management committees at the catchment level, this has not yet been implemented. However, some mechanisms are in place to identify all stakeholders that should be involved in the planning process such as the development of catchment plans. Additional resource mobilization and capacity building is required to support improved coordination between city and downstream stakeholders.

3.2 Proactive coordination with relevant upstream stakeholders on water issues

› QUALITATIVE INDICATOR:

ameworks and mechanisms promote coordination between city stakeholders and relevant upstream stakeholders on water issues.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There are a few planned frameworks and mechanisms to promote coordination between stakeholders such as catchment committees which are expected to include different city and upstream stakeholders. This is a good initiative that needs to be implemented and reinforced technically and financially to make sure coordination becomes effective and fruitful. This should include the creation of financial incentives to reduce pollution and erosion by upstream users. In addition, effort needs to be made to clarify basin delineation and map all upstream stakeholders.

3.3.a Proactive coordination between and within government

› QUALITATIVE INDICATOR

Coordination exists between different government agencies operating at various administrative levels to define and implement water priorities.

QUALITATIVE SCORE:

3.3

SUMMARY OF ROUNDTABLE DISCUSSION:

The existing coordination between different government agencies operating at various administrative levels is mainly visible when developing planning documents for the city of Kigali and related districts. This coordination is also highlighted by the existing thematic working groups for water resources management, as well as water supply and sanitation, which link various government institutions, development partners, and stakeholders at different levels together.

However, there are overlaps in institutional mandates within the water sector and coordination in the implementation phase remains a challenge. Conflicting interests in the implementation of water priorities, due to diverging government agencies interests and mandates, are also a challenge. This is mainly due to various government agencies prioritizing their individual mandates and performance rather than coordination with other agencies on water issues.

There is a low involvement of stakeholders in project design and implementation, especially from the private sector and civil society. In addition, there is an observed gap in data sharing between government agencies, and the sectoral working groups are not performing as expected. All of the above hinders coordination efforts between government agencies to define and implement water priorities.

3.3.b Proactive coordination between and within government

› QUALITATIVE INDICATOR

Coordination exists within government agencies to define and implement water priorities.

QUALITATIVE SCORE:

3.3

SUMMARY OF ROUNDTABLE DISCUSSION:

There are coordination initiatives within different government agencies set to define water priorities, but their implementation and effectiveness are still low, and not all stakeholders are included. Thematic working groups are in place but with a limited and unclear mandate to influence decisions. In addition, there is currently low consensus within government agencies in the water sector on how to address competing demands between different water users including agriculture, power generation, mining, domestic use, and other industrial uses.

3.4. Proactive coordination between government, private sector, and civil society

› QUALITATIVE INDICATOR

Frameworks and mechanisms promote dialogue and deliberation around water and resilience issues between the government and non-government actors.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

In the past, water resilience initiatives have mainly focused on the agricultural sector. Recently, the focus has been shifting to the city-level with many resilience initiatives being implemented in Kigali with government agencies and different technical and financial partners. But there is still a lack of active involvement of local and civil society partners in these initiatives. This is exacerbated by the lack of sufficient resources, technical capacity, data sharing, efficient monitoring and evaluation, and integration between different initiatives.

While frameworks and mechanisms are in place, there is need for a clear definition of roles and responsibilities of stakeholders such as NGOs and civil society. Currently, stakeholder engagement is incorporated into planning documents like catchment management plans, but it needs to be further developed, structured and encouraged to further diversify the stakeholders' landscape.

3.5. Promotion of clear stakeholders' roles and responsibilities

› QUALITATIVE INDICATOR

Frameworks and mechanisms clearly define the roles and responsibilities of water stakeholders.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Roles and responsibilities are defined in some existing policies, strategies, and government agencies mandates. However, there is still a lack of mechanisms, guidance, and tools to define the specific roles and responsibilities of stakeholders in the water sector. Additionally, there is a gap in monitoring and evaluation procedures and compliance mechanisms have not been put in place.

As mentioned earlier, frameworks and mechanisms for horizontal governance are in place, but more effort is needed to ensure that all stakeholders follow the latest aspirations of the country, as vertical integration mechanisms, especially in reference to bottom-up approaches, are less developed.

Additional efforts are needed to ensure that funding goes to the right stakeholders and through the right channels. Definitively more effort is needed around inter-institutional coordination to avoid the duplication of mandates/projects and to improve the alignment of planned works (e.g., what projects the city of Kigali is to be involved in versus the central government?).

PLANNING & FINANCE

In Kigali, there is an awareness of the importance of planning and a significant effort to provide enhanced infrastructure. Furthermore, the city has made a big effort to mainstream resilience into the municipal planning process. More specifically, resilience thinking has been incorporated into the city of Kigali's Integrated Development Strategy (IDS) 2018-2024, a six-year strategy that will guide the city towards achieving its mission. Additionally, the city institutionalized resilience through the recruitment of a Chief Resilience Officer in 2019, a senior government official who advises the mayor on resilience-related matters.

However, Kigali has a history of unplanned development where water management was not given proper attention. The rapid population growth, in both the formal and the informal sector, overstretched the city's water demands. Therefore, the city of Kigali is faced with the challenge to ensure the available water resources match the growing needs of the population in a sustainable manner (i.e., addressing both the city's present and future water demands). Not only by providing all services related to water, but also by ensuring quality and hazard-security.

The Kigali City Master Plan 2050 aims for integrated urban planning, but some key components are still to be developed. For example, the current physical plans provide little or no consideration towards stormwater management. By missing these key aspects, the master plan fails to become water and climate resilient. In addition, competing needs and an inadequate budget are common conditions at the local level. Therefore, a correct prioritization of needs becomes fundamental for resilience planning and finance. In Kigali, there are opportunities for improvement, including the development a circular economy and the enhancement of green space related investments to attract the private sector and stakeholders that can then become the tax base supporting resilience.


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4.2 Effective enforcement of environmental regulations for water
4.3 Effective enforcement of public health regulation for water
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4.5 Enforcement of design guidelines and construction standards for water infrastructure
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11.4 Introduction and enhancement of neighborhood blue-green infrastructure
12.1 Protections around climate-related displacement
12.2 Provision of sufficient water, quality and quantity for industry and commerce
12.3 Support for livelihoods around water
12.4 Support for improved mobility through water-related transportation
N/A

4 EFFECTIVE REGULATION AND ACCOUNTABILITY

4.1 Effective enforcement of economic regulations for water

› QUALITATIVE INDICATOR:

Economic regulation of water and sanitation services and water resources is performed effectively, resulting in adequate provision of key services, and high customer satisfaction.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The Rwanda Utilities Regulatory Authority (RURA) is an economic regulator of water and sanitation services, among others, with clear roles and responsibilities. RURA regularly checks and implements tariffs and service provisions and communicates in a transparent way. The tariffs are set according to predefined conditions and customer revenue, however there are still affordability issues that are not addressed by the tariff structure. The regulator is a mandated agency with relative financial and working autonomy.

There is a general issue of maintenance and operation of existing infrastructure due to gaps in sanitation planning, monitoring and evaluation of water and sanitation systems, and non-revenue water. However, it is unclear how revenue generated is used to improve service quality for users. The revenue collection needs to be improved to increase financial resilience. Non-revenue water is close to 40% which presents a substantial challenge for the city. The drinking water is not yet available in sufficient quantity and quality, but considerable progress and effort are consistently being invested. The larger gap is still on the sanitation side and on the improvement of non-revenue water. Other gaps remain in regular monitoring and evaluation of water and sanitation services, and compliance enforcement still needs major improvement.

4.2 Effective enforcement of environmental regulation for water

› QUALITATIVE INDICATOR:

Environmental regulation is performed effectively, resulting in high quality, protected water environments.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Environmental protection and regulations are in place and assured by the Rwanda Environment Management Authority (REMA) with a clear mandate and responsibility. There are regulation documents to guide how environmental and water resources shall be protected. There is coordination in place between different government institutions on natural resources and environmental protection. However, there are still gaps in the implementation and enforcement of regulations, monitoring and evaluation, and data sharing.

In general, there are laws protecting water resources and environment. However, environmental protection is hindered by a lack of monitoring and evaluation of environmental protection activities, infrastructure, and management of stormwater and catchment issues in Kigali. Water sources are impacted due to poor and inadequate solid waste management and lack of enforcement leading to solid waste dumping in water bodies especially in informal settlements. In addition, inadequate sanitation infrastructure impacts water sources due to open defecation practices, leakage from poorly built containment systems and illegal/improper dumping of untreated sewerage into water bodies.

4.3 Effective enforcement of public health regulation for water

› QUALITATIVE INDICATOR:

Public health regulation for water is performed effectively, resulting in water that is safe to consume and wastewater that can be returned to the water cycle with minimal environmental impact.

QUALITATIVE SCORE:

2.5

SUMMARY OF ROUNDTABLE DISCUSSION:

Though regulations and standards are in place for water quality and wastewater management, investment in infrastructure and enforcement is inadequate to maintain those standards. For example, stakeholders highlighted that closer monitoring is required at the cell level to ensure polluters are identified and penalties are imposed. In addition to regular inspections to prevent polluting, collaboration needs to be built in among water users, including industries-mining, agriculture and other high-water users to understand how improper disposal of wastewater negatively impacts water quality. The wastewater sector is relatively under-developed in Kigali and needs more investment and capacity building, including consideration for ways to reuse and recycle water, especially rainwater harvesting. In addition, water is supplied in many different modes (including piped water at tap, standpipe, through tankers, boreholes, etc.) and water quality is not uniform across these various systems.

Thus far the cities sanitation system is quite inadequate and sparse. Many onsite sanitation systems are poorly managed leading to contamination of groundwater sources and surface water bodies. Water supply systems are also varied with many users relying on untreated water from natural springs or contaminated water bodies, others relying on private suppliers who are not regulated, and still others relying on boreholes where water quality is not monitored. All these factors challenge managing water quality standards across different supply systems and are a huge public health burden for the city and its residents. Stakeholders indicated that wastewater treatment, reuse and recycling could be an important opportunity for Kigali.

4.4 Enforcement of land use regulations and zoning

› QUALITATIVE INDICATOR:

A sound regulatory framework controls land use and urban expansion and reduces growth in high-risk and water poor areas.

QUALITATIVE SCORE:

3.5

SUMMARY OF ROUNDTABLE DISCUSSION:

There are rules and tools, like the Kigali City Master Plan, which define how and where urban expansion might occur. This document also defines different zoning and related requirements. The master plan has gone through consultations with different stakeholders and experts to ensure it is representative of all categories of population. The City of Kigali is the designated authority to ensure the implementation, monitoring, and evaluation of the master plan. The city has additional initiatives in place to respond to settlement sprawl and informal settlement growth by ensuring that people are not living in high-risk zones, which include informal settlement upgrading and removal of people from high-risk zones. There are some gaps in monitoring and evaluation of the implementation of the master plan and compliance enforcement. The stakeholders indicated that smart systems of monitoring like satellite imagery would be critical to understand and manage the rapid expansion.

Regulations and land use policies exist to manage growth; however, they are not enforced, resulting in unmanaged urban expansion, sprawl, and informal settlement, which are hard to manage.

There is a clear gap between the legal framework and the implementation. The master plan in force (2050) encompasses the general vision of the city. Stakeholders at the national and local level are well mapped and responsibilities clearly assigned. Nonetheless, informal urban growth and urban sprawl are a major issue for the city of Kigali, which indicates that the enforcement of plans and laws needs to be improved.

It appears that the challenge of unregulated settlement close to wetlands is primarily the result of self-help housing communities seeking free land and easy access to water. If water access and economic opportunities are provided in locations designated for development in the master plan (through the sites and services programs) then the future development and or growth of self-help housing settlements can be redirected to areas where the environmental impacts on wetlands can be avoided. Further plans for management can be co-owned by citizens and authorities to control future sprawl.

4.5 Enforcement of design guidelines and construction standards for water infrastructure

› QUALITATIVE INDICATOR:

Technical standards and design guidelines define best practice for critical infrastructure.

QUALITATIVE SCORE:

● **3.0**

SUMMARY OF ROUNDTABLE DISCUSSION:

Standards and design guidelines for critical infrastructures are being put in place by working groups including different government institutions with technical mandates. As these standards are still nascent, they do not cover all sectors and have not been widely used until now.

There are technical standards for several kinds of infrastructure, mainly for transport and construction, but only limited to rainwater harvesting and dam construction, highlighting a big gap in sanitation-related infrastructure standards. The city is still lacking the creation of guidelines for water-related infrastructure.

4.6 Effective implementation of transparent and accountable decision-making procedures

› QUALITATIVE INDICATOR:

Decision-making procedures around water resources management, water and wastewater services are made clear and open to all stakeholders.

QUALITATIVE SCORE:

● **3.0**

SUMMARY OF ROUNDTABLE DISCUSSION:

Clear roles and responsibilities are defined mainly for government agencies that are involved throughout the decision-making process. This includes mainly agencies involved in water governance, including in policy making, regulation, and enforcement of the water sector. There is still a gap in communication and consultation with the community, civil society and private sector stakeholders and government agencies involved in the water sector.

There are procedures with clear mandates for agencies at the central level but not on the decentralized level. A gap was also identified on the participation of stakeholders in decision-making processes even if their responsibilities are well defined in catchment planning documents. For the wastewater sector, this initiative is still low, and a lot still needs to be completed. The decision-making process for wastewater services and water services is not open to outside stakeholders and needs to be improved. There has been some progress made in engaging NGOs and private sector stakeholders in the catchment level committees and this model can be extended to other sectors to improve stakeholder participation.

ADAPTIVE AND INTEGRATED PLANNING

5.1 Active monitoring and evaluation of programs

› QUALITATIVE INDICATOR:

Monitoring and evaluation mechanisms and frameworks measure how programs have achieved intended outcomes and disseminate lessons learned.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Non-state actors engaged in the scoring of this indicator held the perception that the monitoring and evaluation of city programs and the dissemination of information on their performance is very low. However, it was reiterated that this indicator statement would be better evaluated by city officials and hence the project team engaged government officials in responding to this question. Noted below are the insights provided by city officials.

City stakeholders identified that monitoring and evaluation is happening at multiple levels and there is often considerable duplication of efforts between the central and local level. This leads to duplicate data sets with discrepancies. There is a need for clearer roles to be established on who collects data for monitoring and evaluation for each issue area. In addition, data quality needs to be improved such that it can adequately inform measurement of outcomes. An example was given of the discrepancy on collecting storm water data between the city and the water board during the master planning process. Resources were also identified as insufficient with inefficient use. The central government is supposed to provide technical support to the local government, but they do not often coordinate or work together to ensure data is collected on a regular basis considering long term needs. Rather, they only come together to share and coordinate data when there is an emergency. There are many lessons learnt about this issue, but they are solely included in reports and no action is being taken to address discrepancies at a program level. WASAC has initiated processes to better coordinate across other city agencies, for example the city of Kigali has provided a representative to coordinate data to inform future investments by WASAC. This collaboration is necessary in order for stakeholders to come together to work on new plans.

5.2 Dissemination of accurate data

› QUALITATIVE INDICATOR:

Accurate data is used by key decision-makers in government, private sector and civil society to promote urban water resilience.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Stakeholders identified that the city does not have an open-source data policy and city data is not adequately disseminated. In addition, water-related information is not readily available. Most city agencies do not have staff dedicated to data collection and monitoring. This challenges their ability to collect good, usable data. Data sharing within government agencies exists but sharing with the public is limited. These issues need to be addressed to enable data-based decision making in the city across agencies.

There is a lack of awareness among city departments on the data sets that are needed for resilience planning. Existing local data sets are not clear, which leaves researchers to use broader data. The data collection process is very scattered, specifically the meteorological agency (rainfall, humidity, etc.) and water resources board (hydrological and flow data) have the mandate to collect water-related data, while the water-related planning data are collected by national ministries like agriculture (soil data), mining (geological data) or statistical agencies (socio-economic data). This creates a challenge for the city to secure and disseminate data.

5.3a Incorporation of redundancy into water sources, networks, and assets

› QUALITATIVE INDICATOR:

Redundancy exists in the networks and assets responsible for water supply, treatment, and sanitation.

QUALITATIVE SCORE:

2.3

SUMMARY OF ROUNDTABLE DISCUSSION:

There are many planning efforts the city has undertaken to expand the existing water supply networks, assign land for utility expansion and demarcate buffer zones to protect water sources. However, plans are often not implemented, and monitoring, enforcement and upkeep is lacking. In addition, some systems are better managed than others. For example, there is good capacity in the water supply and treatment system, but wastewater management capacity is very weak, and in some areas, almost lacking.

The city has a lot of unplanned development that will require rebuilding in a proper way. The city performs in water supply coverage, and in case of emergencies, measures are taken to temporarily provide water to people for a short period. In the case of wastewater management, there is no agreement on planning as the city is still in debate of whether to develop centralized versus decentralized systems. Wastewater treatment capacity is low, and pollution issues impact the ability of treatment plants to function. However, the city is beginning to ensure that adequate public utility space is provided in new development areas. Specifically, there is capacity that is being built in terms of planning, but not in terms of implementation.

5.3b Incorporation of redundancy into water sources, networks and assets

› QUALITATIVE INDICATOR (5.3A):

Redundancy exists in the sources that supply water to the city.

QUALITATIVE SCORE:

2.3

SUMMARY OF ROUNDTABLE DISCUSSION:

The adoption of green building minimum compliance is a good step in wastewater treatment and water infrastructure design for new developments. Urban growth and the complex topography of the city makes it challenging to build redundancies into water infrastructure and wastewater treatment networks. The consensus is that infrastructure needs to be upgraded to account for disruption. The absence of sanitation/sewage networks in Kigali makes waste management very difficult.

Stakeholders have not seen the city implement alternative ways of improving supply and sources. In addition, many treatment plants and their intakes are impacted by flooding and increased turbidity of the water during the rainy season, which further reduces the capacity of the system. The city's water system is not resilient to external shocks and stresses and there is no extra capacity built into the system leading to disruptions both during the rainy and dry seasons. The water supply company (public) does not have any competition and the supply of drinking water from the public sector is ineffective at supplying the needs of the city.

There is no planning for redundancy in water sources, despite the city's rapid growth. The water is sourced not only from rivers, but also from shallow aquifers. Reduced turbidity and pollution, and new water sources would help decrease treatment costs. There are observed conflicts between sources being developed downstream while a dam is being built upstream for energy production along the Nyabarongo River. Increased coordination is needed between the different users. Even if additional water treatment plants are built, the current network is not enough to supply all areas of the city. But there is now better coordination between the water utility and the City of Kigali, especially when it comes to get the required permissions needed to put in place the necessary infrastructure.

5.4 Integrated planning across interdependent urban systems

› QUALITATIVE INDICATOR:

Coordination exists between public sector water agencies, water utilities and organizations working in related domains such as energy, telecommunications, waste management and transportation.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The city has norms and standards in place for integrating key infrastructure systems, however, there is often a lack of coordination in implementing regulations and new infrastructure projects. In addition, coordination with the private sector is lacking, as well as the enforcement of regulations.

While norms and standards exist to coordinate actions between water and energy, transport, and telecommunication, this is not the case with solid waste management and wastewater management. The implementation of solid waste management is also very weak, highlighting the need for these two sectors to learn from the other sectors to improve their coordination frameworks.

5.5 Integrated planning with agriculture and food supply chains

› QUALITATIVE INDICATOR:

Coordination exists between water agencies and organizations involved in food supply and production.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

While many urban agriculture initiatives are being developed in Kigali, there is currently not much thought given to how these initiatives could help support resilience building. Urban agriculture within the city is small scale in nature as Kigali is highly urbanized. Therefore, stakeholders felt that this indicator is not highly relevant for a city scale strategy and investment should be synchronized in terms of resilience building.

Coordination between water agencies and users from the food production and processing industry happens through a permitting process, coordinated by the water resources manager. However, this process only manages issues related to connectivity, not to usage. Further, this is not the case for what concerns agricultural users, as there is little information sharing between agricultural users and the utility, or the city, which can lead to over-extraction and depletion of newly developed sources. To act on these matters, the water resources manager needs to be politically empowered and technically equipped, both of which are lacking in the context of Kigali.

5.6 Promotion of culture, processes, and resources to enable innovation

› QUALITATIVE INDICATOR:

Resources and processes reinforce a culture of innovation within the water sector.

QUALITATIVE SCORE:

2.8

SUMMARY OF ROUNDTABLE DISCUSSION:

Nature based strategies for addressing water risks is an area where a number of projects have been seeded and developed. Resources are being put forward for innovative projects to be implemented (i.e., Global Environment Facility and World Bank), however, implementation is yet to happen. In order to demonstrate impact, more resources need to be put towards this work.

There are no incentives for innovation and coordination among actors from different institutions. Only one program was initiated by RURA to both train and give incentives to managers to improve performance, but no other such program exists. The City of Kigali has created an online platform for the master plan which can encourage increased innovation as information is accessible to all. The plan provides space for utility improvements so managers can make recommendations on improvements and expansion as need be.

Participants agreed that innovation is scarce in general. Specifically, funding allocated to innovation is very scarce, especially in the water and sanitation sectors. There is also no local academia or think tank involved in relevant innovation-based research or projects. Academic projects on the matter remain in the schools but do not add substantial value to the sector. Further, academic programs on water engineering exist and should be utilized to enhance innovative thinking on water management.

6 SUSTAINABLE FUNDING AND FINANCE

6.1 Promotion of integrity in contracting and financial decision-making procedures

› QUALITATIVE INDICATOR:

Financial procedures promote transparency, minimize risk, and ensure that procurement processes are implemented fairly and efficiently.

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Kigali uses the Government of Rwanda's (GoR) e-procurement system which allows for transparency in public bids and optimizes the process of procurement. The GoR has invested in improving the efficiency of this system. This system model should be emulated in other areas of management, however there are structures and requirements in place which make it difficult for international bidders to access bid information or bid for projects without partnering with local organizations.

6.2 Provision of sufficient financial resources for maintenance and upkeep of water infrastructures

› QUALITATIVE INDICATOR:

Adequate funding exists to maintain and operate water and sanitation infrastructure and to support existing programs.

QUALITATIVE SCORE:

2.5

SUMMARY OF ROUNDTABLE DISCUSSION:

The city is developing many new projects, but the funding required to maintain and operate all of the existing water-related infrastructure is insufficient and is mostly dependent on inadequate government funding. Diversity of funding available through international grants often goes towards new projects, thus creating a continuous cycle of backlogged maintenance and infrastructure failures, leading to service disruptions.

Not much of the funding (from private sector and global funds) goes to operations and maintenance (O&M) in urban areas. This is a challenge as O&M is dependent entirely on government funding, which is insufficient. Politically the government is interested in expanding services to achieve 100% service goals, however this is sometimes at the expense of investing in O&M. Revenue sources from tariffs and permit fees are insufficient to cover O&M expenses. In addition, there is a large percentage of revenue that is lost due to water leakage issues. In addition, the informal systems (mostly water supply) are expanding, and these systems require more upkeep in the future. One must also recognize that government revenues will expand as the country's economic status improves. O&M sources were also recently impacted as government funding has been redirected for COVID19 relief.

6.3 Provision of sufficient financial resources for new water programs and projects

› QUALITATIVE INDICATOR:

Adequate funding exists to finance new capital projects and programs that support water resilience.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The city does not have adequate funds to address infrastructure gaps and needs to improve efforts to plan proactively for long-term growth-related needs. This means that the city needs to be able to predict future demand accurately and ensure that funding can be used flexibly for both new developments and maintenance related needs. The city should also leverage private sector investments to meet the current funding gaps and support towards future needs.

There are many internationally funded projects that are coming up under the climate change response umbrella, but this remains insufficient. In particular, local NGO's accessibility to finance is extremely low and funding from the private sector and civil society is extremely limited. Overall, the available funding is not enough to cover all needed projects.

6.4 Water and sanitation pricing for cost recovery and demand management

› QUALITATIVE INDICATOR:

Water tariff systems are sustainable and equitable.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Water loss or wastage through leakage is a key challenge for the city. While there is clarity on the price of water to the public, which is costed proportionally to the water use, citizens feel that the tariff structures are not equitable. It is also common opinion that there is not enough water supply for all citizens, whether they can pay for it or not.

The government is making an effort to provide affordable access to services through subsidized tariffs, but this is insufficient and there is a need for better approaches to tariff management. At the same time there is insufficient cost recovery, so financial sustainability is not guaranteed. This highlights a key challenge for the city, in terms of ensuring water is available and affordable for all while maintaining financial sustainability for operating water services.

Participants noted increases in water tariffs in recent years, though they felt the increases were fair due to the high operational costs for WASAC. They were not able to provide specific details on how tariffs are structured and therefore felt ill-equipped to fully answer questions around fairness and clarity of tariffs. But interest was expressed for more structured and transparent communication around the reasons behind water-tariff increases. It was further mentioned that having a water meter is perceived as a factor in helping to reduce the cost of water, but it was not clarified in what terms.

INFRASTRUCTURE & ECOSYSTEMS

The city of Kigali extends over a complex topographical landscape, composed of numerous hills and low-lying wetlands. Kigali's steep slopes impose increased risks and challenges, including landslides, erosion, challenging construction and maintenance procedures, and difficult access points for fire protection equipment and emergency vehicles. The risk of landslides and floods is becoming even more acute due to climate change. Heavy rains running down the slopes during parts of the year also increase the level of sedimentation in the water entering the treatment plants, which raises costs and hinders their operation.

Rivers and lakes are the main water source in the city, which could lead to problems in the future as catchments are not properly protected. Coordinated efforts are required to protect water source catchments and improve knowledge on groundwater's potential to serve as an alternative water supply source in the future. Additionally, a significant portion of Kigali that is covered by wetlands, which are important for flood control, water purification and water resilience.

Rapid economic and urban growth in Kigali resulted in unprecedented water demands, with the city having limited capacity to meet this increasing demand. In addition, the city has very limited stormwater infrastructure in place, which points towards an urgent need to consider integrated green, grey and blue infrastructure approaches to manage stormwater and water resources more effectively. Kigali's sanitation system is also underdeveloped. This system is very difficult and costly to retrofit into urban environments if space has not been previously allocated for this infrastructure in the land use planning and the identification of servitudes. It is therefore critical to have standards in place to guide the allocation of adequate space for future sanitation infrastructure in new developments.


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Effective Regulation and Accountability
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Sustainable Funding and Finance
Protected Natural Environments
Effective Asset Management
Effective Disaster Response and Recovery
1.1 Active communication on important and sensitive water issues
1.2 Effective communication of government programmes and policies around water
1.3 Promotion of social cohesiveness and strong community networks
1.4 Support for civil society institutions working on water issues
2.1 Incorporation of expert and technical knowledge into decision-making around water
2.2 Incorporation of local knowledge and culture into decision-making
2.3 Incorporation of social, environmental and economic costs and benefits into decision-making around water
2.4 Long-term strategy development and action planning around water
2.5 Political leadership around water resilience issues
3.1 Proactive coordination around downstream impacts
3.2 Proactive coordination with relevant upstream stakeholders
3.3 Proactive coordination between and within government agencies
3.4 Proactive coordination between government, private sector and civil society
3.5 Promotion of clear stakeholder roles and responsibilities
4.1 Effective enforcement of economic regulations for water
4.2 Effective enforcement of environmental regulations for water
4.3 Effective enforcement of public health regulation for water
4.4 Enforcement of land use regulations and zoning
4.5 Enforcement of design guidelines and construction standards for water infrastructure
4.6 Effective implementation of transparent and accountable decision-making procedures
5.1 Active monitoring and evaluation of programmes
5.2 Dissemination of accurate data
5.3 Incorporation of redundancy into water sources, networks and assets
5.4 Integrated planning across interdependent urban systems
5.5 Integrated planning with agriculture and food supply chains
5.6 Promotion of culture, processes and resources to enable innovation
6.1 Promotion of integrity in contracting and financial decision-making procedures
6.2 Provision of sufficient financial resources for maintenance of water infrastructure
6.3 Provision of sufficient financial resource for new water programmes and projects
6.4 Water and sanitation pricing for cost recovery and demand management
7.1 Comprehensive hazard monitoring, forecasting and early warning systems
7.2 Coordination of disaster response and recovery preparation
7.3 Ensuring adequate funds to government for disaster recovery
7.4 Ensuring adequate financial resources for recovery of households and businesses
7.5 Promotion of community capacity for preparedness and response to water hazards
8.1 Active monitoring and evaluation of infrastructure
8.2 Ensuring adequate human capacity for operations
8.3 Promotion of infrastructure for drainage and flood protection
8.4 Routine maintenance and upgrade of infrastructure
8.5 Promotion of reliable supply chains for infrastructure
9.1 Active monitoring and evaluation of environmental resources
9.2 Promotion of sustainable commercial and industrial water use
9.3 Promotion of sustainable household water use
9.4 Protection of aquatic habitats and ecosystems
9.5 Protection of groundwater and surface water resources
10.1 Provision of safe water for personal and domestic use
10.2 Provision of sanitation services
10.3 Universal affordability of water and sanitation services
10.4 Provision of health services to reduce trauma from water hazards
11.1 Application of water sensitive design principles to buildings
11.2 Introduction and enhancement of water-sensitive urban design
11.3 Promotion of water-sensitive urban land development
11.4 Introduction and enhancement of neighborhood blue-green infrastructure
12.1 Protections around climate-related displacement
12.2 Provision of sufficient water, quality and quantity for industry and commerce
12.3 Support for livelihoods around water
12.4 Support for improved mobility through water-related transportation
N/A

EFFECTIVE DISASTER RESPONSE AND RECOVERY

7.1 Comprehensive hazard monitoring, forecasting and early warning system

› QUALITATIVE INDICATOR:

Monitoring, modelling and early warning systems mitigate hazard risks.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Competencies related to the mechanisms for hazard monitoring, forecasting and early warning system are distributed between the national and local levels, which generates a gap between the information that is gathered and shared. Warnings do not have a high level of accuracy and often the information reaches the population when it is already too late. There is no specific effort to present information and warnings in ways that are more accessible for communities at risk and the available channels used to provide information are not widely used, as the information is presented in a very technical format.

7.2 Coordination of disaster response and recovery preparation

› QUALITATIVE INDICATOR:

Disaster response and recovery coordination plans and procedures are current, collaborative, well-rehearsed and properly funded.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Governmental organizations at all levels are organized, stakeholders are mapped and responsibilities well defined. Nonetheless, coordination between all actors still needs improvement, as non-formal actors, such as communities or at-risk individuals, are not involved. The rupture between institutions and local communities' points to a fragmented operational framework. There seems to be a lack of documentation and proactive learning based on previous experiences. Adding to these challenges, the lack of funding pipelines for disaster response and recovery coordination aggravates the issue.

7.3 Ensuring adequate funds to government for disaster recovery

› QUALITATIVE INDICATOR:

Public authorities have access to funds for disaster recovery.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There does not appear to be a specific fund for the financing of disaster recovery. At the national level, the Rwanda Green Fund (FONERWA), an investment fund that supports environmental and climate change projects, might absorb some of the disaster recovery needs. Nonetheless, the available financing options are limited, and application procedures remain complicated and long.

7.4 Ensuring adequate financial resources for recovery of households and business

› QUALITATIVE INDICATOR:

Households and businesses have access to sufficient financial resources for recovery and continuity following shock events or persistent stresses.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The available funds are not developed to be accessed by communities. Processes to receive funds are long and complicated, and many of the traditionally affected communities in the city lack the capacity to apply and implement the recovery funds. This highlights a clear need to work on capacity building, together with community leaders, in order to enable the local population to self-organize and manage recovery following the established plans and regulations.

7.5 Promotion of community capacity for preparedness and response to water hazards

› QUALITATIVE INDICATOR:

Mechanisms promote community preparedness for water-related shocks and stresses.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

In general, in each community the stakeholders have been identified, but they are not very active in the case of water hazards or preparedness for water-related shocks and stresses. Overall, there seems to be a disconnect between the different levels of government and the local communities.

There are no communication systems in place for processing the warnings received from the weather forecast, hence both the city and communities are not adequately prepared. Temporary high-risk zones (due to construction or reparation/maintenance work) need to be identified and timely communicated as well to prevent disruption of livelihoods. Information, both top down and bottom up, has been identified as missing or insufficient.

Currently, Kigali has no protocol in place to support communities in the relocation process, nor a participatory strategy in which communities are supported and trained to play an active role during the relocation process.

EFFECTIVE ASSET MANAGEMENT

8.1 Active monitoring and evaluation of water infrastructure

› QUALITATIVE INDICATOR:

Monitoring and evaluation of water infrastructure and networks ensures data is current and accurate.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There are standards defined at the national level to monitor water infrastructure. At the local level, the information remains incomplete. The available data is not easy to locate, and dissemination of information across different sources remains an issue, highlighting a critical operational gap for stakeholders.

8.2 Ensuring adequate human capacity for operations and implementation

› QUALITATIVE INDICATOR:

Technical and managerial staff are trained and knowledgeable in areas related to operation of key infrastructure and project implementation.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There is a challenge to attract and retain skilled professionals within the local government, as conditions and wages cannot compete with those offered by the private sector. Professionals do not register with the relevant professional bodies, and institutions do not seek certified professionals.

8.3 Promotion of diverse infrastructure for flood protection

› QUALITATIVE INDICATOR:

'Grey' and 'green' infrastructure provide protection from flooding and ensure adequate urban drainage.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The city has infrastructure in place for flood protection, as flooding has been historically identified as a prioritized challenge for Kigali. New developments have also been made including retaining walls and drainage systems. The quality of the infrastructure is nonhomogeneous and varies significantly across the different districts. The city is promoting nature-based solutions and household collection of rainwater to minimize flooding risk, while planning for an integrated stormwater management plan. However, practical, and accessible nature-based solution application frameworks are lacking. Currently, households manage their own wastewater, most of which is draining into the wetlands without proper treatment.

8.4 Routine maintenance and upgrade of water infrastructure

› QUALITATIVE INDICATOR:

Existing infrastructure is regularly maintained and upgraded to reduce likelihood of failure.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Water supply infrastructure within Kigali is planned and managed by WASAC, while other kinds of infrastructure, like the stormwater drainage system, are planned and managed by the city. The main issue identified is the lack of sufficient resources and technical capacity to maintain infrastructure. This is especially true for what concerns stormwater drainage systems, which have to be maintained by the respective districts. It is unclear whether there is a local maintenance plan, therefore it is uncertain if the city is conducting response or planned maintenance. There is a common perception that while water supply generates income, water and wastewater management do not. If there is no perceived financial benefit, maintenance does not occur. Additionally, illegal connections are common, as there is no monitoring system for illegal connections, which worsens the issue further.

In addition, while the city is focusing more on improving the quantity of water infrastructure to meet the growing demands and gaps in provisioning, the focus on resilience, and what it implies in terms of the routine maintenance and types of infrastructure upgrades, is lacking and is highly needed as well.

8.5 Promotion of reliable supply chains for water infrastructure

› QUALITATIVE INDICATOR:

Supply chains for key water and sanitation infrastructure are reliable during normal conditions and in the face of shocks and stresses.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The supply chain is stressed twice a year during the local rainy season. Sedimentation was clearly identified as a factor that hinders the proper function of the water system, and therefore stresses the supply chain. Nevertheless, it is unclear how robust the supply chain is. There are water wells at community level, managed by WASAC, the only legal supplier of water.

PROTECTED NATURAL ENVIRONMENTS

9.1 Active monitoring and evaluation of environmental resources

› QUALITATIVE INDICATOR:

Environmental monitoring is conducted to assess the quality of water used for human consumption.

QUALITATIVE SCORE:

3.5

SUMMARY OF ROUNDTABLE DISCUSSION:

There are initiatives which show water quality monitoring is in place, however there is a fragmented governance approach with a lack of data sharing. This means organizations are not able to understand what other monitoring is taking place, leading to gaps in understanding and increased overlaps. Improvement in governance mechanisms and developing collaboration between agencies would improve understanding of the current water quality baseline.

Kigali has standards in place for environmental monitoring, however water systems monitoring is generally trialling environmental monitoring. This has been prioritized in the city master plan, with specific zoning and monitoring outlined. However, at present there is little coordination between agencies and a lack of resources to implement monitoring programs. Residents are unaware of the responsibilities of different agencies and there is little accessible information available. The main actors are currently the Rwanda Water Board (RWB) through the University of Rwanda, REMA, and the city of Kigali.

9.2 Promotion of sustainable commercial and industrial water use

› QUALITATIVE INDICATOR:

Mechanisms promote sustainable water use for commercial and industrial users.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The discussion around sustainable water use was split into standards for new buildings and governance of water users in the city. There are well developed standards for water efficiency in place for new buildings in the city including a set of minimum 'green' standards. However, the private sector's commitment to sustainability is low and financial penalties are given for noncompliance. For water users in the city, there is a general lack of awareness and drive for sustainability around water use. There is a system of permitting and financial penalties for large water users, however this is small and has not been shown to affect large users' behaviour. There is low awareness of how ecosystems are maintained, with several pilots ongoing to demonstrate payment for ecosystem services.

9.3 Promotion of sustainable household water use

› QUALITATIVE INDICATOR:

Mechanisms promote sustainable water use for households.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There are different requirements for commercial water users because the difference in capability across diverse commercial users is substantial. The water system seems to be sufficiently structured, but the capacity of water users is low.

9.4 Protection of aquatic habitats and ecosystems

› QUALITATIVE INDICATOR:

Policies and programs protect aquatic habitats and ecosystems.

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The city has policies in place to protect its aquatic habitats (namely wetland areas) with ecological zoning determining their use. Policies exist to evict those who are living in protected areas of the wetlands but there are challenges in implementing them, in particular around the city limits and the administrative borders. While the environmental monitoring is under the mandate of REMA, the City of Kigali has a wetland committee ensuring collaboration between agencies. But issues have been raised regarding the proper engagement with stakeholders during the development of policies to protect aquatic habitats and ecosystems.

9.5 Protection of groundwater and surface water resources

› QUALITATIVE INDICATOR:

Protections exist to prevent over-abstraction and eliminate pollution of surface water sources.

QUALITATIVE SCORE:

3.5

SUMMARY OF ROUNDTABLE DISCUSSION:

Policies exist to protect surface water sources, but enforcement is an issue. The city mandates buffer zones from riverbanks and lakes but these are commonly ignored, particularly in informal settlements where water quality is poor, and residents may resort to dumping waste. Programs around waste reduction are in place including the REMA plastic recycling program, REMA air and water monitoring project and a planned collective wastewater treatment plant. The master plan includes regulation of pollution, but further consultation on how to enforce this will be needed. Waste is collected across the city and common dump sites and further education and awareness raising is needed around the need to protect surface water sources.

There is little understanding of the current baseline of groundwater sources, with no mapping or modelling of the current quality or quantity of groundwater sources present. It is assumed that the discharge of sewage and pit latrine use impact the quality of the groundwater and surface water resources. A WASAC borehole study was carried out in 2012, but this was not widely known to stakeholders. A sewer system plan is suggested but not yet developed. The city needs to phase out the use of septic tanks in urban areas and provide adequate sewerage connection to curb the issue of waste discharge into groundwater sources.

HEALTH & WELLBEING

Considering the landscape of the city of Kigali, the current wastewater disposal approach, which is mostly the use of soak pits, present several risks including land sliding due to the saturation and fragility of soil, especially on steep slopes, as well as consistent contamination of shallow groundwater in lowlands. The management of wastewater, which is mostly done at the individual household level, is challenged by the limited technical and financial capacity of most of Kigali's population and leads to the application of disposal approaches which present several risks. The provision of adequate sanitation systems in conjunction with the safe supply of water is essential for social and economic development and the overall health of a city.

In addition, the effects of COVID-19 have clearly placed further stress on the access to water, sanitation, and hygiene (WASH). Inadequate access to basic WASH services posed many challenges to disease containment for Kigali. The use of integrated planning, with a specific focus on water resilience, can help the city to better cope with future pandemic-related stresses and increase the capacity to deliver an integrated approach to public health.


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Effective Regulation and Accountability
Adaptive and Integrated Planning
Sustainable Funding and Finance
Effective Asset Management
Effective Disaster Response and Recovery
1.1 Active community engagement and participation around water issues
1.2 Effective communication of government programmes and policies around water
1.3 Promotion of social cohesiveness and strong community networks
1.4 Support for civil society institutions working on water issues
2.1 Incorporation of expert and technical knowledge into decision-making around water
2.2 Incorporation of local knowledge and culture into decision-making
2.3 Incorporation of social, environmental and economic costs and benefits into decision-making around water
2.4 Long-term strategy development and action planning around water
2.5 Political leadership around water resilience issues
3.1 Proactive coordination around downstream impacts
3.2 Proactive coordination with relevant upstream stakeholders
3.3 Proactive coordination between and within government agencies
3.4 Proactive coordination between government, private sector and civil society
3.5 Promotion of clear stakeholder roles and responsibilities
4.1 Effective enforcement of economic regulations for water
4.2 Effective enforcement of environmental regulations for water
4.3 Effective enforcement of public health regulation for water
4.4 Enforcement of land use regulations and zoning
4.5 Enforcement of design guidelines and construction standards for water infrastructure
4.6 Effective implementation of transparent and accountable decision-making procedures
5.1 Active monitoring and evaluation of programmes
5.2 Dissemination of accurate data
5.3 Incorporation of redundancy into water sources, networks and assets
5.4 Integrated planning across interdependent urban systems
5.5 Integrated planning with agriculture and food supply chains
5.6 Promotion of culture, processes and resources to enable innovation
6.1 Promotion of integrity in contracting and financial decision-making procedures
6.2 Provision of sufficient financial resources for maintenance of water infrastructure
6.3 Provision of sufficient financial resource for new water programmes and projects
6.4 Water and sanitation pricing for cost recovery and demand management
7.1 Comprehensive hazard monitoring, forecasting and early warning systems
7.2 Coordination of disaster response and recovery preparation
7.3 Ensuring adequate funds to government for disaster recovery
7.4 Ensuring adequate financial resources for recovery of households and businesses
7.5 Promotion of community capacity for preparedness and response to water hazards
8.1 Active monitoring and evaluation of infrastructure
8.2 Ensuring adequate human capacity for operations
8.3 Promotion of infrastructure for drainage and flood protection
8.4 Routine maintenance and upgrade of infrastructure
8.5 Promotion of reliable supply chains for infrastructure
9.1 Active monitoring and evaluation of environmental resources
9.2 Promotion of sustainable commercial and industrial water use
9.3 Promotion of sustainable household water use
9.4 Protection of aquatic habitats and ecosystems
9.5 Protection of groundwater and surface water resources
10.1 Provision of safe water for personal and domestic use
10.2 Provision of sanitation services
10.3 Universal affordability of water and sanitation services
10.4 Provision of health services to reduce trauma from water hazards
11.1 Application of water sensitive design principles to buildings
11.2 Introduction and enhancement of water-sensitive urban design
11.3 Promotion of water-sensitive urban land development
11.4 Introduction and enhancement of neighborhood blue-green infrastructure
12.1 Protections around climate-related displacement
12.2 Provision of sufficient water, quality and quantity for industry and commerce
12.3 Support for livelihoods around water
12.4 Support for improved mobility through water-related transportation
N/A

10 PROTECTED NATURAL ENVIRONMENTS

10.1 Provision of safe water for personal and domestic use

› QUALITATIVE INDICATOR:

All people have access to sufficient, safe, accessible, and affordable water for personal and domestic use.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The city does not currently have 100% water supply network coverage. Three sectors, Gasabo, Kicukiro and Nyarugenge, remain unconnected. In addition, many areas are subject to water sharing policies where supply comes weekly and requires water storage or the use of alternative water sources. Water quality is often poor, requiring boiling or other treatment at the household level to make it safe for consumption. Piped water supply is affordable for many, but others struggle to manage these prices and rely on alternative surface water sources instead. The water supply system has been upgraded and expanded in recent years but still does not meet the city's current needs. Private water suppliers are used in some areas, although pricing is regulated.

10.2 Provision of sanitation services

› QUALITATIVE INDICATOR:

All people have access to sanitation that is safe, hygienic, secure, affordable, and socially and culturally acceptable.

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There is improved sanitation across the city, with a public toilet campaign contributing to accessible and affordable sanitation. The city aims to provide 100% access to improved sanitation in the future using a combination of ecosan, toilets, flush toilets and centralized wastewater treatment in urban areas, a priority in the master plan. According to WASAC, Kigali's centralized sewage system will be delivered by 2024. Currently, sanitation services are not centralized and remain the responsibility of the individual. Individuals are responsible for their own sanitation set up and providers vary their tariffs geographically with no discernible explanation. Tankers and private waste disposal and collection are performed in hard-to-access areas and informal settlements. There are a few pilot cases of WASAC taking on sanitation for new real estate developments, but this is not representative of the city as a whole. Sanitation clubs at the community level promote dialogue around sanitation and include local residents and stakeholders in prioritizing investments, although this varies in effectiveness between areas.

10.3 universal affordability of water and sanitation services

› QUALITATIVE INDICATOR (10.3A):

Safe water for consumption is made affordable to all users.

QUALITATIVE SCORE:

3.3

QUALITATIVE SCORE:

Currently in Kigali, consumers pay per volume of water used and there is no additional consideration given to vulnerable groups. Ongoing studies are looking into the possibility of linking income brackets to water usage payments, but this is complicated due to shifting income groups. Vulnerable groups do not receive subsidized water and there is a risk of limiting consumption and use due to cost.

Tariffs vary widely depending on the region of the city, this leads to dumping and unconsented discharge, particularly in informal settlements. Sanitation clubs are used at a local level to identify vulnerable people who require additional support, but this is mainly linked to social issues and the health sector, rather than the water and sanitation provider. The new developments related to affordable housing in Kigali include access to sanitation.

10.4 Provision of health services to reduce trauma from water hazards

› QUALITATIVE INDICATOR:

High quality health services are made available to residents to reduce impacts from water related shocks and stresses including water borne diseased.

QUALITATIVE SCORE:

● 4.5

SUMMARY OF ROUNDTABLE DISCUSSION:

Health service provision in Kigali is accessible and of high quality. The master plan aspires for all neighbourhoods to have a health facility within a 15-minute walk. The highest caseload seen is transmissible diseases that could be ameliorated through improved hygiene, demonstrating the need to improve water and sanitation services in the city. All citizens must have health insurance, with the government providing assistance to vulnerable groups. There is a lack of trained medical professionals, which will become more apparent as the government tries to meet future healthcare commitments. Water related diseases are not currently a substantial issue across the city. There has been increased publicity on the links between health and water, especially after the COVID-19 pandemic. Pressure has grown on WASAC to deliver enhanced services to improve health outcomes with social media being used to highlight issues.

11 HEALTHY URBAN SPACES

11.1 Application of water sensitive design principles to buildings

› QUALITATIVE INDICATOR:

Design principles are promoted to improve water performance for buildings.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The regulations in Rwanda are designed with improved water performance in mind, but they are not always clear, and implementation and enforcement remain an issue. Furthermore, while regulations promote good standards for new construction, it is unclear how they are to be enforced on existing buildings and infrastructure.

11.2 Introduction and enhancement of water sensitive urban design

› QUALITATIVE INDICATOR:

Water is incorporated as a design element in urban place-making.

QUALITATIVE SCORE:

● 3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There are plans to further improve the prevalence and quality of water amenities throughout the city, however there are not many amenities or recreational opportunities that are designed around water. These types of amenities are not featured in city residents' day to day lives and those that do exist (i.e., pools) are neither affordable nor widely accessible to most city dwellers.

11.3 Promotion of water-sensitive urban land development

› QUALITATIVE INDICATOR:

Water is incorporated as a key consideration in land-use planning and development.

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

At a high level, most stakeholders agreed that water is central to land use planning and the Kigali Master Plan does account for water sensitive urban development. However, it was identified that improvements are needed to have more detailed land use planning (to translate the master plan to local /neighbourhood level) and to deploy data and technology more regularly to enforce high-level regulations. Generally, the city has been improving their high-risk area (hillsides, etc.) management and efficient relocation of people from these zones.

11.4 Introduction and enhancement of neighbourhood blue-green infrastructure

› QUALITATIVE INDICATOR:

Blue and green infrastructure is adopted in neighbourhoods.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

- *Kigali has a vision to promote green infrastructure within the city, but generally blue infrastructure is still lagging in implementation and achievement. Consulted stakeholders held differing opinions surrounding the involvement of and resources dedicated to promoting green and blue infrastructure to communities and decision makers. While there is an availability of funds allocated to plan for blue infrastructure, there are no clear financing mechanisms for green infrastructure which restrains private developers' investment/action in this regard. Planning and implementation are still at an early stage, and most issues lie within the implementation phase, especially in terms of the lack of pertinent references (good contextual examples/adapted knowledge) and specific know-how.*

PROTECTED NATURAL ENVIRONMENTS

12.1 Protections around climate-related displacement

› QUALITATIVE INDICATOR:

Policies exist that protect vulnerable populations from displacement as a result of water-related shocks and stresses.

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Generally, stakeholders assigned this indicator a high score because they identified that the right policies are in place. However, the following challenges were identified: 1) stakeholder coordination is difficult and affected stakeholders rarely are given a say in the relocation plans; 2) funding to provide compensation to affected families is limited; and 3) livelihoods and other social factors can be negatively impacted as a result of relocation.

12.2 Provision of sufficient water quality and quantity for industry and commerce

› QUALITATIVE INDICATOR:

Businesses and industry have access to sufficient water of appropriate quality.

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Water provision for commercial purposes is prioritized, however not accessible on a daily basis. The consultation on this indicator highlighted a variety of positions among participants. One position was that there is sufficient supply and no issues with water provisions, or the quality of water, to businesses. Other stakeholders held the position that there is still a gap in water provision to businesses but did not go into additional details. It was identified that the Ministry of Environment is handling the new water permitting strategy and WASAC is performing water supply in urban areas only.

12.3 Support for livelihoods around water

› QUALITATIVE INDICATOR:

Jobs and skills are developed, and new opportunities created for developing livelihoods around water.

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There is still a lot of work to be completed to better understand what types of jobs could be made available in Kigali's water-related sectors. Stakeholders were unaware of specific programs or resources aimed at training and upskilling for water-related livelihoods.

12.4 Support for improved mobility through water-based transportation - N/A

3. CHALLENGES

Following the two-day Assessment workshop, key points and reflections were captured based on the stakeholder consultations held during each breakout session. Through the process of sharing and compiling this information, a set of emerging themes were identified for Kigali. As a result of this analysis and diagnosis of the assessment workshop, the core CWRA partner team drafted ten challenges currently confronting the city of Kigali.

The ten challenges were transformed into a series of "Challenge Questions" that served as starting point for stakeholder consultation during the visioning workshop. The following section presents an overview of the ten challenges, a brief contextualization of the challenges, the related indicators to each challenge, as well as, the result of the root causes analysis, that was carried out by participants during the visioning workshop.

CHALLENGE		CHALLENGE QUESTION
1	**Lack of shared quality data**	How can we ensure that data is actionable, of high quality, accessible and shared between stakeholders?
2	**Limited livelihoods around water bodies**	How do we create comprehensive skills development and create livelihoods that can better serve the city's water needs by incentivizing the private sector and professional bodies?
3	**Limited technical capacity in water resilience**	How can the city create targeted capacity development programs that develop and strengthen the skills, knowledge, processes and resources that key stakeholders (individuals and organizations) need to build water resilience?
4	**Ineffective engagement of stakeholders in water resilience planning process**	How do we develop plans and policies which include all necessary actors and identify appropriate stakeholder responsibilities across government, civil society, and private sector?
5	**Ineffective multi-level water governance**	How can we ensure effective coordination mechanisms between government institutions operating at all levels for planning and implementation of water and sanitation in Kigali?
6	**Ineffective development and enforcement of regulations of water related services**	How do we improve implementation, enforcement and evaluation of urban planning and environmental regulations to promote more resilient water systems in Kigali?
7	**Vulnerable water related infrastructure**	How do we improve resilience to external shocks and stresses in city planning and implementation of water and wastewater service delivery systems and infrastructure?
8	**Low mainstreaming of resilience into key water related plans**	How can Kigali improve integrated planning and implementation of grey-green-blue solutions for stormwater management, as well as solid waste management and wastewater treatment, improving health, environmental and social outcomes for residents?
9	**Inadequate stormwater management system and downstream pollution (originating from the city)**	How can we ensure that residents and businesses in the city of Kigali are resilient to water related disasters and do not pollute the city's water bodies impacting downstream areas?
10	**Unsustainable water investments due to low economic return**	How can the city diversify its funding sources (increasing private sector and international investment) to fill gaps in operations and maintenance and capital investment in a manner that is equitable and plans for future hazards?

1.

Lack of shared quality data

CHALLENGE QUESTION

How can we ensure that data is actionable, of high quality, accessible and shared between stakeholders?

CHALLENGE DESCRIPTION

In Kigali, there are currently no mandates to share information between agencies, leading to a lack of transparency regarding the amount of data that is collected and monitored within the city. As a result, issues arise around agencies unknowingly duplicating efforts or developing knowledge gaps in their data collecting processes. Additionally, there are limited mechanisms in place to disseminate information to various audiences including the public and academia. External stakeholders are unaware of the roles and responsibilities of different public agencies in data collection and management, making it a challenge for information and data requests to reach the right people.

The lack of open data policies and fragmented data collection and storage hinders the planning and monitoring of water resources development programs and projects in the city, while also affecting ecosystem and water quality monitoring and disaster planning processes. Institutions need to be aware that accessible data is an integral component of the management of the city's water systems and understand how data directly contributes to Kigali's water resilience efforts. Climate change poses a risk to Kigali in terms of increased flooding and landslide events. For example, for flood early warning systems, the city of Kigali has to rely on globally available data because the in-country data capacity has not yet been built up. To prepare for the increased frequency of natural disasters, especially those related to water, institutions need to share data and follow an adequate system of practice to collaboratively analyse hazard data to achieve high quality disaster preparedness initiatives and responses.

In terms of data technologies and capacities, there are not enough experts in the system. Local expertise in state-of-the-art technologies is needed in Kigali to appropriately analyse and assess areas of need that should be prioritized in the water system and ensure any technological efforts are sustainable in the long-term. Previously, new data analysis technologies have been brought in by development partners, but these specific actions failed to plan for the transition of capacity and did not enable local experts to take over and manage these technologies. Without planning for the longevity of this technological knowledge, the data analysis systems in agencies often revert to their old methodologies. An additional challenge presents itself when a new technology is leveraged because the city still has to rely on other systems, such as the national government, to obtain the knowledge to then use this technology.

Finally, there is a lack of financial means which leads to the low prioritization of handling challenges such as ensuring quality and shared data across systems. There is almost no space for the private sector to play a role, not only in providing services, but in becoming a buyer of data as well. Including the private sector and industries in a data sharing community of practice would allow agencies, for example, to easily check if an industry is following the appropriate procedures to minimize their water pollution in Kigali.

1.

Lack of shared quality data

RELATED INDICATORS

- **7.2** Coordination of disaster response and recovery planning
- **9.1** Active monitoring and evaluation of environmental resources
- **8.1** Active monitoring and evaluation of infrastructure
- **7.1** Comprehensive hazard monitoring forecasting and early warning systems
- **5.1** Active monitoring and evaluation of programs
- **3.3** Proactive coordination between and within gov agencies
- **3.4** Proactive coordination between government, private sector and civil society
- **3.5** Promotion of clear stakeholders' roles and responsibilities

ROOT CAUSES

Social Causes

- Lack of planning for the long-term capacity building of local experts to take over new data collection and analysis systems; staff revert to old methodologies after individual projects are implemented.
- Lack of awareness around the importance of sharing spatial data and data that is being produced within individual institutions, in addition to the lack of means/ platforms for data dissemination.
- No community of practice for data sharing, knowledge building or capacity development to use new systems for data management.
- People are unaware of how to find or analyse relevant data for urban water resilience.

Technological Causes

- New technologies are often brought in by donors, but this is performed without assessing Kigali's system needs or how to make new technological processes sustainable.
- Lack of advanced technology to manage large amounts of data and its access issues.

Political and Governance Causes

- Reliance on the national government to access available data and information.
- A governance issue – For example, WASAC has the privilege of being the sole source of data on water quality.
- Lack of clarity regarding institutional roles and responsibilities with no mandate to share information between agencies.
- Lack of open-data policies.

Financial Causes

- Lack of financial means, so the challenge of handling quality data is not prioritized in the city.
- There is almost no space for private sector to play a role, not only in providing services but also in becoming a buyer of data.

Environmental Causes

- Industrialization causes pollution risks for the city's water systems. There is a lack of transparent monitoring processes for industrial pollutants and/or self-reporting mechanisms in place for collecting data on industrial pollutants.
- Institution in charge of hazards does not have a particular data system to follow.

Other Causes

- Data can sometimes be published, but it is not published daily, and access is often unavailable. People need to know when the data is available and where it is. If such standards are adopted, it could engender a constituency of data users.
- Some of the data shared is not of high-quality.
- Lack of close coordination – For example, when data is not shared then the same activities end up being conducted across different institutions leading to the duplication of efforts. There is also a lack of a match-up of the collected data.

2.

Limited livelihoods around water bodies

CHALLENGE QUESTION

How do we create comprehensive skills development and create livelihoods that can better serve the city's water needs by incentivizing the private sector and professional bodies?

CHALLENGE DESCRIPTION

The major water bodies or aquatic lands in the city are composed of an extensive network of wetlands and a few lakes. Over the years, a combination of factors has put these ecosystems at high pressure. Factors such as rapid growth of the city with limited lands, poor land use planning inducing informal socio-economic activities development in these ecosystems, among others, have led to the deterioration of ecosystem service provision from these water bodies. Wetlands in the city of Kigali have for years faced a large issue of encroachment that has concentrated economic activities in the wetland resulting in a sprawl of informal activities. Additionally, the fertility of these lands has led to an increase in poorly practiced agriculture further resulting in the reliance of subsistence agriculture for the surrounding community. Many industries in the past were built in wetlands because of the poor land management at the time, despite the ongoing reforms to address this issue, many wetlands have been highly polluted and are no longer able to provide the ecosystem services they once did. Furthermore, the encroachment of wetlands has heavily impacted the capacity of these ecosystems to temporarily store and convey stormwater therefore reducing the resilience of the city to climate change induced water disasters. The development of settlements in the city of Kigali, without a proper wastewater management system has led to the heavy pollution of wetlands, which further puts informal settlements located around the wetlands at risk. The situation around Kigali's lakes is different than the wetlands. Because of their picturesque scenery, lakes have always attracted a certain social cluster of wealthy people who settle in the vicinity. However, in some areas of the lakes a few industrial and informal developments are present. Pollution in the lakes is mostly related to activities in the surrounding landscape such as agriculture, mining, and industries outlet, which brings in sediments and chemicals of various kinds.

Water bodies in the city of Kigali have the potential to offer a range of opportunities for communities at different scales such as urban smart agriculture and livestock production, eco-tourism, payment for ecosystem services supporting wastewater treatment, and flood control using nature-based solutions. However, these types of opportunities require a certain level of skills development that surrounding communities do not possess. The current policy reforms and development focus more on the protection of the water bodies in the city of Kigali and water access, and less on skills development and job opportunities around water bodies in the city of Kigali. Jobs around water bodies are available but limited, especially in the private sector. There are few programs in place to support the required skills development and current regulations are insufficient to ensure a proper development of opportunities for the communities living around the water bodies. Despite the reforms that have led to a systematic cleaning of water bodies, demarcation, and tenure security, there is still a challenge of determining the way forward in their restoration and development and a need to incorporate a community engagement framework, with all that it entails, into the next steps.

2.

Limited livelihoods around water bodies

RELATED INDICATORS

- **1.1** Active community engagement and participation around water issues
- **1.3** Promotion of social cohesiveness and strong community networks
- **1.4** Support for civil society organizations working on water issues
- **2.1** Incorporation of expert and technical knowledge into decision-making around water issues
- **2.2** Incorporation of local knowledge and culture into decision-making
- **8.2** Ensuring adequate human capacity for operations and implementation
- **9.1** Active monitoring and evaluation of environmental resources
- **12.3** Support for livelihoods around water

ROOT CAUSES

Social causes

- The prevalence of unplanned settlements around wetlands and rivers with increasing migration of people coming from rural areas to seek jobs.

Environmental causes

- Untreated wastewater discharge into rivers and wetlands, recurrent flooding events affecting mostly lowland areas, erosion on steep slopes, limited trees to intercept rainfall, etc.

Technological causes

- High Non-Revenue Water with limited technology to monitor both physical losses (i.e., pipe leaks) and commercial losses (i.e., unbilled water, illegal connections, etc.); limited water resource monitoring system within the city to inform flood management strategies.

Political and governance causes

- Lack of understanding of the supporting policies and how communities can advocate.

Financial causes

- Water supply systems can be costly; Lack of an effective and efficient system; costly sanitation and water supply the farther it is from the system.

Other causes

- Professional knowledge is not shared knowledge.

3.

Limited technical capacity in water resilience

CHALLENGE QUESTION

How can the city create targeted capacity development programs that develop and strengthen the skills, knowledge, abilities, processes, and resources that key stakeholders (individuals and organizations) need to build water resilience?

CHALLENGE DESCRIPTION

Kigali's water sector, much like other public sector systems in the city, faces a capacity deficit in its workforce. As Kigali has developed its vision to become a green and innovative city, new types of investments are being required to enhance critical lifeline sectors of the city, including the water sector. These new investments require the labour market to possess a complex set of technical and soft skills. However, the traditional educational system, highly dependent on its universities, has not yet met this demand. This gap is visible in the number of international consultants that are now hired within the city's water sector to fill the gaps in expertise, which the city has not been able to fill with local hires.

This lack of local expertise partly stems from a mismatch of available labour and the demands of the market. New graduates entering the workforce lack the necessary skills to meet the city's current and future water resilience challenges, making them incapable of effectively tackling the city's service delivery needs. This mismatch originates from the current curriculum in the city's educational institutions, especially within the water engineering departments, that fails to teach students relevant skills beyond technical knowledge. This results in a workforce with a siloed understanding of the needs of the water system and lacks the holistic understanding that considers socioeconomic nuances, governance needs, legal frameworks, and the intersectionality of different systems. This mismatch significantly affects the city's ability to hire qualified staff. Fuelled by this reality, many young professionals either fall into unemployment, or choose to leave the country to pursue their studies. In the context of the small pool of qualified experts that have access to advanced education, Kigali's public sector lacks competitive incentives that are comparable with compensation packages offered by the private sector and international NGOs. This further inhibits the city's ability to attract new hires that meet its needs.

The lack of comprehensive training opportunities for existing staff is another challenge faced by the city. Despite its limited capacity to attract qualified hires and the limitations of the current labour market, there is low recognition by the government of the need to build capacity for its employees to make up for its gap in expertise. This is exacerbated by the lack of embedded performance indicators within relevant departments, which limits the city's ability to monitor progress among its employees.

The lack of capacity is further compounded by the city's complex and fragmented institutional framework, where there is limited coordination and a siloed overlap between relevant departments responsible for service delivery of water, sanitation, flooding, etc. Additionally, the centralized nature of the Rwandan government means that budgeting is done at the national level and directed towards local development efforts. This brings with it an added layer of fragmentation, as there is a large disconnect in budget setting and local needs.

Thus, despite positive steps taken to create plans for the city that advocate for green and resilient development, there is limited implementation power within the public sector to achieve the city's ambitious goals.

3.

Limited technical capacity in water resilience

RELATED INDICATORS

- **2.5** Political leadership around water resilience issues
- **2.1** Incorporation of expert and technical knowledge into decision-making around water
- **6.2** Provision of sufficient financial resources for maintenance of water infrastructure.
- **7.5** Promotion of community capacity for preparedness and response to water hazards
- **8.2** Ensuring adequate human capacity for operations

ROOT CAUSES

Political and governance causes

- Responsibility: there is low recognition by the government on their role to play regarding capacity development for their own staff.
- Fragmented system: there is low coordination between local governments and educational actors. Moreover, there are not enough types of educational actors. For instance, vocational trainings and specialized courses are missing.

Financial causes

- The CoK is undergoing a transition in its development trajectory with many new investments in green cities, but there is a lack of understanding on which types of professionals are necessary to support this transition. In this sense, the type of professional that is needed to work in water resilience is also changing, meaning that other types of expertise such as legal counselling and economic analysis are becoming increasingly relevant.

Social causes

- Brain drain: a number of Rwandan students decide to study abroad at foreign universities and when they come back to Rwanda, they prefer to work in the private sector due to its higher salaries.

Technological causes

- Institutions lack instruments that build capacity such as performance indicators in contracts, monitoring capacity, etc.

Other causes

- Responsibility: for the private sector, there is low engagement in educational activities that are not necessarily related to their staff.

4.

Ineffective engagement of stakeholders in the water resilience planning process

CHALLENGE QUESTION

How do we develop plans and policies which include all necessary actors and identify appropriate stakeholder responsibilities across government, civil society, and the private sector?

CHALLENGE DESCRIPTION

Kigali's water sector has limited opportunities to engage community-based organizations and civil society actors, leaving the beneficiaries of the city's water-related investments out of the planning and implementation processes. Rather, the city employs a top-down project design approach, focusing on the implementation of technocratic solutions that are unaligned with the needs of its constituents. This has created a divide between investments being made and the realities of communities on the ground, countering efforts to build water resilience.

Additionally, there are currently limited efforts by the city to present information and warnings to communities at risk of water related disasters. All available information is technical, making it inaccessible to a majority of the city's communities who lack sufficient technical knowledge. This leaves community and civil society actors uninformed about the magnitude of the risks they face and unable to advocate for investments that address their vulnerabilities. It is uncommon for civil society actors to engage in providing alternative services, increasing reliance on the formal delivery from public sector.

This is a result of the complex, and at times contradictory, institutional framework of the city, which has created a situation where departments responsible for building water resilience work in silos, while having overlapping and confusing mandates. For instance, services related to the water sector, such as water supply, sanitation, and flood protection, are provided by different departments within the city's public services system. Further, the centralized nature of the Rwandan governmental framework influences this institutional fragmentation. This is mostly observed in the budgeting process for the city, which is done at the national level by the Ministry of Finance. There is a disconnect between budget allocation processes and implementation needs on the ground, which is negatively affecting the city's capacity to set and implement investments with localized impact. This leaves the community, NGOs and other civil society actors unable to influence and monitor the implementation of projects that directly affect their day-to-day lives and the services they provide. This reality inhibits the ability of civil society actors to engage with relevant bodies in ensuring effective public sector-led project design and implementation.

The city's institutions also suffer from a lack of continuity in their planning. Despite budgetary support from the national government, the city still faces large gaps in funding which has fostered a dependence on development partner financing. These programs are usually designed in silos and end abruptly when external funding dries up. This reality has resulted in a string of ad-hoc efforts that do not sufficiently engage communities and cannot be monitored to ensure their implementation has meaningful impact.

4.

Ineffective engagement of stakeholders in the water resilience planning process

RELATED INDICATORS

- **2.1** Incorporation of expert and technical knowledge into decision-making around water issues
- **2.2** Incorporation of local knowledge and culture into decision-making around water
- **3.4** Proactive coordination between government, private sector and civil society
- **5.4** Integrated planning across interdependent urban systems
- **3.5** Promotion of clear stakeholder roles and responsibilities
- **4.6** Effective implementation of transparent and accountable decision-making procedures

ROOT CAUSES

Social Causes

- Kigali's water sector has limited opportunities to engage civil society organizations in planning and implementation processes.
- The city employs a top-down project design approach.
- Communication with communities is complex and the message is unclear, so civil society does not know how to participate.
- All available information related to water disasters and risk is technical, making it inaccessible to a majority of the city's communities who lack sufficient technical knowledge.

Political and Governance Causes

- There is a complex, and at times contradictory, institutional framework of the city; departments responsible for building water resilience work in silos, with overlapping and confusing mandates.
- Services related to the water sector such as water supply, sanitation and flood protection are provided by different departments within the city's system. However, the regulation of these services is done by another external regulator.
- Centralized nature of the Rwandan governmental framework.
- Lack of continuity in institutional planning.
- The city is mostly operating in the visible problems and not in the invisible causes of the problems (such as rapid and unplanned urban development).
- The city is very ambitious on its goals but lacks the monitoring capacity of its targets.

Financial Causes

- There is a clear disconnect between budget allocation processes and implementation needs on the ground, which is negatively affecting the city's capacity to set and implement investments with localized impact.
- Large gaps in funding leads to a dependence on development partner financing.

5.

Ineffective multi-level water governance

CHALLENGE QUESTION

How can we ensure effective coordination mechanisms between government institutions operating at all levels for planning and implementation of water and sanitation in Kigali?

CHALLENGE DESCRIPTION

The city's agencies need to be empowered to coordinate with outside stakeholders such as agriculture, mining, other major water users, and regional upstream and downstream stakeholders to improve resource management, the provision of services and resilience. In addition, there is a disconnect between a program's/project's planning and implementation stages, which is exacerbated by poor coordination between agencies. To address this issue, many frameworks and committees have been established. However, there is a lack of compliance, monitoring tools, and mechanisms available to ensure proper coordination between these frameworks and committees, in addition to the lack of capacity and funds.

Central and decentralized coordination needs strengthening as standards are defined at the national level to monitor water resources development, but there is a lack of clarity on the city's role. For example, water supply infrastructure is planned and managed at the national level by WASAC as the legal supplier of drinking water with a mandate to oversee the central wastewater system, but their coordination with the city is undefined.

Different stakeholders have varying practices in collecting baseline data as it relates to pollution and flooding issues, which challenges proactive and coordinated planning for resilience building. It is worth noting that coordination does not currently include all actors (i.e., civil society, private sector, informal actors, or at-risk individuals).

5.

Ineffective multi-level water governance

RELATED INDICATORS

- **3.1** Proactive coordination around downstream impacts
- **3.2** Proactive coordination with relevant upstream stakeholders
- **3.3** Proactive coordination between and within government agencies
- **3.5** Promotion of clear stakeholder roles and responsibilities
- **5.4** Integrated planning across interdependent urban systems

ROOT CAUSES

Political and Governance -

- The Ministry of Finance and Economic planning is the approver of all plans and programs in Rwanda but lacks a multi-disciplinary team to properly assess and coordinate all the plans.
- The structures and mandates of government institutions and decentralized entities are still not clearly defined despite many recurrent restructurings. The basis of restructuring efforts appeared to lack a proper technical rationale and most of the time was kept confidential.
- Capacity of city agencies and government - structure and personnel of city is not appropriately designed. For example, there is no water expert who can guide issues in urban water resilience, instead there is a structural engineer.
- Coordination fails due to the lack of implementation. Policies and strategies are in place, but when it comes to implementation there is a disparity due to the lack of human resource capacity.
- Issue of overlap and contradiction in the institutional mandate leads to conflict and a lack of ownership.
- Challenge to incorporate diverse stakeholder perspectives.
- Lack of a robust retention policy of trained experts within the government institutions and decentralized entities, which is affecting the overall capacity of these institutions and entities to coordinate, plan and implement accordingly.

Environmental causes

- In Kigali, rivers outside the city have a huge sanitation problem. An enabling environment for water resources management is needed to link coordination between populations upstream and downstream and improve the current structure of the public-private partnership.
- Lack of proper personnel within the city to materialize initiatives such as a payment for ecosystem services to include upstream catchment areas and link to communities.

Social causes

- Stakeholder engagement remains inefficient and is most of the time overlooked during the planning and implementation of programs and projects.
- Due to poor planning, limited and ineffective stakeholder engagement, the beneficiaries' ownership is often not achieved which affects the sustainability of a program/ project's expected impacts.
- Lack of early-stage coordination/engagement with stakeholders.
- People are unaware of new approaches, especially when it comes to sustainability and resilience.

Technological causes

- There remains a lack of appropriate IT based tools to facilitate and optimize the coordination and planning of government institutions and decentralized entities.
- People do not have the technical know-how, both in terms of communication skills and IT needs.
- Technological tools are expensive, creating a link between technological and financial causes.

Financial causes

- Implementation often lacks the necessary budgets and financing.

Other causes

- Lack of strategy to engage the private sector.
- Unaccountability in urban water resilience requires the need for joint efforts and a joint action plan.

6.

Ineffective development and enforcement of water related services regulations

CHALLENGE QUESTION

How can we ensure effective coordination mechanisms between government institutions operating at all levels for planning and implementation of water and sanitation in Kigali?

CHALLENGE DESCRIPTION

In 2002, in response to the city of Kigali's fast population growth and physical expansion, urban authorities decided to develop master plans and zoning regulations (CoK, 2007). Developed in 2007 and approved by parliament in 2008, the Master Plan is a key urban planning tool that supports land use planning through zoning regulations. New zoning requires the provision of space for adequately sized public utility infrastructure, but there is still no financial means for its implementation.

In addition, there is a gap between planning and enforcement. Citizens are often unaware of laws and regulations, and little has been done to sensitize the population on related matters. Further, building codes are insufficiently respected and building regulations are not fully enforced.

Guidelines based on The Green Growth and Climate Resilience Strategy, recently updated in 2021, was initially developed in 2011 at the national level as a result of a collaborative effort between a multitude of stakeholders coordinated by the Ministry of Environment (formerly the Ministry of Natural Resources). Based on the definitions and goals set at the national level, the city of Kigali proposed a local green growth vision, approach, and strategies, all compiled in Kigali's Master Plan. Regulations promote good standards for new construction; however, it is unclear how they are to be enforced on existing buildings and infrastructure.

There are standards in place for monitoring and evaluation but there are overlapping mandates between the national and local government that need to be reviewed and addressed. The Rwanda Utilities Regulatory Authority's (RURA) mandate in the water sub-sector is to regulate the provision of water services in a way that water service providers offer good quality service. The responsibility of the water and sanitation regulation unit is to license water service providers, monitor compliance by licensees with laws and standards, ensure a high quality of water service delivery, monitor performances of service providers, advise the government on water-related policies, and perform audits and inspections of water service providers to assess their service provision. Duplication of data collection within the monitoring and evaluation process also needs to be addressed.

6. Ineffective development and enforcement of water related services regulations

RELATED INDICATORS

- **3.2** Proactive coordination with relevant upstream stakeholders
- **3.4** Proactive coordination between government, private sector and civil society
- **3.5** Promotion of clear stakeholder roles and responsibilities
- **4.1** Effective enforcement of economic regulations for water
- **4.2** Effective enforcement of environmental regulations for water
- **4.4** Enforcement of land use regulations and zoning
- **5.3** Incorporation of redundancy into water sources, networks and assets
- **5.4** Integrated planning across interdependent urban systems
- **8.1** Active monitoring and evaluation of infrastructure
- **9.1** Active monitoring and evaluation of environmental resources
- **11.3** Promotion of water-sensitive urban land development
- **11.4** Introduction and enhancement of neighborhood blue-green infrastructure

ROOT CAUSES

Social Causes

- Communities and other civil society organizations active in the field are not currently involved in monitoring and evaluation (M&E). A participative M&E approach is essential.
- Lack of engagement of community sectors in all phases of urban planning processes, which leads to decreased ownership and understanding of the water system.
- There is very limited or no awareness on the importance of regulations, as well as the existing regulatory framework.
- Citizen perception of regulations is either low or negative.
- There is a widespread lack of knowledge on environmental laws.

Environmental Causes

- Environmental degradation impacts water quality, especially to water sources located near mining facilities as runoff from the facilities carries pollutants such as metals.
- Limited natural resources with high demand, for example, there is limited land for urban agriculture in areas where the city is expanding.

Technological Causes

- The distribution network needs to be revised and upgraded to ensure water quality throughout the entire distribution chain.
- The local government lacks tools and the mandate to systematically monitor water and its related infrastructure.
- Local technical staff lack access to advanced IT for M&E.
- Even when advanced IT is available, there is insufficient capacity building given to technical staff to have the necessary skills to make use of these new technologies.
- There is a lack of decentralized laboratories.
- The urban sanitation system in the city is poor and regulations only focus on the household level and not on the general system.

Political and Governance Causes

- There is no common definition of standards among all responsible institutions.
- There is limited coordination among institutions in charge of enforcing existing regulations (RURA, Ministry of Infrastructure, RBS, etc.)
- There is currently no strategy in place for a participative planning process. All stakeholders need to be taken into consideration.

Financial Causes

- Lack of and limited funds available.
- Environmental issues increase the cost for water treatment.

Other Causes

- International standards, such as those suggested by the World Health Organization (WHO), are incorporated as national standards in Rwanda. Instead of tailor-made standards that accurately meet the capacities and needs of the population and governmental institutions.
- The Ministry of Infrastructure has standards for harvesting rainwater, but these standards do not apply for the house-hold level.

7.

Vulnerable water related infrastructure

CHALLENGE QUESTION

How do we improve resilience to external shocks and stresses in city planning and implementation of water and wastewater service delivery systems and infrastructure?

CHALLENGE DESCRIPTION

Rapid growth in Kigali is leading to urban sprawl. The needs of today's increasing population exceed the city's capacity to provide essential and emergency services, particularly in informal areas where accessibility is limited. Building desired resilience qualities such as redundancy remains challenging due to insufficient municipal financial capacity on top of limited engagement of private actors in the city's development processes. Existing infrastructure such as boreholes are not functioning and need rehabilitation. For example, according to the Kigali Land Use Master Plan 2050 and the Kigali Water Supply Master Plan, among 31 boreholes drilled in Nzove, only 22 are operational. Treatment and water storage facilities are either deteriorated or have no capacity to store enough for two-to-three days of water demand. There is also shortage or aging of distribution pipes. Out of 353 km of distribution pipelines in Kigali, 6% (20km) of pipelines above ND 150 were constructed in or before 1983 and are more than 40 years old, 3% were constructed between 1984-2001, 42% were constructed from 2002 onwards. The year of construction for the remaining 49% remains unknown. Obsolete infrastructure is among the contributors to water leakage that was estimated at 38% in the year 2017/18. Moreover, absence of a backup route by pipeline loops/networks is among the causes of intermittent water supply.

In addition, there are no current guidelines on how to incorporate resilience into water infrastructure projects' design, construction, and management processes. This affects the quality of future water facilities and undermines the integrity of the existing structures and systems.

Efforts around water resilience have previously focused on the agriculture sector and not on the urbanization sector. A comprehensive approach to resilience building is yet to be applied/adopted to all sectors of development. There is a great need to foster integrated planning that considers interdependencies between the water system and other systems (i.e., electricity, chemicals, etc.) because they may cause critical impacts to Kigali's water system, especially during times of disruption. According to the same plans referenced above, Kigali's water system is currently highly dependent on electricity to the extent that more than 50% of WASAC's production cost is dominated by electricity cost. This fraction keeps increasing. There is also limited consideration of human capital and social agency as a key ingredient to resilience building, particularly in the face of disruption.

7. Vulnerable water related infrastructure

RELATED INDICATORS

- **1.3** Promotion of social cohesiveness and strong community networks
- **2.1** Incorporation of expert and technical knowledge into decision-making around water issues
- **2.3** Incorporation of social, environmental and economic costs and benefits into decision-making around water
- **4.5** Enforcement of design guidelines and construction standards for water infrastructure
- **5.3** Incorporation of redundancy into water sources, networks and assets

ROOT CAUSES

Social causes

- Limited consultations with residents at all stages of WASH project development affect Kigali's infrastructure resilience. People-centred approaches to infrastructure design and management are not always applied. This leads to poor spatial allocation of utilities or to infrastructure that does not serve the specific needs of residents.
- Precarious livelihoods, poor WASH service provision in some areas, and limited WASAC-community relations contribute to poor ownership and lead to incidents of vandalism around WASH assets.

Environmental causes

- Rapid urbanization, coupled with extreme weather, poor drainage systems and decreased infiltration, contributes to high runoff that in turn leads to soil erosion and frequent floods. On several occasions these have led to high sediments in water sources making water treatment very costly. This is on top of increased health hazards whenever toilets are washed out together with faecal matter during flooding events.
- The hilly terrains of Kigali can be challenging for construction and maintenance of infrastructure services.

Technological causes

- The lack of tools to monitor and report on Non-Revenue Water (NRW) limits WASAC's capacity to timely coordinate maintenance activities and reduce NRW in a sustainable way.
- There is a limited number of qualified utility technical staff and the few that are available lack reliable projections, guidelines, or design standards that would enable them to design, build, operate and maintain resilient infrastructure.

Political and governance causes

- Lack of joint and coordinated planning leads to under-designed infrastructure that is unable to meet the growing water demand.
- Lack of strategic guidance from decision makers in terms of design guidelines and construction management standards. These are needed to ensure the quality of the future water facilities as well as ensure integrity of structures and systems already in place.
- Limited capacity to gather data that informs decision making regarding investments prioritization and management of infrastructure development funds.
- Limited law enforcement and collaboration with grassroot leaders for dealing with vandalism.

Financial causes

- Persistent budget gaps leading to unequal distribution of infrastructure across the city, making water systems inefficient and expensive.
- The need to minimize budget, sometimes results in procuring low quality or cheap equipment with embedded high running and maintenance costs.
- The need to constantly expand utilities for the ever-growing population and newly developed areas puts the government under pressure and financial strain at the expense of building desired redundancy.
- At the household level, there is limited purchasing power for residents to acquire household equipment for reusing, recycling and reducing water (e.g., water harvesting systems).

8.

Low mainstreaming of resilience into key water related plans

CHALLENGE QUESTION

How can Kigali improve integrated planning and implementation of grey-green-blue solutions for stormwater, solid waste, as well as wastewater management; improving health, environmental and social outcomes for residents?

CHALLENGE DESCRIPTION

The city of Kigali is challenged by ensuring adequate infrastructure for its water supply, matching the available resources and needs of the population. One of its main issues is the management of stormwater and wastewater. Wastewater management is mostly done at the individual household level; therefore, it is hindered by the limited technical and financial capacity of most of the city's population. This is mainly due to a lack of public knowledge and awareness in distinguishing stormwater from wastewater. As a result, people often discharge wastewater into drainage canals, increasing both the pollution of waterways and flooding. Solid waste is also dumped in drainage canals, clogging the artificial drainage canals, which diverts the flow and leads to increased flooding and environmental damage.

While there is awareness on the importance of urban planning and a significant effort to provide infrastructure, the city has a history of unplanned development. More specifically, water management was not given proper attention resulting in the development of informal settlements on steep slopes, exposing them to flood hazards and contributing to environmental degradation of sensitive areas and waterways. Lack of wastewater treatment and solid waste management is affecting the quality of surface water and groundwater resources leading to poor health outcomes for residents. Environmental protection is hindered by poor infrastructure and lack thereof, as well as by poor management of stormwater and related catchment issues. Additionally, wastewater treatment capacity is so low that no redundancy is being planned.

The city needs to invest in resources and capacity to improve solid waste, stormwater, and wastewater management, as these also impact the conveyance capacity of existing infrastructural and natural drainage systems due to pollution related clogging, siltation, etc. However, as infrastructure and urban planning are often completed during different stages and by different authorities, this increases the challenges in devising integrated water sensitive approaches to infrastructure planning and hinders coordination efforts around implementation. Although a strong policy push is present, water sensitive planning and implementation of integrated blue-green infrastructure is still at an early stage and inadequate. Uncoordinated planning between future land-use and infrastructure, as well as the lack of appropriate water sensitive design guidelines and construction management standards for blue-green infrastructure and nature-based solutions all manifest in an overall poor integration of various aspects of planning, and in lack of coordination in implementation efforts that heavily affect Kigali's resilience.

As such, the city needs to invest in optimizing its infrastructure planning and implementation with a robust water resilience consideration to ensure sustainability. Strategic policy orientations and technical tools for water sensitive infrastructure resources and capacity development to optimize solid waste, stormwater, and wastewater management to build resilience in the city's water system; are paramount. Such tools must include supporting water sensitive integrated planning, strengthening coordination and stakeholders' engagement in the infrastructure development value chain, strengthening reuse and recycling, reducing pollution, and integrating nature-based solutions, among others.

8. Low mainstreaming of resilience into key water related plans

RELATED INDICATORS

- **5.3** Incorporation of redundancy into water sources, networks and assets
- **5.4** Integrated planning across interdependent urban systems
- **5.6** Promotion of culture, processes and resources to enable innovation
- **8.4** Routine maintenance and upgrade of water infrastructure
- **11.3** Promotion of water-sensitive urban land development
- **11.4** Introduction and enhancement of neighbourhood blue-green infrastructure
- **1.1** Active community engagement and participation around water issues
- **2.1** Incorporation of expert and technical knowledge into decision-making around water issues
- **4.2** Effective enforcement of environmental regulations for water

ROOT CAUSES

Social causes

- Limited community knowledge on reuse and recycling methods and appropriate and sustainable wastewater management approaches. Demonstrates an overall need to sensitize people to water-related issues.

Environmental causes

- Major environmental causes are linked to the combination of the city's challenging landscape and the neglect of hazards such as sedimentation, erosion, siltation, etc. This implies that both natural and manmade hazards are often ignored in the planning process, and the role of blue-green infrastructure is not fully understood.

Technological causes

- A lack of proper tools facilitating integration in planning as well as the lack of appropriate skills in key positions. Impacts integrated approaches and highlights a neglect in considering ways to incorporate blue-green spaces into infrastructure systems.
- There are limited skills for nature-based solutions and water use/smart technologies around water.

Political and Governance causes

- Because of the inherent Imihigo system[1], there is a performance frenzy of various institutional levels/entities (pushing towards short-term wins versus long-term benefits), impacting limited interaction among institutions. As a consequence, there is often a lack of coordination in both operational and planning aspects.
- Lack of knowledge on ecosystem services and their contribution to the city's social and ecological resilience. Implies missing layers in the planning process.

Financial causes

- A general lack of propensity to invest in preventive measures highlights a reactive mentality, which affects innovation and integration in both planning and implementation.
- Integration is limited due to lack of funding, as mechanisms to attribute specific financing lines to the different actors within the same project are lacking.

Other causes

- The academic sector and research centres are not fully exploited as nature-based solutions are not inserted into trainings and curricula.

9.

Inadequate stormwater management system and downstream pollution (originating from the city)

CHALLENGE QUESTION

How can we ensure that residents and businesses in the city of Kigali are resilient to water related disasters and do not pollute the city's water bodies impacting downstream areas?

CHALLENGE DESCRIPTION

Population growth in and around the city of Kigali, is putting increasing pressure on land. Rapid and unplanned expansion of the city has led to a high increment of impervious land in the city, which over time has affected the hydrological behaviour of the city by considerably reducing the soil infiltration capacity and increasing surface runoff. Unplanned development combined with a lack of water management consideration has resulted in a city with limited conveyance capacity of the high amount of surface runoff generated. Therefore, the city's resilience to flooding has been heavily impacted, an impact that is worsening as climate change uncertainties grow.

Another major challenge the city faces is the lack of appropriate wastewater management practices. Currently, in Kigali, the vast majority of residents apply individual wastewater management essentially consisting of discharging all the wastewater in pits that are directly connected with groundwater. In some parts of the city there are traditional and aging infrastructure which was originally designed for a significantly lower population, leading to supply and treatment capacity issues and water quality problems. Moreover, shocks and stresses, such as flooding, exacerbate the effects of ongoing sanitation capacity issues and put increasing pressure on the system. The government is planning to expand and develop centralized wastewater treatment plants within the city.

The nature and impact of poor stormwater and wastewater management in the city is not properly understood due to limited data availability, technical capacity to generate knowledge required for decision making, planning and implementation. Unplanned development also creates difficulty in collecting data and influencing appropriate and localized approaches to stormwater and wastewater management. Insufficient mapping and modelling of the city's groundwater resources have resulted in a limited baseline understanding of the resources opportunity, pollution and interlink with the city's water resilience.

Kigali's water sector is siloed with stakeholders unaware of overlaps as well as coordination opportunities. Until 2019, no water resources board existed in Rwanda and now the Rwanda Water Resources Board (RWB) is still building capacity. Furthermore, the manner in which regulatory bodies are organized leaves room for ambiguity when regulating surface and groundwater resources.

9. Inadequate stormwater management system and downstream pollution (originating from the city)

RELATED INDICATORS

- **4.1** Effective enforcement of economic regulations for water
- **4.2** Effective enforcement of environmental regulations for water
- **4.3** Effective enforcement of public health regulation for water
- **4.5** Enforcement of land use regulations and zoning
- **9.4** Protection of aquatic habitats and ecosystems
- **9.5** Protection of groundwater and surface water resources
- **10.1** Provision of safe water for personal and domestic use
- **10.2** Provision of sanitation services
- **10.4** Provision of health services to reduce trauma from water hazards

ROOT CAUSES

Social Causes

- Lack of coordination and efficiency of management.
- Currently land users are not involved and their role in protecting water resources is not understood. This is heightened by population growth.
- New programs can be confusing and do not achieve long-term resilience. Highlights a need to reinforce existing programs, as the thinking is accurate and best suited for Kigali.

Technological Causes

- Prevalence of aging infrastructure.
- Lack of data causes inconsistent programs to monitor groundwater.

Political and Governance Causes

- Lack of understanding on the arrangement of regulatory bodies, including water supply and management, and water sources and groundwater.
- There is an overall lack of enforcement of water-related programs and initiatives.
- The water resource sector remains under construction as the institution was only formed in 2019.
- Limited coordination between stakeholders and committees.

Financial Causes

- Financial barriers lead to a lack of wastewater facilities.

Environmental Causes

- The current approach to wastewater management practices needs to be adapted to the topography and degree of waste.
- Wastewater treatment is limited in the city, although the government is planning for expansions.
- Outdated infrastructure is not adapted to new issues brought on by climate change, such as heavy rain.

Other Causes

- Lack of a circular process for solid waste management.
- Presence of unplanned settlements creates difficulty to collect data. Currently, the extent of existing informal settlements makes it hard to plan for a good approach to waste management.

10.

Unsustainable water investments due to low economic return

CHALLENGE QUESTION

How can the city diversify its funding sources (increasing private sector and international investment) to fill gaps in operations and maintenance and capital investment in a manner that is equitable and plans for future hazards?

CHALLENGE DESCRIPTION

The current situation in Rwanda is characterized by the lack of enough funds. Additionally, the limited available funds are not equitably accessible. The same applies to disaster risk funding, which has limited resources and very long and complicated application procedures. On top of this, affected communities have no access to funds. Some of the main reasons affecting the access to funds revolve around the critical skills gaps in project financing, asset management, resilience planning, data management and analysis, and project implementation from the city and government entities staff, as well as the civil society and private sector. As a result, it is a challenge to develop bankable programs and projects with sound cost benefit analysis and compelling cases for theories of change to attract financing.

Investment in sectors such as solid waste management and wastewater management is urgently needed. Service levels in these two areas are very low and this impacts the quality of water resources available, cost of providing clean water (resulting from pollution, inadequate treatment, and discharge), and the health of the community, most especially vulnerable communities. The present situation is redundant, due to the lack of expertise and conflicting mandates, in such a way that the limited funds are invested in developing more studies and plans without any concrete implementation on the ground. The rate at which studies and plans are produced does not match the rate at which funds are mobilized to implement them.

An additional challenge is the overlook of the operations and maintenance (O&M) funding requirements. Most of the time this component is not prioritized because it must be self-financed. Programs and projects are funded for a limited amount of time and therefore uptake is required to operate and maintain what was achieved. The latter is mostly affected by a lack of ownership, poor planning and conflicting mandates which impact decisions on local funds allocation. O&M falls under local agency mandates and does not have sufficient funding (local revenue/budget) without federal support. O&M funding needs to be diversified to include more private sector and international funding as well as increased local revenue sources (tariffs, fees, taxes etc.).

10.

Unsustainable water investments due to low economic return

RELATED INDICATORS

- **4.1** Effective enforcement of economic regulations for water
- **5.1** Active monitoring and evaluation of programs (3 score)
- **5.3** Incorporation of redundancy into water sources, networks and assets (2.3 score)
- **5.4** Integrated planning across interdependent urban systems (2 score)
- **5.5** Integrated planning with agriculture and food supply chains (2 score)
- **6.2** Provision of sufficient financial resources for maintenance and upkeep of water infrastructure (2.5 score)
- **6.3** Provision of sufficient financial resources for new water programs and projects (2 score)
- **6.4** Water and sanitation pricing for cost recovery and demand management (3 score)
- **7.4** Ensuring adequate financial resources for recovery of households and businesses (2 score)
- **7.5** Promotion of community capacity for preparedness and response to water hazards (3 score)
- **9.1** Active monitoring and evaluation of environmental resources (3.5 score)
- **9.5** Protection of groundwater and surface water resources (3.5 score)

ROOT CAUSES

Political and Governance causes-

- There is too much focus on quantitative indicators and less on qualitative indicators which enhance siloed approaches. Old policies are based on quantitative indicators.
- Uncoordinated planning leads to disconnection between actors.
- City has committed to restructure every 3 years which creates a challenge for retention.

Financial causes-

- Projects are often implemented but not maintained due to lack of funding for project maintenance.
- The city does not have large capital investment related to water resilience programs or infrastructure. There are financing gaps which make the efficiency, timeliness, and accessibility for new projects/programs challenging.
- Private sector investment is lacking and their commitment to sustainability is low.
- While there are plenty of available funds allocated for planned blue infrastructure, there are no clear financing mechanisms for green infrastructure which restrains private developers' investment/action in this regard.

Social causes-

- Lack of water use efficiency awareness.
- Lack of stakeholder mapping and engagement.

Environmental causes-

- Landscape restoration activities are uncoordinated.
- Wastage of water due to loss and leakage and a payment for wasted water could help generate funding.

Technological causes-

- Old infrastructure leads to loss of water.

4. SUMMARY

Over the course of the assessment, more than 40 stakeholders from key city government agencies, academia, business, and civil society assessed the strengths and weaknesses of Kigali's water system. 10 critical challenges were outlines through this process and corresponding actions were developed to address these challenges. The overarching themes of these actions include creating a data collection and analysis platform, improving coordination between stakeholders, guiding the creation of new opportunities around the conservation of wetlands in the city, helping to bridge the gap of unequal distribution of water infrastructure in the city and increasing the retention of trained experts in public administration. The work of these diverse groups of stakeholders provides a sound foundation for an action plan that can be enhanced through continued coordination.

Kigali, © Rachel Strohm, Flickr

NO.	CHALLENGE	VISION	ACTIONS
1.	**Lack of shared quality data**	*A vision for actionable, high quality, accessible data that is shared between stakeholders from public agencies, academic institutions, and the private sector to support management of water resources.*	**Action 1 -** Leverage existing data platforms to build a water resilience dashboard for decision support for the city of Kigali. **Action 2 -** Operationalize the Kigali data platform through promotion of entrepreneurship around data and engagement of academia and youth in data collection and analysis to enhance data-based decision making in water resilience. **Action 3 -** Develop data-based decision making and monitoring approach for key strategic projects where large investments are planned in the near future in the city.
2.	**Limited livelihood around water bodies**	*Well-developed and enforced guidelines and standards for the use of Kigali's water bodies and their buffer zones.*	**Action 1 -** Development of guidelines and standards for the use of Kigali's water bodies and their buffer zones. **Sub-action 1.1 -** Development of detailed guidelines and standards for land uses in and around the water bodies and their buffer zones by communities. **Action 2 -** Training of relevant government agencies mandated with enforcement, monitoring, and evaluation. **Action 3 -** Development of an engagement framework to build awareness and capacity among private sector and communities to comply with new guidelines for water use.
3.	**Limited technical capacity in water resilience**	*Build capacity to advance Kigali's water resilience.*	**Action 1 -** Establishment of a Water Resilience Hub to develop tailor-made training programmes for public sector and other urban professionals, to support applied research, and to facilitate knowledge exchange and peer-to-peer learning. **Sub-action 1.1 -** Comprehensive Needs Assessment for the establishment of capacity building services for professionals in water related sectors. **Action 2 -** Organize an annual Urban Water Resilience Exchange and Learning Event. **Action 3 -** Develop and implement vocational training programs on water resilience across different professional sectors. **Action 4 -** Conduct reviews and provide relevant recommendations for improvement of water-related curriculum in academic institutions. **Action 5 -** Strategic mentorship and empaneled experts program to sustain long-term capacity building at the individual and city level and support retention of in-city talent in the water sector in the city of Kigali.
4.	**Ineffective engagement of stakeholders in water resilience planning process**	*Innovative stakeholder engagement approaches for inclusive water resilience planning and implementation*	**Action 1 -** Develop and implement effective communication channels that can enable timely dissemination of information on water stresses and shocks among communities. **Action 2 -** Explore innovative and interactive mechanisms to strengthen the existing stakeholder engagement platforms for inclusive water resilience planning and implementation. **Action 3 -** Leverage existing initiatives and venues to host water exhibitions to increase awareness and build a new generation of water resilience champions.
5.	**Ineffective multi-level water governance**	*Well-coordinated water governance, at the community level, towards water resilience.*	**Action 1 -** Establish a community water governance framework for effective management of water assets through community engagement and ownership.

NO.	CHALLENGE	VISION	ACTIONS
6.	**Ineffective development & enforcement of water related services regulations**	*Ensure high quality water-related services.*	**Action 1 -** Strengthen the capacity of regulators in developing and proactively enforcing regulations for water-related services.
7.	**Vulnerable water related infrastructure**	*Build resilient water-related infrastructure in the city of Kigali.*	**Action 1 -** Adopt technical guidelines for resilient water-related infrastructure in the city of Kigali. **Action 2 -** Develop a water safety strategy for Kigali's water systems. **Action 3 -** Enforce/Promote circular water technologies (water reuse and recycling) through the building construction permitting process. **Action 4 -** Develop a smart monitoring tool for water losses and water assets management.
8.	**Low mainstreaming of resilience into key water related plans**	*Enhance resilience of key water-related plans.*	**Action 1 –** Develop a water resilience checklist for relevant city of Kigali plans.
9.	**Inadequate stormwater management system and downstream pollution (originating from the city)**	*Flood resilient city with healthy water bodies.*	**Action 1 -** Develop a stormwater management plan for the city of Kigali. **Action 2 -** Develop a detailed nature-based solution framework for the city of Kigali. **Action 3 -** Develop a priority bankable nature-based solution investment program for the city of Kigali. **Action 4 -** Develop a priority bankable sanitation investment program from the city of Kigali sanitation master plan (under development).
10.	**Unsustainable water investments due to low economic return**	*Ensure sustainable water investments.*	**Action 1 -** Develop a resilience screen tool to prioritize water investments with high resilience dividends. **Action 2 -** Develop mechanisms to optimize the economic return of prioritized water investments. **Action 3 -** Review and adopt policies to attract private sector investments in the water resilience in Kigali.

VISION 1

VISION STATEMENT

A vision for actionable, high quality, accessible data that is shared between stakeholders from public agencies, academic institutions, and the private sector to support the management of water resources.

OPPORTUNITY STATEMENT

Partner with youth and academic institutions to build a community of practice, foster citizen participation in data collection and analysis, and invest in innovative data platforms to encourage entrepreneurship around data and pilot strategic data initiative projects.

RELATED CHALLENGE

#1 Lack of shared quality data

VISION DESCRIPTION

In order to prepare for future water-related natural disasters and monitor the quantity and quality of Kigali's water systems, the city must address the challenge of ensuring data is actionable, of high quality, accessible and shared between stakeholders. To best address this challenge, it will be important to think "out of the box" with new ideas to reach the shared vision of building a community of practice of data users and providers and developing a mechanism for data sharing relevant to Kigali's water resilience efforts.

This vision aims to empower communities to influence water plans, regulations, and policies by increasing public access to data and information on a continuous basis. Students and the younger generation will be involved as key players to improve the systems of data collection and sharing which will enable further public access to data and increase the available data surrounding potential water-related risks to Kigali. It is believed that the accessibility of data will foster and inform more accurate academic research on the city's water system, therefore, further building knowledge and capacity for water resilience. Youth engagement is an important component in collecting reliable data and ensuring it is collected on a regular basis so that the city of Kigali's future plans and policies remain up to date.

Data quality and accessibility will be improved in Kigali not only through youth engagement but also by bringing all actors together for a common goal. Through the utilization of technologies and innovative solutions, Kigali will be able to connect information and experts more efficiently. The current use of external resources and consultants slows down the process of planning within the city. There is a need to focus on increasing the data capacity and knowledge of both water users and decision makers to inform the planning process with strong evidence-based assessment. Open-source data solutions will be integrated into data platforms and strategic projects to encourage sharing data among stakeholders and across different agency levels, as well as decrease the presence of biased data. Additionally, investments from the private sector and the promotion of entrepreneurship can be leveraged to increase the financial resources available to support data collection and improve data quality.

VISION 1

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Create a community of practice around data collection and sharing for sustainable data coordination in the long run.
- Promote awareness of why sharing quality data (including spatial, socio-economic, etc.) and information across institutions is important for planning the city's urban water resilience needs.
- Identify and develop strategic priorities for integrating robust data collection and monitoring processes into key strategic projects in the city.
- Enhance knowledge and capacity on data technologies and their related systems.
- Identify and increase funding opportunities for enhanced data management in Kigali.

RELEVANT ASSETS AND RESOURCES

- Strategic projects identified by stakeholders for piloting data-based decision making and monitoring and evaluation include:

- The National Integrated Water Supply and Sanitation Master Plans for Rwanda
- Rwanda's Green Growth and Climate Resilience Strategy (GGCR)
- National Water Resources Master Plan for Rwanda
- National Land Use and Development Master Plan
- Kigali City Wetland Master Plan

SHOCKS AND STRESSES

- Increased flooding and landslides due to climate change impacts
- Industrial pollution of water systems and lack of proper procedural monitoring
- Non-compliance with open-data systems and lack of consistent adoption of data policies
- Differing standards around water quality and ecosystem monitoring at the national and city levels
- Repetition of the same data collection activities among different agencies and institutions

OVERALL CHAMPIONS

Lead

City of Kigali, University of Rwanda

Partners

WASAC, RWB, RISA, youth organizations, and programs in the water-related field

Approval

City Council

ACTION 1.

Medium-term – Leverage existing data platforms to build a water resilience dashboard for decision support for the city of Kigali.

DESCRIPTION

Water sector information needs to be more easily shared among stakeholders. One way to accomplish this is to leverage and invest in innovative data management solutions and to encourage start-ups to share data and promote entrepreneurship around data. By connecting critical information through innovative data platforms, people can better understand the issue of urban water resilience.

This is a good opportunity for the city to see how Kigali can harmonize its data systems by using platforms for communication and continued motivation. Data platforms provide an area for data users to connect and give constructive comments on the data that is put into place. This allows people to see first-hand what can be done differently and then work together using a shared framework.

The water sector is broad with many different components feeding into its resilience. Encouraging innovation and entrepreneurship will help develop interest in key, prioritized areas of the water sector. For example, innovative platforms will enable public agencies to connect with local experts who understand and can share the appropriate water background needed to interpret specific types of data useful for the city of Kigali.

Additionally, the private sector can play a role in this action. Specifically, the private sector can use the platforms to share data and put in place mechanisms such that the data can be trusted within the industry. There is also a need for youth involvement in the water sector, as they can support continuous data collection with minimum investment. By encouraging data management, there will be increased motivation in the small business water monitoring realm which will open new opportunities for youth to get involved in both entrepreneurship and data.

This action aims to develop a water resilience dashboard for the city of Kigali, leveraging on existing data platforms locally and globally, to facilitate the collection, consolidation, harmonization, storage and support access to data related to Kigali's water sector (available water resources, water demands, water consumption, drinking water - storage, treatment, supply, distribution, water resources quality/pollution, sanitation, stormwater, wastewater, flooding, etc.) and specifically on its water resilience.

Rwanda has already invested in conceptualizing an infrastructure spatial data framework, a national spatial data infrastructure and a statistical data platform, these platforms are important assets that can be leveraged by the city of Kigali to build the water resilience dashboard. The Rwanda GeoPortal is an online platform developed by the former Rwanda Natural Resources Authority (RNRA), currently Rwanda Land Management and Use Authority, in collaboration with the Regional Center for Mapping of Resources for Development (RCMRD). This was created to facilitate spatial data sharing among the public, private and non-governmental institutions as well as the general public. The goal of the portal is to improve access to geospatial datasets for decision making and to implement the National Spatial Data Infrastructure (NSDI). In addition, the National Institute of Statistics of Rwanda (NISR) maintains many web-based data platforms to share specific data types. These existing platforms are an important effort in the direction of supporting data-based decision making across institutions and agencies in Rwanda.

RESOURCES

- National Spatial Data Infrastructure (NSDI)
- Spatial Data Framework
- NISR Data Repository
- Rwanda water portal
- ESRI ArcGIS StoryMaps: Platforms like the ESRI StoryMaps offer ready to use dashboard formats that allow cities to upload relevant local data to tell effective stories of key challenges facing their region. Effective story telling encourages awareness of critical environmental issues and motivates stakeholders to take action (Link)
- Digitizing Water: INTERA report on modernizing water utility resiliency with data analytics. Includes a case study from Tampa Bay, Florida using a practical approach to digitization to achieve goals and outcomes (Link)

STAKEHOLDERS

- **Lead:** City of Kigali, University of Rwanda
- **Partners:** Youth based organizations, RWB, RMA, RAB, WASAC, NISR, RISA, REMA, RFA, RLMUA, RHA, RTDA, NIRDA, NAEB, RDB, RURA, MTN, AIRTEL, NCST, Private sector and start-ups

NEXT STEPS

- Create a mapping of all existing databases and systems for data storage in the Kigali water sector. Map ownership and relationships of database owners. Prioritize existing databases and gather insights on what information is conducive for building and integrating a water resilience dashboard.
- Develop policies and standards around collection and sharing between the existing databases and systems as required for the creation of a water resilience dashboard.
- Seek funding to launch a data platform that can integrate information from the various water related data systems in existence in the city.
- Improve accessibility of innovative data platforms.

OUTCOME

Enhancing the capabilities for sharing data through an innovative data platform will lead to improved decision-making for water resilience among various actors. This will build an inclusive data system that leads to an improved overall water system by providing increased water-related data and information. Through promotion of entrepreneurship around data, skills and knowledge of data management, in the water sector, will be retained more effectively due to the domestication of knowledge. Creating increased data management and participation will have a positive impact on building climate and water resilience into Kigali's urban development and growth. This particular action will leverage new technologies and create an established framework to encourage, increased entrepreneurship around data and provide an enabling environment for private sector involvement.

ACTION 2.

Short-term – Operationalize the Kigali data platform through promotion of entrepreneurship around data and engagement of academia and youth in data collection and analysis to enhance data-based decision making in water resilience.

DESCRIPTION

Youth constitute over 53% of the population of the city of Kigali and the city is home to several educational institutes at the secondary and post-secondary level. This generates a wide pool of well qualified graduates with degrees from internationally recognized institutes, a key asset that the city government can mobilize to address gaps in data collection and analysis to enhance data-based decision-making in the water sector. Many examples of such city-university partnerships exist around the world (i.e., Fractal, South Africa), including opportunities to engage with existing programs run by third party partners (i.e., the World Bank's WaterHackathon) to support entrepreneurship around data in Kigali city.

Today, youth utilize digital media, mobile devices and web platforms to share and communicate information with one another easily and efficiently. By including youth in the initial planning and implementation process for data collection and analysis in Kigali, the city can utilize their existing data collection and communication expertise to find innovative ways to quickly address data and communication issues as they arise across their networks. Providing youth with the basic knowledge and foundation of data collection and analysis needs in the water sector will be the first step towards building the capacity of future generations in understanding the city's systems and improving how information is shared across agencies, institutions, and citizens. In addition to bringing tremendous human capital in the form of its large talent pool of students and faculty to this challenge, academic institutions can also bring other resources to the table including access to laboratories, technologies, and research resources to support the city's capacity for enhanced data management and analysis. Connecting directly to current students and recent graduates will consequently help to bridge the data collection and analysis knowledge gaps and create partnerships between academia and public agencies. This connection will allow youth to develop the necessary skills to design new systems with the context of local knowledge and needs in mind.

RESOURCES

- Future Resilience for African Cities and Lands (FRACTAL): FRACTAL brings together researchers, decision makers, and government officials to build the knowledge base around resilient development in response to the impacts of climate change (Link).
- The World Bank and Water and Sanitation Program's WaterHackathon: (Link) Developed as an innovative way to brainstorm solutions to challenges in the water and sanitation sectors. Based off of the Random Hacks of Kindness (RHoK) model where problems are submitted by experts and stakeholders for technology specialists work on during a hackathon event.
- Mobile for Development: The GSMA Innovation Fund for climate resilience and adaptation which supports digital solutions that contribute to sustainable and equitable impact (Link).
- Adaptation Research Alliance: A membership alliance focused on systemic change in climate research in order to collaboratively increase the development of adaptative solutions (Link).
- ISeeChange: Citizen science data initiative programs such as ISeeChange showcase an effective way to crowdsource citizen reported data for monitoring of slow onset changes in the environment. Provides a model for the wetland restoration work in development in Kigali (Link).
- Case Study* – Data Eye: Intelligent ICT Implementation Project in the Takahashi River Basin that aims to re-vitalize the region using data utilisation activities through collaborations between public and private sectors of the local community (Link).

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STAKEHOLDERS

- **Lead:** University of Rwanda's Center of Excellence in Biodiversity and Natural Resources
- **Partners:** Rwanda Young Water Professionals, Water Access Rwanda, Institution of Engineers Rwanda, NCST
- **Approval:** City of Kigali, Rwanda Information Society Authority (RISA)
- **NGOs:** The Green Protector

NEXT STEPS:

- Work with city stakeholders to design a data challenge, such as hackathons, on one of the key emerging themes including water quality monitoring, ecosystem services assessment and/or disaster risk mapping. Identify and confirm the key theme in coordination with universities to motivate students and encourage interest in data.
- Secure a corporate sponsor or apply to an existing program for a grant for innovation in data.
- Identify a set of youth start-ups to engage in the promotion of entrepreneurship around data.
- Engage youth programs in the water-related field and establish a network to share information around enhanced and collaborative data collection.
- Formalize partnerships with key academic institutions and youth organizations to foster youth participation in data collection and analysis and setup Youth Water Leadership Awards.

OUTCOME:

Youth will participate in data challenges and promote data education and awareness throughout their networks. The younger generation makes up the largest portion of Rwanda's population, their participation not only benefits future career development, but also resilience awareness and data skills development for a majority of Kigali's residents. Additionally, public institutions will benefit from a greater percentage of knowledgeable and skilled people in data collection and analysis. Including students in building urban water resilience in Kigali will also lower the costs of data collection while increasing the quality and understanding of the available data and its systems. Providing more advanced education opportunities in the data and water sectors is an asset for the city of Kigali and a starting point for water resilient urban development and growth. By working with youth from academic institutions, a partnership will be formalized to help bridge the gap between public agencies and academia.

ACTION 3.

Long-term – Develop data-based decision making and monitoring approaches for key strategic projects where large investments are planned in the near future in the city.

DESCRIPTION

This action aims to develop data pilots for specific strategic projects, such as FONERWA's Green City Kigali project or the Kigali Industrial Park's Special Economic Zone, as a way to initiate a new model for coordinated data management from design to implementation to monitoring and evaluation. These two strategic project examples provide an opportunity to demonstrate how the city will manage land and water resources in an integrated manner. Land use plans, building designs, landscape designs and construction approaches need to address water in future developments for the near-term and long-term. This will include monitoring both the water consumed in the development as well as the quantity and quality of water returning to the environment as a result of the development. Such monitoring and evaluation through these strategic projects will help develop prototypes for new neighbourhoods and industrial zones to become water smart. In order for this action to be sustainable, the ambitions and plans of these strategic projects will need to draw a connection between the city's existing and future water resilience needs.

The strategic prioritization will be incorporated through data pilots to create a proper system and management plan in addition to a monitoring framework which will give the city of Kigali entry points to venture into longer-term changes for data management and monitoring in the water sector. Specifically, a system will be developed where the owners of these industrial plants can monitor water related needs and impacts in a way that is trusted and cheaper.

The recent improvement and restoration of wetlands in Kigali opens an opportunity for enhanced data collection in this environment to better understand the wetland's ecosystem services and how they relate to the city's water resilience efforts. This also presents the opportunity to connect back to citizen science groups to participate in the data pilot projects as well, leading to a better understanding of not only data accessibility but also of the wetland's value to the city.

RESOURCES

- The SmartData Platform (Chicago): This platform is an open source predictive analytics tool that enables data-driven decision making to ensure city operations are smarter and more efficient (Link)
- Case Study* – Data Eye: Intelligent ICT implementation in the Takahashi River Basin that aims to re-vitalize the region using data utilisation activities through collaborations between public and private sectors of the local community (Link)
- Houston Sustainability Indicators (HSI) project: Provides sustainability performance tracking and analytics for the city of Houston which can be used as a framework for cities without comprehensive plans (Link)
- Smart Water Management (SWM) Project: SWM focuses on the use of smart systems to address water management challenges. Case studies are provided to document knowledge on the use of SWM globally (Link)
- Growing Water Smart Growth: A Lincoln Institute and Sonoran Institute project (Link) with the potential to leverage this methodology and workshops to assess best approaches in water management for strategic actions.
- Case Study* - SIGeo: Integrated Geoinformation Management of the City of Niterói provides open access to the city government's geoinformation and fosters closer coordination among various departments (Link)

STAKEHOLDERS

- **Lead:** Rwanda Green Fund (FONERWA), Rwanda Water Resources Board (RWB), Rwanda Development Board (RDB), MINICOM
- **Partners:** Green City Kigali, Global Green Growth Institute (GGGI), Rwanda Environment Management Authority (REMA), Intergovernmental Hydrological Program (IHP),
- **Approval:** City of Kigali; MINECOFIN

NEXT STEPS:

- Identify the strategic projects to collaborate with for a pilot data initiative.
- Develop a data management plan to incorporate into the data pilot.
- Work with the city of Kigali to establish a coordinated monitoring framework.
- Use peer-to-peer learning exchanges to understand the path of those who have been successful with data pilots for strategic projects.

OUTCOME:

A model will be created that improves the trend in the specific management strategies people use to collect data. Pilots will influence Kigali's urban water resilience plans by adopting a water-related focus to data management strategies in the city. These efforts will give the city detailed data on water quality and pollution in the surrounding water systems and wetland habitats. By establishing monitoring mechanisms, in strategic city projects, there will be an increase in data accountability and transparency. This will enable the identification of areas where planning has previously relied on outdated data and will encourage the hiring of new staff members dedicated to data within agencies and organizations.

VISION 2

VISION STATEMENT

Well-developed and enforced guidelines and standards for the use of Kigali's water bodies and their buffer zones.

OPPORTUNITY STATEMENT

The policy and planning provisions, as well as the topography and climate context, facilitate the use of natural features in water management, such as gravity. The opportunity to develop and implement water use and land use regulations in the urban wetlands, water bodies and buffer zones are context specific, science-based, and support a balance between water use and environmental protection in a manner that sustains the ecosystem services of the wetlands and empowers both the city officials and the citizens to take collective action for improved wetland and water body management in Kigali.

RELATED CHALLENGE

#1 Lack of shared quality data

VISION DESCRIPTION

Kigali's wetlands are an important source of water for the city and help the city improve its resilience to flood risks. It is therefore critical that Kigali actively manages the health of these ecosystems and protects them from current and future climate and development risks. However, the city is growing rapidly and there are pressures on land that are affecting the wetland ecosystems. Proactive and inclusive management of these wetlands is needed to ensure long-term sustenance of this important asset. This vision supports the development of detailed, science-based and context specific water use guidelines that ensure livelihoods and lives dependent on water use in the wetlands are sustained, without compromising the environmental quality of the wetlands. In addition, this vision recommends the development of land use guidelines, around wetlands and water bodies and in the buffer zones, that are actively monitored to ensure impacts from sub-basin and catchment levels are managed as well. Further, this vision recognizes that for guidelines to be effective, capacity among city staff is needed and this will be supported by instituting training and capacity building programs for city staff to support the development of skills needed to effectively monitor guideline compliance. Lastly, this vision aims to empower communities dependent on water use from wetlands to adopt environmentally sound practices of water use and disposal. This will be achieved through awareness building programs, knowledge, incentives (financial and technological) for improved water use practices, and access to services to support a collective approach to the management of the wetlands.

The Rwanda Environment Management Authority (REMA) and Ministry of Agriculture and Animal Resources (MINAGRI) have an ongoing initiative for improving the wetland ecosystems by carefully managing the practices of urban agriculture cooperatives working in and around wetlands. There is an opportunity to develop detailed guidelines and standards for cooperatives on the land use in the urban wetland buffer zones. These standards and guidelines need to be developed using science-based design and enforced and monitored based on their impact on urban water quality.

To increase the resilience of communities in the city of Kigali, the livelihoods around water need to use an approach that is cognizant of the urban and geographic structure of the city to better understand and ensure the improved quality of surface water flowing to and from urban wetlands. For example, the

VISION 2

land uses around urban wetlands receive higher quantities of wastewater from uphill, and the activities conducted on the buffer zones have higher impact on the wetland water quality. Low water quality affects the urban water supply. Having proper guidelines and standards will create livelihoods around water by empowering communities and cooperatives to apply innovative and appropriate livelihood activities. To achieve this, based on the initiative of MINAGRI and REMA, all land in and around wetlands needs to enforce strict regulations and practices. Technologies need to be employed with respect to improving the quality of run-off water draining into the wetlands, while at the same time working with urban agriculture practices that improve wetland functionality.

The guidelines and standards for the use of urban wetlands will ensure that communities using the wetlands fully understand the content of the guidelines and standards and that the city has the capacity to measure the long-term impact of livelihoods on water quality.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Adapt the current operations of agriculture cooperatives working in wetlands to account for the multiple functions of urban wetlands (i.e., flood control, water purification, biodiversity conservation, etc.).
- Incorporate activities that promote water quality.
- Strengthen the shared knowledge and guidance to reinforce appropriate use of water for livelihoods.

RELEVANT ASSETS AND RESOURCES

- Kigali Urban Wetland Master Plan
- The National Integrated Water Supply and Sanitation Master Plans for Rwanda
- The Rwanda Sustainable Water and Sanitation Program
- City Development Strategy (IDS) 2018-2024
- Bachelor of Science (Hons) in Water Resources Engineering at University of Rwanda
- A master's course program in Water Resources and Environmental Management at University of Rwanda

SHOCKS AND STRESSES

- Poor water quality in wetlands due to human activity upstream and around the wetlands
- Landslides due to the poor soil stability and depletion of forest cover
- Flooding due to high rainfall intensity, high topography, reduction of permeable spaces from rapid urbanization and encroachment of natural flood prone zones
- Informal settlements within and around wetlands

OVERALL CHAMPIONS

Lead

Rwanda Environment Management Authority (REMA) and city of Kigali

Partners

Rwanda Land Management and Use Authority (RLMUA), Ministry of Agriculture and Animal Resources (MINAGRI), Rwanda Water Resources Board (RWB), Rwanda Development Board (RDB)

Approval

City Council, Ministry of Environment (MoE)

ACTION 1.

2

Overarching - Development of guidelines and standards for the use of Kigali's water bodies and their buffer zones.

DESCRIPTION

The development of the guidelines and standards will build on the provisions from Kigali's Wetlands Master Plan, which developed a zoning of the city's wetlands. These guidelines will be science-based and context specific to serve the water use of the urban wetlands, and they will integrate livelihoods protection and promotion, environmental protection, and more. Once the guidelines are finalized and approved, a module for capacity development in the application of the guidelines will be necessary for the local government to ensure the application, enforcement, and impact evaluation of the guidelines. The content of the guidelines and standards will be developed and disseminated in a manner that will be accessible to the communities using the wetlands. This includes developing feedback mechanisms for communities to inform the development of the guidelines during planning stages and on an ongoing basis to ensure they appropriately balance water use and quality for communities near the wetlands and the city as a whole.

RESOURCES

- The Striking a Balance (SAB) Wetlands International project: An approach developed to value wetland conservation efforts and connect it with livelihood development through sustainable wetland management (Link)
- Paraná's Water Basin Committees: Developed as a way for local government departments and residents to work collaboratively on an environmental renewal project (Link)
- Kigali Nyandungu Urban Wetland Park: Supported by REMA to showcase protection and creation of urban wetlands that improve the quality of water (Link)
- Case Study* - The Eco-district Programme: Initiated under the Green City Development Programme (GCDP), utilizes an approach which aims to strengthen the resilience and sustainability of Indonesian cities (Link)

STAKEHOLDERS

- **Lead:** REMA, City of Kigali
- **Partners:** MINAGRI, RWB, RLMUA, RDB
- **Approval:** City Council, MoE

NEXT STEPS

- **Short term:** Development of studies, guidelines, and standards.
- **Medium term:** Adoption of guidelines, development of a monitoring framework and feedback mechanisms, capacity development to communities and cooperatives, and capacity development to the government agency mandated with enforcement and monitoring.
- **Long term:** Evaluation of urban wetlands water quality and livelihoods, adoption of new technologies and innovation.

OUTCOME

Through sustainable management of urban wetlands, the quality of the water supplying the city is improved, and more livelihood opportunities are created around wetlands/ water bodies.

SUB-ACTION 1.1

Supporting action - Development of detailed guidelines and standards for land uses in and around the water bodies and their buffer zones by communities.

DESCRIPTION

Setting standards for land use changes in the areas surrounding the wetlands, especially in the buffer zones denoted as sensitive areas that impact ecosystem functioning of the wetlands, is critical. Impacts such as heavy runoff and waste dumping are key challenges that are impeding water quality and the ecosystem services provided by the wetlands. The wetlands buffer zones are impacted by urbanization and the wetland water is affected by the degrading ecosystems. The urban wetlands are important because they drain the water to the sources of water supply for the city. In order to ensure the functionality of the wetlands, the land uses around urban wetlands need to be regulated. The national environment authority, the national land use authority and the city authority have taken steps towards reducing the impact of urban development on the wetland ecosystems. For example, the Kigali Master Plan promotes land uses that protect and restore urban wetlands, and recently, the national government is enforcing the creation of an urban wetland master plan that will identify the wetland land uses. This activity builds on the efforts to date, bringing the communities at the forefront of livelihoods around water.

The creation of detailed guidelines for using the land surrounding the wetlands will be developed for the communities living around the wetland, including the cooperatives for urban agriculture, and will be monitored by the city. Additionally, the act of identification, selection and nourishment of certain plant species around the wetlands will serve a triple purpose of ensuring livelihoods for community members, cleaning contaminated water entering the wetlands, and reducing erosion and flood risks.

The activity includes the development of a detailed monitoring framework to ensure the guidelines will help protect the wetlands that are crucial sources of water supply for the city of Kigali. The monitoring framework will integrate a community feedback mechanism from the communities implementing the guidelines. The successful implementation of the guidelines will be best evidenced through community buy-in for the program.

STAKEHOLDERS:

MINAGRI, MoE, REMA, RLMUA

NEXT STEPS:

- Develop detailed studies on how land uses can support improved water quality in urban wetlands and downstream ecosystems.
- Develop detailed studies regarding vegetation and plant species in the surrounding ecosystems. In addition to studying urban agriculture practices that can be performed in urban areas for the purpose of aiding water capture, retention, cleaning and draining.
- Develop detailed guidelines and standards for land uses by communities in and around the wetlands.
- Develop a monitoring framework for land uses in urban wetlands and buffer zones whereby the new guidelines and standards are applied.
- Establish a community feedback mechanism (city level, sub catchment level, cell level).

OUTCOME

Detailed guidelines and standards for land uses in and around the wetlands for the use of communities and cooperatives living and working around urban wetlands in Kigali.

ACTION 2.

Training of relevant government agency mandated with enforcement, monitoring, and evaluation.

DESCRIPTION

The implementation of the Kigali Master Plan involves multi-sectoral collaboration and the presence of the national authorities in Kigali which constitutes great capacity to implement local policies. City water managers and assigned teams will undertake training to perform their jobs professionally to ensure long-term effectiveness of the program. Well-designed training programs will be instituted to train and equip city inspectors in monitoring and enforcing the land use and water use guidelines for the wetland and buffer zones. The training will also ensure that city inspectors have the skills needed to use the appropriate technology to conduct tests or assessments, document processes and results, and follow appropriate reporting schedules and mechanisms including follow through actions such as recovery of penalties and/or redressal of complaints. The training must target officers with a good understanding of the objective of such guidelines and be able to manage complaints mechanisms and prevent risks. The city of Kigali has already conducted evacuation of illegal polluting activities in urban wetlands, raising awareness about the importance of water sources. The action aims to improve the relation between land users and the city authorities to create more opportunities of livelihoods around water that protect the ecosystems.

STAKEHOLDERS

City of Kigali

NEXT STEPS

- Develop a training module.
- Conduct training.

OUTCOME

Institutional capacity development in the application and monitoring of guidelines and standards for urban land uses in and around the wetlands.

ACTION 3.

2

Development of an engagement framework to build awareness and capacity among the private sector and communities to comply with the new guidelines for water use.

DESCRIPTION

This action recognizes that many communities are dependent on water use from wetlands for livelihoods and their basic needs. It aims to build awareness, capacity, knowledge, and provide monetary incentives to cooperatives and other users to adopt practices that support improved environmental protection and water quality, while sustaining the health and wellbeing of these communities.

The action is enabling communities and the private sector to apply new approaches and to transfer and develop innovation that improves the water quality in the urban wetland. The cooperatives for urban agriculture and other forms of associations are an instrument to mainstream the guidelines and their application. In addition to advocacy and training, the activity is proposing financial incentives to encourage the creation or growth of local economies while protecting the wetland ecosystems.

RESOURCES:

Case Study* - Carbon Banking in Gwangju: A program to spark voluntary carbon-saving steps and engagement by citizens. Five years later, 1.5 million Gwangju citizens were already participating, which is 62 percent of the city's population (Link)

STAKEHOLDERS

Communities and cooperatives working in and around the urban wetlands, small business operators, youth groups

NEXT STEPS

- Develop manuals and communication materials.
- Conduct communication programs (e.g., newsletters, ads etc.) and implement outreach efforts to communities and cooperatives (townhalls, community meetings, workshops etc.) on the new guidelines and standards.
- Deliver training to communities and cooperatives.
- Invest in business development focused on the application of the standards.

OUTCOME

Communities and established cooperatives are equipped to comply with the new guidelines and standards.

VISION 3

VISION STATEMENT

Build capacity to advance Kigali's water resilience

OPPORTUNITY STATEMENT

Collaborate and partner with educational institutions and development partners to bridge the gap between the available skills and technical expertise of the labour-force and Kigali's public sector needs to improve Kigali's capacity to improve service provision and build resilience in the city's water system.

RELATED CHALLENGE

#3 Limited technical capacity to identify, develop and implement water resilience actions, solutions, and projects

VISION DESCRIPTION

To build resilience within its water system, the city of Kigali needs to think about how to attract and keep the best talent, how to create a positive workplace culture and how to prepare for the future considering its growth and development potential in the region. While building resilience and tackling climate change are core priorities for the city, it is not properly staffed to tackle these initiatives. In addition to developing a strategy on how to attract new talent, the city needs to think about how it can support its educational and academic sector to not only build a robust talent pipeline but to support the city in identifying the right solutions and develop local knowledge and specific approaches that cater towards its resilience and development needs. In parallel, the city needs to think about how to develop the skills and capacity of public officials and how to keep staff in the public sector work force through targeted internal and external training and capacity building measures.

One of the challenges in the city of Kigali, with a recurrent nature despite regular efforts invested to address it, is the lack of technical and human capacity in government agencies and decentralized entities. Capacity building strategies and programs were developed and implemented to increase the technical and human capacity of different organizations within the government, some were proven successful and others less so. Many junior officers were trained and gained advanced skills and expertise over time; however, the government has failed to retain them. The current structure is set in such a way that the level of expertise is not considered in the benefits obtained from the job. This leads to local senior experts going for better job offers outside the government organization that has invested in their expertise development. Although, at this stage, it is not straightforward to address this issue, an alternative solution to address this issue could be conceptualized and implemented for the city of Kigali. An alternative to the retention policy for the city of Kigali would be to set up an expert's roster program, which will consist of a pool of experts readily available on an as-needed basis for specific assignments requiring advanced expertise. In this way, the city will have additional capacity to address the observed challenges.

To develop a better understanding of existing gaps and current and future needs, the city will have to conduct a comprehensive staff capacity and capacity needs assessment. Furthermore, the city needs to investigate new partnerships and improved approaches to working with academic, as well as technical and vocational education and training (TVET), institutes to ensure resilience thinking and state of the art planning approaches are integrated into existing curricula and developed through applied research, therefore, helping the city to address its capacity needs. The city will have to think about innovative strategies to recruit talent and provide personnel development, coaching and mentoring to foster

VISION 3

career development and how to build technical capacity through national and international collaboration, internal and external knowledge and staff exchange or placements, and peer-to-peer learning leveraging different stakeholders including the public and private sectors.

The vision aims at developing and strengthening the skills and knowledge key government stakeholders (individuals and organizations) need to identify, develop and implement actions, solutions and projects that build water resilience. Although this vision is primarily aimed at improving public sector capacity, it will reverberate to meet demands by the private sector and non-profit organizations which makes it important for the city to think about how to develop capacity but also how to retain talent within the public sector. It will directly support the city in meeting its goals towards becoming a green and innovative city while at the same time addressing youth unemployment in the medium- to long-term.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Identify skill and capacity gaps, and their root causes, that need to be addressed to future-proof the city's organization and operation.
- Develop curricula that anchor on resilience building to respond to existing skills gaps in the water sector.
- Improve service delivery within departments working in the water sector.
- Improve the implementation power of Kigali's green development and resilience building goals.

RELEVANT ASSETS AND RESOURCES

- The National Integrated Water Supply and Sanitation Master Plans for Rwanda
- Rwanda's Green Growth and Climate Resilience Strategy (GGCR)
- The Resilience Roadmap

SHOCKS AND STRESSES

- Urban fire
- Heavy rainfall, flooding, and landslides
- Infrastructure failure
- Epidemics and pandemics
- Lack of affordable housing and informal settlements
- Rapid population growth
- Environmental degradation and unsafe living conditions
- Inadequate transport infrastructure and services
- Unemployment
- Water shortage

OVERALL CHAMPIONS

Lead

City of Kigali, National government (Water and Sanitation Corporation; Rwanda Water Resources Board)

Partners

University of Rwanda, Rwanda Polytechnics, Rwanda T-VET Board, Private Sector Federation, Utility representatives

Approval

Ministry of Education, Ministry of Finance

ACTION 1.

3

Overarching – Establishment of a water resilience Hub to develop tailor-made training programmes for public sector and other urban professionals, to support applied research, and to facilitate knowledge exchange and peer-to-peer learning.

DESCRIPTION

This action aims to improve and institutionalize collaboration between the city of Kigali, local training institutes, colleges and universities with an option to extend and include other regional, or even international, partners to develop and facilitate water and climate resilience related research and training programs and to create a platform to collect, share, and capitalize on learnings and knowledge produced in the city. Similar to the African Cities Lab, set up by African Center for Cities in South Africa, this action aims to develop continued professional development training programs tailored to the needs of public sector officials and other urban and water professionals in Kigali, Rwanda, and the region. The Hub will provide a training and research platform bringing together organizations in the private, public, knowledge, and NGO sectors to do work or conduct research that directly or indirectly contributes to building water resilience in Kigali and other cities. It will provide professionals and civil servants with a space to exchange ideas, learn about new tools and approaches and jointly develop capacity to plan for and identify actions to improve water resilience.

The Hub will address specific and emerging local challenges in the water sector, in the city and the region including but not limited to climate induced flooding, landslide risks, and water scarcity. The lab will include the establishment of a Center of Excellence (like the Institute for Coastal Adaptation and Resilience (ICAR) center at Old Dominion University) to build out and leverage research, education, and community partnerships to develop practical solutions to existing and future water and climate challenges. It will focus and establish partnerships to advance applied research around emerging areas of practice that require enhanced knowledge and skills to plan and design for resilience including predictive analytics using climate models, which evaluate the level of acceptable risk and assess scenarios for action to reduce damage and loss and adapt to future conditions. The Center of Excellence will also aim to enhance academic goals by promoting learning and research in emerging fields. Through this action university resources will be mobilized to develop climate modelling, project future flood risk, recommend new adaptation measures as well as support ongoing monitoring that can evaluate efficacy of interventions already planned to mitigate risks in the near- and medium- term as climate science and data is updated.

RESOURCES

- African Cities Lab by the African Centre for Cities: Provides professional development training that is context-specific for various urban professional audiences across Africa (Link)
- Institute of Coastal Adaptation and Resilience (ICAR): Example of a research centre for applied research at universities dedicated to city collaboration and support (Link)
- US Army Corps of Engineers' Institute for Water Resources: Example of national level training programs by federal agencies with an online learning centre including webinars, risk resources, and training courses (Link)

STAKEHOLDERS

- **Lead:** CoK and University of Rwanda
- **Partners:** RWB, MININFRA, WASAC, REMA
- **Approval:** MINECOFIN, MINEDUC
- **NGOs:** RYWP, Water for People, RISD

3

NEXT STEPS:

- Develop a framework for collaboration between the city of Kigali, technical colleges, and universities, defining how planning efforts should allow for involvement and interactions of all parties.
- Enhance collaboration and integrate water programs in university and college curricula. Create new ways to collect, share and capitalize on all the knowledge produced (i.e., through previously built web-platform).
- Develop project opportunities to devise occasions for engaging students around pilot projects, therefore creating chances to bring their knowledge to the table. Set-up programs to exchange knowledge around integrated planning and implementation efforts.
- Monitor and evaluate pilot projects to learn from their processes and outcomes and strategize how to scale accordingly. This includes funding roles of private sector and broader stakeholders in designing bankable projects.

OUTCOME:

- Mainstreamed interdisciplinary knowledge and integration of NBS and green-blue infrastructure approaches into various technical curricula.
- Improved understanding and knowledge of integrated planning efforts around water resilience for future professionals.
- Realized demonstrative projects using NBS and green-blue infrastructure approaches to build water resilience in the city.
- Kigali and Rwanda placed as a leader in water resilience curricula, capacity building and peer-to-peer learning efforts.

SUB-ACTION 1.

3

Short-term – Comprehensive needs assessment for the establishment of capacity building services for professionals in water related sectors.

DESCRIPTION

The current gap between the capacity of graduating youth and the needs of Kigali's water system is stark. This action aims at understanding the root causes of the current mismatch between labour and market needs. An in-depth assessment will enable the identification of the current needs of the main stakeholders in Kigali's water sector, in terms of capacity to both deliver its work and integrate aspects of resilience planning.

This process will involve an assessment of skills gaps within relevant departments working on areas such as water service provision, sanitation, flood protection, and land-use planning to identify where increasing training opportunities are most crucial. Additionally, the city will work with the private sector to understand the needs required to strengthen cooperation in the water sector. The assessment will explore current governance models, working, for instance, towards increased capacity for the decentralization of services, cost recovery, etc. In addition, the comprehensive needs assessment will target new investments being proposed in the city to understand the current set of skills needed to carry this work.

RESOURCES

- Environment and Natural Resources Capacity building strategy

STAKEHOLDERS

- **Lead:** City of Kigali, University of Rwanda and other educational institutions, Rwanda T-VET Board, Private Sector Federation (PSF) and other private sector actors
- **Partners:** Rwanda Water Board, Water and Sanitation Corporation, Development Partners with demonstrated experience in water resilience (Resilient Cities Network, World Bank, WRI, C40 cities, etc.)
- **Approval:** Ministry of Education, Ministry of Labour

NEXT STEPS

- Conduct the needs assessment exercise to understand gaps in labour supply and demand in the water sector. A wide range of stakeholders needs to be engaged in this exercise.
- Identify gaps that need improvement to strengthen planning, management systems, and performance in terms of technical capacities, as well as organizational performance.
- Identify priority topics within the water sector to develop intensive capacity building programs for technicians and mid- and high-level managers.
- Strengthen cooperation between public entities in the water sector with universities and technical colleges in order to bridge the gap between professional and technical training and the needs of the sector.

OUTCOME

This action will help Kigali develop an understanding of the gaps between the available workforce and the needs of its water sector. In doing so, it will help identify the root causes that can shape the development of coursework tailored to the resilience needs of the city's water systems and better prepare young graduates who are joining the workforce. This will increase the number of qualified professionals seeking employment in Kigali's public sector and improve its capacity to competently plan and implement investments in building urban water resilience. Furthermore, a better established cooperation with the private sector will help the creation of strategies to retain professionals in the public sector.

ACTION 2.

3

Recurrent – Organize an annual Urban Water Resilience Exchange and Learning Event.

DESCRIPTION

To drive implementation of resilience solutions and to build capacity of sector professionals as well as public sector officials, the city can actively create a platform to share knowledge, encourage peer-to-peer learning, source innovation and discover new solutions to the resilience challenges the city faces.

This action aims to design and implement an annual Urban Water Resilience Exchange and Learning event for the city of Kigali with a select number of other African cities with the objective that participants share best practices, solve problems collectively, and jointly craft an urban water resilience agenda for months and years ahead. The event aims to drive implementation so that participants take knowledge, innovations, and solutions back to their workplaces and cities to reshape their water resilience building efforts now and in future.

The first event will be hosted by the city of Kigali. For the first water resilience exchange, Kigali will become a living resilience laboratory and create a powerful venue for resilience learning and collaboration. Through site visits, expert presentations, and multi-disciplinary workshops, participants will grapple with common water resilience challenges which African cities face today and proactively share knowledge about each other's successes and failures. Participating cities will jointly identify and analyse their water related risks and vulnerabilities, assess their individual water resilience and benchmark it against other cities, and identify actions targeted at incorporating resilience principles into decision making, service provision and project design and development processes. The exchange will facilitate the sharing of knowledge and experiences among peer cities, allowing them to discuss, examine and learn from each other. This peer-to-peer learning and exchange event will highlight lessons learned, best practices and innovative approaches, solutions and projects that work in similar environments to build urban water resilience. The exchange will also feature case studies on how cities are working to increase equitable access to sustainable water and sanitation services in highly urbanized areas, with a particular emphasis on the planning and implementation processes they are engaging in to ensure improved and resilient service delivery in a changing climate and uncertain future. The exchange will thus be an opportunity for government officials and other relevant stakeholders to be exposed to different planning, infrastructure and service delivery concepts and will allow them to gain insights on approaches that can be adapted to their city's context.

The objective of the Urban Water Resilience Exchange and Learning event is to catalyse real and concrete action so that the city of Kigali and attendees who return to their cities can act upon the lessons learned and leverage the experiences of their peers, partners, and experts.

Furthermore, participating cities, including the city of Kigali, can jointly sign a "African City Deal" for water resilience that will commit them to work together to reinforce their approach to build water resilience and to build practical learning centres over the next years. Working on water resilience in urban areas requires specific local knowledge and each city has already started with developing knowledge and specific approaches. Partners of an African City Deal will create a practical learning environment for innovation and collaboration that helps to initiate and develop water resilience action and projects in cities based on the belief that integrated water and urban approaches are impossible without engaging a wide range of stakeholders at an early stage. Cities will intensify their cooperation in an open learning, experimental and innovating culture, through collaboration in real working practices. Lessons will be shared with other parties, including educational organizations.

3

Lastly, by making the Urban Water Resilience Exchange a regular event hosted by participating cities it will help the creation of a community of practice among interested cities with shared challenges and similar goals targeted towards building resilience within their water system. This will allow for trusted partnerships to be formed among cities that will provide peer-to-peer support.

The Urban Water Resilience Exchange will leverage existing city relationships that the city of Kigali has, including city networks and experiences gained across the continent and through the 100 Resilient Cities Program, now known as the Resilient Cities Network, that successfully initiated a network exchange hosted by the city of Rotterdam in 2015 on water management and multi-benefit solutions. Furthermore, cities participating in the Urban Water Resilience in Africa Initiative can be included in the event.

RESOURCES

- Rotterdam Exchange on Water Management and Multi-Benefit Solutions: A network exchange event hosted by the Resilient Cities Network with a focus on water-related urban adaptation measures (Link)
- International Urban Cooperation (IUC) Programme: Provides a model for a city-to-city cooperation programme to foster city exchange on sustainable urban development (Link)
- Global Water Operators' Partnerships Alliance (GWOPA): Alliance with an initiative called WaterWorX which works through water operator partnerships to support sustainable water services (Link)
- Utility Platform for Strengthening Partnerships of Municipal Utilities Worldwide: Pilot project financed by the German Federal Ministry for Economic Cooperation and Development to support cooperation and partnerships between municipal utilities (Link)
- Africa Water and Sanitation Local Authorities (AWASLA) Network: Supported by ICLEI Africa, AWASLA provides a platform for local governments to engage with one another to exchange information on urban water and sanitation best practices (Link)
- Case Study* - Climate Protection Concept Renewable Wilhelmsburg: Starting in 2005 Hamburg began to support the redevelopment of the Wilhelmsburg neighbourhood through an International Buildings Exhibition (IBA) and International Garden Show (IGS), an event for both the private sector and local community. (Link)

STAKEHOLDERS

- **Lead:** Water and Sanitation Corporation, city of Kigali, Rwanda Water Resources Board, Donor Community, Neighbouring Municipalities, Professional Organizations
- **Partners:** Donor Community, Neighbouring Municipalities, other African and global city partners, Private Sector

NEXT STEPS

- Identify a core group of cities, partners, and key experts to design the Urban Water Resilience Exchange and Learning Event.
- Compile best practices and case studies relevant for the attending cities and stakeholders.
- Develop a means to keep the cities engaged with each other for further peer-to-peer learning following the event.
- Identify challenges to be addressed and local projects that can serve as examples to showcase during the annual Urban Water Resilience Exchange.

3

OUTCOME

This action will provide the city of Kigali and other participating cities with insights to different planning, infrastructure and service delivery concepts and will expose them to solutions and approaches that can be replicated or adapted to their city's context. City officials will build resilience planning capacity through knowledge exchange and peer-to-peer learning. The action will help create a peer group of African cities that collectively advance actions to improve access to safely managed and resilient water services across the continent. The action will catalyse real and concrete action through dissemination and scaling of best practices. By connecting the work to international events, such as the African Water Week, experiences and knowledge can be shared with the wider global community.

ACTION 3.

Medium-term – Develop and implement vocational training programs on water resilience across different professional sectors.

DESCRIPTION

Government departments in Kigali that work directly or indirectly in the water sector currently provide little to no opportunities for professional development for their employees. This action aims to fill this gap by providing a range of vocational and skills training options for the existing workforce to increase their understanding of resilience and enhance their personal development. The action will involve the development and provision of training courses that help government officials and staff acquire the tools, skills, and knowledge they need to manage their city's water-related risks and opportunities and advance the city's water resilience journey.

Training and development programs are expensive and can be challenging to design if it is a new practice or technical field evolving with lots of innovative solutions and technical skills being required. Therefore, the city may want to consider working with private sector partners who can bring additional expertise or have training needs themselves. Furthermore, internal capacity to train new or existing staff on resilience fundamentals or tools and approaches can be enhanced through a training of trainer's approach. The city may use selected supervisors or outstanding employees and train them to be internal trainers and respectively build capacity within city government. Furthermore, the city can explore mentor programs, internships, placements, or secondments to build capacity of its staff.

The capacity building program could involve the city staff in the ongoing and planned water related project development with a high interaction with experts working on those projects. The action will be nourished by the assessment presented in Vision 3 Action 1 Sub-action 1.

Additionally, the action will aim to create opportunities for peer-to-peer learning and mentoring for participants through the creation of knowledge hubs and experience sharing platforms with other cities in the region and beyond, which will be linked with the Urban Water Resilience Exchange proposed in Vision 3, Action 2.

In parallel to designing and implementing a training and capacity building program for its staff, the city wants to think about employee retention. A lot of African municipalities experience the so called "brain drain" as high-quality employees leave government and join the private sector or international development organizations because they offer more competitive salaries and benefits as well as performance-based compensation, career development opportunities and modern working environments and workflows.

RESOURCES

Case Study* - Participatory Development Action Program (PDAP): Initiated a plan to increase community resilience through leadership building and disaster risk reduction training (Link)Technical and Vocational Education and Training (TVET) in the Water Sector: In Germany, there is a focus on the intersection between TVET systems and the water sector to prepare standards for the water sector in Germany and conduct trainings for water professionals. DWA is the organization that sits at the centre of its water sector and is scaling and implementing TVET work around the world. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali, Rwanda T-VET Board, Water and Sanitation Corporation, Rwanda Water Resources Board
- **Partner:** University of Rwanda and other technical colleges and educations institutions, Private Sector Federation (PSF) and other private sector actors, Resilient Cities Network
- **Approval:** Ministry of Education, Ministry of Finance

3

NEXT STEPS:

- Carry out an employee/staff survey and focus groups to better understand their needs and wants.
- Determine the relevant partners to help identify training needs, develop training concepts, curricula, and materials including e-learning and virtual training platforms.
- Develop a mentor, peer-to-peer learning approach including the training of trainers and the use of selected supervisors or outstanding employees, training them to be internal trainers and respectively build capacity within city government.
- Identify ongoing and planned projects or activities that can serve as opportunities for city staff capacity building (learning on the job).
- Identify opportunities nationally, regionally, and internationally for peer-to-peer learning and mentoring or shadowing opportunities.
- Develop a certification program to promote the value of working with accredited personnel among government and private actors.
- Coordinate with existing training providers to develop training modules for filling in technical and governance gaps to advance water resilience.

OUTCOME:

This action will improve the competence of the labour force currently working within Kigali's water sector and therefore is a value add to professional associations connected to the training. This will allow the city to meet service delivery needs while improving employees' capacity to understand and drive the implementation of planned investments. It will also enable existing employees to learn from and emulate experiences from other cities to better tackle issues within the city's water system and create a community of practice around water resilience.

ACTION 4.

3

Short-term – Conduct reviews and provide relevant recommendations for improvement of water-related curriculum in academic institutions.

DESCRIPTION

The needs assessment (Vision 3, Action 1, Sub-action 1) will highlight opportunities to cooperate with academic institutions to improve and develop curricula that incorporate resilience aspects. Recommendations may inform a larger curriculum change or amendment leading to improved water governance in the city of Kigali which includes political, social, economic, technical, and administrative aspects of the water system. The objective is to establish partnerships with academic institutions to ensure that they produce the city's workforce of the future. Curricula will be co-developed with a range of partners active in the water sector and Kigali's leading educational institutions. It will be embedded in the courses provided in higher education institutions with the long-term goal of preparing students to integrate their water resilience education into their careers and work tasks following graduation. It will also be embedded in various course structures, such as short-term courses, to ensure as many people as possible can benefit from the learnings of the updated water-related curricula.

RESOURCES

Pani Pahar – The Water Curriculum: Curriculum developed for young students with lessons on how climate change impacts the sustainability of water resources in India and how young people can get engaged in the water sector issues (Link).

STAKEHOLDERS

- **Lead:** City of Kigali, University of Rwanda and technical colleges, Rwanda T-VET Board, Private Sector Federation (PSF) and other private sector actors
- **Partner:** Rwanda Water Resources Board, Water and Sanitation Corporation, Development Partners with demonstrated experience in water resilience (Resilient Cities Network, World Bank, WRI, C40, GGGI, etc.)
- **Approval:** Ministry of Education/Higher Education Council (HEC)

NEXT STEPS

- Engage relevant stakeholders to begin the co-production of coursework anchored in resilience thinking.
- Create a dedicated forum for discussion of the revision of the curriculum.
- Lobby for the inclusion of developed curricula as part of standard coursework in Kigali's higher education system.

OUTCOME

This action will increase the number of skilled workers in the city of Kigali, improving levels of employment and quality of projects delivered in the water sector. It will also support the city in achieving its long-term goals for climate adaptation and resilience by enhancing the related governance frameworks. This action will increase the capacity of educational institutions and support their ability to develop curricula that reflects and adapts to realities of the city's water system. Thus, improving the educational system towards the goal of building water resilience in the city.

ACTION 5.

3

Strategic mentorship and empanelled experts program to sustain long-term capacity building at the individual and city level and support retention of in-city talent in the water sector in the city of Kigali

DESCRIPTION

Over the years, the government of Rwanda has invested considerable efforts into developing the capacity of its institutions and human resources to ensure its societal development. Considerable investments were done in all infrastructures needed, including IT infrastructure, to improve the capacity of these institutions and their respective human resources. Recently, effort has been made to boost water sector management by establishing the Rwanda Water Resources Board, with a mission to guide on the overall water resources management. However, the concern of human resources capacity is still observed as an issue. Considering that developing human capacity requires considerable time and financial means, a short- and medium-term alternative should be adopted.

Such is the case of a mentorship and roster experts' program for the city of Kigali, to help the city catalyse on the available and needed expertise for water resilience in the short- and medium-term. This work should inform the definition of an institutional arrangement (including the public sector, private sector, civil society, professional bodies and academia) that supports constant evaluation of the city's needs, the latest innovative thinking and research, and promotes an environment of constant learning. This empaneled taskforce, ideally, would not only be connected to the water sector, but serve as a technical body capable of developing capacity for the city's different resilience needs, as well as finding synergies between sectors and developing tools and knowledge resources to support the city's decision making on water resilience.

RESOURCES

- York City Panel on Climate Change (NPCC): A 20-member independent advisory body that synthesizes scientific information on climate change and advises City policymakers on local resiliency and adaptation strategies to protect against rising temperatures, increased flooding, and other hazards (Link).
- Resilient Cities Share Strategies for Adapting to Climate Change: Rotterdam and Surat were paired together as part of the European Union International Urban Cooperation programme (IUC) which led to Rotterdam's water plaza concept being adopted by Surat (Link).
- Mayors for Mentoring: Program to help showcase the work Mayors are doing in their cities and further build mentorship initiatives in Mayor's cities. (Link)
- Case Study* - Johannesburg-Lilongwe Mentorship Programme: The mentorship-based partnership between Johannesburg and Lilongwe led to the creation of the Lilongwe City Development Strategy. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali, University of Rwanda and other educational institutions, Rwanda T-VET Board, Private Sector Federation (PSF) and other private sector actors
- **Partner:** Rwanda Water Resources Board, Water and Sanitation Corporation, Development Partners with demonstrated experience in water resilience (Resilient Cities Network, World Bank, WRI, C40 cities etc.)
- **Approval:** Ministry of Education

NEXT STEPS

- Identify water resilience gaps in the city in terms of personnel and skills.
- Complete a benchmark analysis of successful empanelment models in other cities.
- Develop a mentorship and roster program for water resilience in the city of Kigali.
- Mobilize finance to support the program.
- Hire the experts through framework contracts.

3

OUTCOME

Institutionalized capacity building program in the city that utilizes the expertise and strengths of all key partners working within the water sector including the public sector, the private sector, civil society, and academia to improve knowledge and action on water resilience in the city. A framework that provides an opportunity for all stakeholders to contribute to improving water governance in the city of Kigali. Furthermore, the city of Kigali will be equipped with a mentorship and roster program of all needed expertise for water resilience. This action will also strengthen the capacity of the city to coordinate and plan on water resilience related matters in an efficient way.

VISION 4

VISION STATEMENT

Innovative stakeholder engagement approaches for inclusive water resilience planning and implementation

OPPORTUNITY STATEMENT

Make targeted investments in stakeholder engagement to empower civil society as co-producers and champions of resilience building in Kigali's water sector and create risk-aware communities.

RELATED CHALLENGE

#4 Ineffective engagement of stakeholders in water resilience planning process

VISION DESCRIPTION

Kigali's water system currently lacks relevant opportunities to engage citizens, community-based organizations and civil society actors that has left them out of investment decisions and limits their capacity to access critical information about the water system they rely on. This has created a mismatch of investments and needs, which has further contributed to the lack of community awareness around the vulnerabilities they face each day.

In order to make inclusive and informed investments to strengthen Kigali's water resilience, the city needs to create accessible opportunities for engagement with citizens, community-based organizations and civil society actors. This requires actively integrating participatory processes in project design and implementation. It also requires improving the capacity of community-based organizations and civil society actors to understand the risks the city faces and help them navigate the city's complex institutional framework to advocate for solutions.

This vision aims to address the mismatch between investments and community needs by empowering community-based organizations and civil society actors to influence the design and monitor the implementation of water-related investments. It also aims to increase the awareness of communities of the water-related vulnerabilities they face by ensuring effective and accessible communication of risks. The goal for this vision is to provide sufficient platforms for them to co-develop solutions that are aligned with the lived experiences of communities served by the city's water sector. It will also create opportunities for transparent communication of project implementation between the city government, communities and civil society, therefore creating an accountability loop. The vision will strengthen the city's ability to build comprehensive engagement and will provide support to improve the effectiveness of existing efforts such as the Catchment Committee, which aims to engage different city and upstream stakeholders and expand similar opportunities across the city's water system.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Improve the awareness of water-related vulnerabilities among communities.
- Improve effective risk communication between the government and communities and promote risk awareness.
- Improve capacity of civil society actors to navigate the city's complex institutional framework.
- Increase opportunities for civil society actors to be involved in water-related project designs.
- Create platforms for civil society actors to monitor the implementation of water-related investments.
- Build accountability within Kigali's water sector.

VISION 4

RELEVANT ASSETS AND RESOURCES

- The National Integrated Water Supply and Sanitation Master Plans for Rwanda
- The established Catchment Committees
- Local community leaders and educational institutions

SHOCKS AND STRESSES

- Increased flooding and landslides due to climate change impacts
- Environmental degradation and pollution affecting water systems
- Lack of proper procedural monitoring
- Water shortage due to ineffective service delivery and climate induced extreme weather events
- Population growth in risk prone areas with unsafe living conditions
- Outbreak of water-related diseases
- Infrastructure failure due to climate events, poor construction, and insufficient maintenance

OVERALL CHAMPIONS

Lead

City of Kigali

Partners

Local civil service organizations, community leaders, educational institutions

Approval

City Council

ACTION 1.

Medium-term – Develop and implement effective communication channels that can enable timely dissemination of information on water stresses and shocks among communities.

DESCRIPTION

Information within existing communication channels is largely technical and is not translated into layman's terms that can be understood by those without a sufficient knowledge basis. Additionally, access to existing communication channels, especially for vulnerable communities, can be improved to increase their knowledge on future water-related risks.

This action will address Kigali's lack of effective tools and resources for risk communication through the development of an information transfer system that aims to improve communities' understanding of the water-related challenges they face and integrate concepts of resilience thinking into their day-to-day lives. The system will inform communities of the water-related vulnerabilities they face, alert them to changes in their risk exposure, and communicate existing and planned programs, services and resources communities can leverage to support building their resilience to water-related shocks and stresses. This communication system will be designed following an assessment of effective communication methods for engaging community members, and will leverage various communication materials including advisories, social media and text alerts and public messaging. It will also include resources that maximize accessibility including different language options, graphics and voice recordings. It will leverage existing assets including Kigali's network of community leaders and schools to disperse information in a manner that is palatable, accessible and trusted by community members.

RESOURCES

- Groundwater and Drinking Water Toolbox: Developed by the Environmental Protection Agency to support city governments in the communication of water risks and stresses through templates for public advisory, press releases, social media posts and more. (Link)
- "Day Zero" Communication Campaign: Cape Town issued a communications procedure to emphasize the need for behaviour changer around water consumption in a manner that was inclusive, transparent, recognized good behaviour, and made it collaborative. (Link)
- Citizen Observatory of Drought: An example of a citizen science initiative which emphasizes mutual learning and provides accessible information on the vulnerabilities to drought risk. (Link)
- StoryMaps: An example from eThekwini Municipality demonstrating how the use of StoryMaps can be used as a visual communication tool to share information on climate risks in the municipality and how resilience can be incorporated to address these risks. (Link)
- Extrema Global: Urban Heat Resilience App that provides an example of how cities can use a mobile app to communicate with residents on resilience information to protect them from increasing climate-related risks. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali, WASAC
- **Partner:** Local civil service organizations, community leaders, schools, Rwanda Meteorological Agency; Security Organs
- **Approval:** City Council

4

NEXT STEPS

- Identify where this platform sits within the city government and who is mandated to develop and maintain it while concurrently developing a list of information and data-points that are relevant to communicating risks with communities.
- Assess methods of communication that can lead to effective information sharing between the city government and local communities to help inform the design of this educational platform (including placed based approaches such as tactical urbanism).
- Engage leaders and institutions, including schools and community centres, with the capacity to become conduits for information transfer.
- Develop and populate templates with relevant and palatable messaging around water risks and resilience, leveraging different mediums including social media, radio, mass texts, etc.

OUTCOME

This action will facilitate community education of the water-related shocks and stresses they face and allow them to understand efforts being made by the city to address their vulnerabilities. It will offer communities the opportunity to make informed decisions. It will also supplement their ability to convincingly critique existing investments that are not meeting their needs and advocate for new ones from a data-backed perspective. Lastly, the platform will help build trust between the city government and its constituents by creating an accessible channel of communication that informs citizens of crucial risks and decision making in real time.

ACTION 2.

Explore innovative and interactive mechanisms to strengthen the existing stakeholder engagement platforms for inclusive water resilience planning and implementation.

DESCRIPTION

As it stands, community-based organizations and civil society actors in Kigali have limited voice in the planning of water-related projects. There is also little public understanding of the roles and responsibilities of the different departments responsible for water-related service delivery, limiting community-based organizations and civil society's capacity to identify public sector entities that are responsible for meeting community's water needs. Community-based organizations and civil society actors are not given the opportunity to hold the government accountable for effective implementation of planned projects. This has created a gap between the development of investments and the needs on the ground.

This action aims to rectify this issue by making related investments in improving the participation of community-based organizations (CBOs) and civil society organizations in water-related project development, increasing their visibility and contribution to program/project design. Created based on an assessment of effective participation methods fit for Kigali's context, these mechanisms will support beneficiary communities to have a say in planning processes of water-related investments. They will give communities opportunities to understand planned investments, communicate their context and challenges and co-produce programs that are compatible with their needs. This action will encourage the integration of the knowledge and innovation that community-based organizations hold into the official planning system of the city, while also building on their relationship with communities to increase ownership of planned projects.

The action will also create a framework for monitoring and evaluation for project/program implementation. This framework will effectively communicate the roles and responsibilities of different departments active in Kigali's water system, allowing community-based organizations and civil society members to understand who they need to hold accountable to ensure service delivery. It will ensure the transparency of water-related investments and create engagement opportunities that can allow communities to hold the government accountable for program delivery.

RESOURCES

- Environment Museum: Based near Lake Kivu in the Western Province, the Museum of the Environment covers two floors with a traditional herbal medicine garden on the rooftop. The first of its kind on the continent, the museum looks at renewable and non-renewable sources of energy. It is designed as an educational centre for our visitors, many of them local. Its purpose is to help people understand and safeguard their environment and ensure integrated and durable development (Link).
- The Nile Institute Rwanda: The Nile Institute aims to deliver a threefold project. The Nile Research Centre will focus on elaborate studies of the Nile, while the Nile Visitor and Education Centre will contribute to both local and global education. The Nile Institute Foundation aims to support local and global development by exploring all the wonders of the Nile (Link).
- Cape Town Section 80 Committee: A Water Resilience Advisory Committee established in the city of Cape Town to provide a forum for the local government to engage external stakeholders on topics around water resilience. (Link)
- Water Fund: The Upper Tana-Nairobi Water Fund launched by The Nature Conservancy in 2015 engages local leadership to address upstream water challenges through investments with farmers on training, resources, and equipment (Link)
- Case Study* - Climate-Smart Street Project: Developed by the city of Helsinki, this project involves public agencies, residents, and businesses to work together to convert sustainable ideas into practical, replicable and scalable actions. (Link)

4

STAKEHOLDERS

- **Lead:** City of Kigali
- **Partner:** Local civil service organizations, community leaders
- **Approval:** City Council

NEXT STEPS

- Identify where this platform sits within city government and who is mandated to develop and maintain it.
- Conduct research to identify platforms, frameworks and mechanisms that can serve as case studies within and outside Kigali.
- Identify relevant civil society actors who can have key contributions to the city's planning processes and understand what participatory approaches they want to be engage with.
- Develop and pilot engagement and monitoring platform

OUTCOME

This action will grant community-based organizations and civil society actors the platform to influence investments made in building water resilience across Kigali. This will allow the city to design and implement projects that are aware of the different contexts and needs on the ground, maximizing the impact of investments. The action will bring public institutions and communities together to convert context specific and informed program design into scalable actions that have localized relevance and ownership. It will allow CBOs and civil society actors to recognize that they should, and are able to, hold their government accountable for the proper implementation and maintenance of water-related investments, creating a feedback loop between the city and its citizens that can improve project delivery.

ACTION 3.

Leverage existing initiatives and venues to host water exhibitions to increase awareness and build a new generation of water resilience champions.

DESCRIPTION

Kigali has a tremendous opportunity to start shaping its future generation by sharing water resilience knowledge with its large youth population. However, Kigali is not investing sufficiently into shaping its future generation of leaders into becoming water resilience champions. The city's primary and secondary schools present an undeniable opening to rectify this lack of investment and improve the accessibility of water resilience knowledge among Kigali's youth. This will allow the city to begin investing in water resilience champions from an early age through educational institutions as hubs to build positive behaviours around water sensitivity. Schools can also become a great medium to share knowledge around effective responses to water-related shocks and stresses, which can improve Kigali's capacity to respond to water related disasters such as excessive flooding and landslides.

This action aims to embed a set of courses and extra-curricular activities on water resilience knowledge in schools across Kigali. By partnering with selected schools and existing initiatives and venues hosting water exhibitions, it intends to pilot extracurricular activities and after-school clubs covering a range of courses to build positive cultures around the conscious use of water, water reuse, water resource protection and environmental sustainability. The action will include educational trips for students to various sites and facilities across the city (wetlands, water and waste treatment plants, catchment areas, water and environment museums, etc.) to raise their awareness of risks and environmental issues facing Kigali. It will also pilot after-school programs that will allow students to be involved in water resilience-building efforts in their city from an early age. This activity will leverage existing water and environment clubs in colleges and universities to strengthen their awareness raising capacities and stakeholder engagement (this will include primary and secondary schools, civil society organizations, private sector, public institutions, etc.). Lastly, the action will create and integrate Disaster Risk Response courses designed to convey appropriate actions to take in the face of water-related disasters to provide youth with the knowledge to protect themselves and their communities from the shocks the city may experience.

RESOURCES

- Environment Museum: Based near Lake Kivu in the Western Province, the Museum of the Environment covers two floors with a traditional herbal medicine garden on the rooftop. The first of its kind on the continent, the museum looks at renewable and non-renewable sources of energy. It is designed as an educational centre for our visitors, many of them local. Its purpose is to help people understand and safeguard their environment and ensure integrated and durable development. (Link)
- The Nile Institute Rwanda: The Nile Institute aims to deliver a threefold project. The Nile Research Centre will focus on elaborate studies of the Nile, while the Nile Visitor and Education Centre will contribute to both local and global education. The Nile Institute Foundation aims to support local and global development by exploring all the wonders of the Nile. (Link)
- City of 1000 Tanks School Pilot: Example of a secondary school demonstration project in Chennai which integrates Nature-based Solutions with an eco-literacy centre to increase awareness and community capacity on urban water resilience solutions. (Link)
- Water Resources Art and Poetry Contest: A New York City initiative that encourages the younger generation to learn more about their surrounding water resources in a fun and creative way. (Link)
- Théâtre Évolutif: A built structure in Bordeaux that invites community members to congregate in a welcoming and open space while also witnessing and learning about its water supply specific infrastructure which builds awareness of the connection between urbanscapes and natural ecosystems. (Link)

4

STAKEHOLDERS

- **Lead:** RWB, WASAC, City of Kigali
- **Partner:** REMA, MININFRA, MINALOC, MINEMA, Security Organs, Rwanda National Youth Council, Rwanda Environment Museum, The Nile Institute Rwanda
- **Approval:** City of Kigali

NEXT STEPS

- Identify criteria for selecting pilot schools.
- Co-design extra-curricular programs around water resilience with educational institutions and civil society actors active in the water sector and relevant city agencies.
- Partner with facilities and sites to organize educational trips across the city.
- Develop a curriculum on Disaster Risk Response and design it to be replicable for various schools and classrooms.
- Upscale to all schools in the city of Kigali.

OUTCOME

This action will increase youth's awareness of local and global challenges around water resilience. It will equip them with the knowledge to respond to the water-related challenges they face in their communities, while also opening their minds to new interests, skills, and career paths within the water sector. This action will increase youth's sense of citizenship and help create ownership around behavioural changes that will improve communities' capacity to respond and build resilience to water-related shocks and stresses.

VISION 5

VISION STATEMENT

Well-coordinated water governance, at the community level, towards water resilience.

OPPORTUNITY STATEMENT

There is an opportunity to improve multi-level governance to advance climate resilient water resources management in the city of Kigali by rectifying gaps and overlaps in agency mandates and responsibilities, supporting talent retention and innovation programs in city agencies, increasing communication and engagement with non-state actors and community organizations in the water sector and engaging the private sector in water resources governance at the basin and city level.

RELATED CHALLENGE

#5 Ineffective multi-level water governance

VISION DESCRIPTION

Several factors have been observed to contribute to the poor water resilience-related multi-stakeholder coordination and governance experienced to date in the city of Kigali. The factors are (i). lack of more advanced IT-based tools to facilitate the coordination and enhance the quality of the planning and coordination, (ii). limited technical and human capacity exacerbated by the lack of a retention policy of inhouse experts in government agencies and decentralized entities (the latter is applicable to the civil society as well and negatively impacts the efficiency of a multi-stakeholder engagement and communication approach), (iii). overlapping and inadequate structuring of government agencies and decentralized entities with no clear mandates at each level, and (iv). lack of engagement and communication with users and stakeholders when developing new policies, programs and plans in the water sector.

The existing planning tool IFMIS, used by the government of Rwanda, is composed of indicators that are quantitative with no spatial component to allow for robust planning and monitoring. This has led to duplication and overlap of many government programs and plans. In addition, the monitoring and evaluation of these plans has always been inadequate as the quality of the implemented activities cannot be assessed (mainly due to a combination of a lack of proper qualitative indicators in the system and limited technical capacity of those in charge of monitoring) as well as their contextual spatial characteristics (due to the lack of a system with integrated spatial analysis capabilities but also a lack of an appropriate framework regulating the production and standardization of spatial data in the country). To address this challenge sustainably, the existing IFMIS should be upgraded to incorporate qualitative based indicators for enhancing the impact of programs/projects in the evaluation and monitoring phase. To further optimize the IFMIS, the development and establishment of a national spatial data infrastructure, that in turn is synchronized to the IFMIS, would be very strategic.

The efficiency and performance of government agencies and decentralized entities are dependent on the adequacy and clarity in the setting of their structures and respective mandates. Currently, this is still a challenge in the city of Kigali and at the central level in general, despite numerous restructurings conducted by the government with the attempt to improve service delivery to citizens through better coordination and high institutional performance. The issue remains on the basis on which the restructuring is done. A proper detailed analysis of the adequate organizational structure and relations between the central level and decentralized level can be conducted in close collaboration with the institution mandated for public service management with the expectation

that the analysis will be considered in the next restructuring of the government agencies and decentralized entities. Such an analysis is needed to provide additional insight to decision-makers on the technical needs required to reach urban water resilience in the city of Kigali, as well as other cities in Rwanda.

In addition, there is a need to improve communication and engagement of users and community in the plans and investments in the water sector to improve ownership and awareness of water resilience needs and actions among citizens and users. Such an inclusive approach will improve uptake and compliance with regulations and reduce the need for enforcement and promote responsible use of public resources.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- The planning of programs and projects need to include qualitative indicators in their log frame.
- Spatial characteristics need to be considered when assessing the plans.
- There is a need to produce standardized and complementary spatial data for better planning.
- There is a need to set a practical alternative that will help the city of Kigali to access the local expertise available anytime needed.
- There is a need to conduct a detailed assessment of the appropriate institutional structure to inform decision-makers.
- The planning at the national and local level needs to be improved, well communicated, and understood by the civil society, communities, and other stakeholders.
- There is need to improve the collaboration capacity of the private sector and public institutions on water-related issues/ opportunities.

RELEVANT ASSETS AND RESOURCES

- City Development Strategy (CDS) 2018-2024
- Nyabugogo Catchment Management Plan 2018-2024
- Service delivery report/score card by the Rwanda Governance Board
- Water resources management law and its implementing orders (most specifically the ministerial order determining the function and attribution of catchment committee)
- Established catchment committee
- Existing water user association in Nyabugogo catchment
- Existing civil society platforms of environment and natural resources-based NGO
- Rwanda Interfaith Council
- The State of Civil Society in Rwanda in National Development report
- The WHO Community Engagement Framework and Experiences from Rwanda.
- National capacity building strategy
- Decentralization policy
- Decentralization implementation plan
- Kigali city profile
- Integrated household living conditions survey 6

SHOCKS AND STRESSES

- City management structure restructuring
- Health crises
- Water pollution
- Water resources mismanagement
- Overlapping and contradicting plans and programs
- Decreasing availability of funds

OVERALL CHAMPIONS

Lead

City of Kigali; Ministry of Local Government

Partners

Ministry of Agriculture, Ministry of Commerce, Ministry of Environment, Ministry of Infrastructure, Ministry of Public Labor, Ministry of Emergency Management, Private Sector Federation, Rwanda Water Resources Board; Rwanda Utilities Regulatory Authority (RURA); Rwanda Environment Management Authority (REMA); Rwanda Governance Board (RGB); Rwanda Agriculture Board; Rwanda Mining Board, Water and Sanitation Corporation (WASAC), Rwanda Energy Group (REG) and other sectors as well; Private sector

Approval

City Council, Ministry of Local Government

ACTION 1.

5

Establish a community water governance framework for effective management of water assets through community engagement and ownership.

DESCRIPTION

Currently, stakeholder engagement in planning for water-related programs or projects is still inefficient and therefore overlooked by agencies. The challenge is mostly related to the poor communication skills on both sides, such as conveying the message to the beneficiaries and incorporating beneficiaries' expectations in project plans and designs. The end result reflects a lack of ownership of what has been implemented, therefore a lack of operation and maintenance is experienced, affecting the sustainability of the implemented activities. This issue is still experienced at the approval level in the Ministry of Finance because of the lack of a diverse or interdisciplinary technical group assessing the framing of the program and projects. Communication, in water resilience-based plans, is key for its successful implementation and longevity. Strategies and skills for effective stakeholder engagement in the water sector are needed to address this issue of the lack of ownership after implementation.

This action will develop targeted training modules for existing and new staff. It will provide effective protocols for continued staff-capacity development opportunities to enhance the city's capacity to advance participatory planning approaches and implementation of community-led adaptation efforts around water resilience. While at the same time, this action devises easy-to-access opportunities for engagement of communities and the private sector in city planning and development initiatives to improve their understanding and knowledge of what role they can play in enhancing water resilience in the city. These opportunities would allow communities and other non-institutional stakeholders to access parts of the online training courses, using advanced tools of the previously built platform to structure online consultation mechanisms within plans and projects' design and implementation phases, thereby fostering integrated and participatory approaches to water resilience in practice.

RESOURCES

- Boston Participatory Budgeting program: Engaged youth to collect ideas for capital projects, distilled those ideas into concrete proposals, held a city-wide vote to determine which projects get funded, and directly determined how a portion of the city's budget should be allocated. (Link)
- Case Study* - Metropolitan Planning Institute of Guadalajara Metropolitan Area (IMEPLAN): An example of a decentralized public body that has been setup for effective metropolitan management in Guadalajara with a focus on inclusive and participatory decision making. The body has developed curriculum and training modules for both citizens and city officials to better engage in and implement effective participatory planning processes. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali, Ministry of Local Government Partners – MININFRA, RWB, WASAC, Private Sector Federation.
- **Approval:** City Council, Ministry of Local Government
- **NGOs:** Water for People, RISD. All NGOs operating in the water sector and in good governance (list of all registered NGOs can be found on the RGB website). Local NGOs are normally organized into platforms, the latter can be consulted in addition to INGOs such WaterAid, Water for People, IUCN, etc.

NEXT STEPS

- Identify the gaps in terms of personnel and skills on both sides (public institutions and civil society).
- Identify the capacity needs/opportunities within the current set-up to optimize stakeholder engagement.
- Develop a stakeholder engagement practical guide for the water sector, to be used as a skill development tool.

5

- Train the city, central government officials and civil society on engagement in program and project planning.
- Develop targeted training modules for existing and new staff aimed at synthesizing various types of knowledge and improved integrated and participatory approaches to infrastructure planning and implementation.
- Develop protocols for active involvement of the community and private sector across the various phases of infrastructure planning and implementation.
- Devise experimental and innovative ways for communities to increase their technical knowledge and understanding of water-resilience, while bringing their own knowledge to the table, within structured participatory planning and implementation processes.

OUTCOME

- Improved coordination and ownership of projects and infrastructure investment for water resilience.
- Active participation of stakeholders in project planning and implementation.
- Improved planning at all levels that is well communicated and understood by civil society, communities, and stakeholders.
- Increased capacity of city staff to devise inclusive solutions for water resilience.
- Improved knowledge of water resilience for various stakeholders, including a better understanding of each other's roles and responsibilities.
- Enhanced participation, inclusion and opportunities for communities and the private sector to participate and contribute to building water resilience in Kigali.

VISION 6

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Ensure high quality water-related services	Optimize water-related services delivery through strengthening its framework by increasing the capacity of the regulators to develop and proactively enforce water-related services delivery regulations.	#6 Ineffective development and enforcement of regulations of water-related services

VISION DESCRIPTION

To achieve optimum development and enforcement of water-related services delivery regulations, coordination, and integration of existing stakeholders (with consideration of their roles, and mandates) in the water sector is essential. An improvement in the coordination of all multi-level governmental agencies and institutions will result in a more robust water governance, where roles and responsibilities are shared and understood. With an improved water governance, the development and enforcement of regulations can easily be streamlined in the activities and plans of all stakeholders and positively impact the water-related services delivery in Kigali. For example, within an improved water sector multi-level coordination, it becomes efficient for the Rwanda Utilities Regulatory Authority (RURA), which is mandated to regulate provision of water-related services, to develop and enforce water-related services delivery regulations that are responsive to the needs and accepted by the beneficiaries in the city. The latter ultimately impacts the efficiency of the Water and Sanitation Corporation (WASAC) to provide water services in the city.

Furthermore, the city of Kigali's water-related services delivery is challenged by an unequal distribution of infrastructure, and a low rate of participation of communities, civil society organizations and the private sector in the development of regulations. A people-centred approach, led by the regulators and the city officials, that puts the needs of communities at the center is envisioned to be a catalyst to encourage the participation of these actors, while at the same time, help prioritize the needs at the city level that the regulations can help to address to secure a safe and high-quality water-related services provision.

This vision supports the optimization of the framework in place to develop and enforce water-related services delivery regulations. The support is through strengthening the capacity of the regulators to deliver on their mandate with a people centred approach. To optimize the framework of water-related services delivery regulation in place, this vision aims to partner with the institutions in charge of regulations, and local academic institutions to improve research and motivate local professionals and experts to help develop tailor-made standards and advocate for the importance of regulations.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Ensure enforcement of the existing regulations and create awareness on the importance of regulations.
- Strengthened coalition with the academic sector to develop research to build tailor made and domestically owned standards to inform the development of regulations.

6

RELEVANT ASSETS AND RESOURCES

- PREPARED - Planning for Resilience in East Africa through Policy, Adaptation, Research and Economic Development
- Bachelor and Master course programs in Water Resources and Environmental Management at the University of Rwanda
- RURA Board decisions Board Decisions (Link)
- RURA Draft regulations Draft Regulations and guidelines (Link)

SHOCKS AND STRESSES

- Water shortage and poor water quality in some sectors of the city
- Disease outbreak and control of diseases related to the water sector
- Infrastructure failure

OVERALL CHAMPIONS

Lead

RURA, WASAC, CoK

Partners

RWB, REMA, Ministry of Health, Ministry of Infrastructure

Approval

RURA

ACTION 1.

6

Strengthen the capacity of regulators in developing and proactively enforcing regulations for water-related services.

DESCRIPTION

This action aims to mainstream the need to efficiently develop and proactively enforce regulations in every stage of the planning and implementation process to achieve high-quality water related services. A tailor-made water regulation framework will enable the city of Kigali to define its basis and standards and ensure effective coordination with all actors as far as regulations development and enforcement are concerned. Fulfilling this purpose is a complex task that requires strategic thinking and efficient stakeholder engagement at the city level. A set of concrete guidelines and approaches will present a comprehensive framework to achieve high-quality water-related services delivery. The goal is to empower regulators by strengthening their capacity to help the development and enforcement of regulations to achieve a tailor-made high-quality standard in all water related services delivery.

A reference for such a regulatory framework could be the Abu Dhabi's ESTIDAMA Sustainability Program. The main goal of this programme is to preserve and enrich the physical and cultural identity of the city, by working on four pillars of sustainability: environment, economy, society and culture. By working closely with all stakeholders, ESTIDAMA aims to establish a mindset that contributes to achieve sustainability. A government-mandated program which, through the enforcement of regulation, provides guidelines on design, construction and operational performance, setting out policies and procedures for building owners and operators. Guidance is also provided for facilities management teams and users. Besides regulations, this programme identified the importance of conducting multiple trainings and providing technical support as key learnings. Efforts on the creation of courses and training are essential for the proper implementation and enforcement of regulations. For this reason, trainings, and technical support needs to be developed and made available. In addition, free training can be provided for communities to increase engagement, and foster awareness raising on the importance of high-quality water related services.

RESOURCES

- Case Study* - ESTIDAMA: A holistic framework that enables the implementation of previously defined sustainability principles as the foundation of any new development. It also provides regulatory guidance on operational performance, and guidance on maintenance protocols and procedures for remedial works. (Link)
- Berlin Design for All: An example of a manual developed to provide a framework for experts and planners with a set of requirements and planning principles focused specifically on barrier-free planning. (Link)

STAKEHOLDERS

- **Lead:** CoK
- **Approval:** RURA, WASAC, RWB, REMA, Ministry of Health, Ministry of Infrastructure
- **NGOs:** Ministry of Finance.

NEXT STEPS

- Develop a framework for collaboration between the city of Kigali, and primary stakeholders, such as RURA, WASAC, and Universities, to participate in the design and development of Kigali's water-related services delivery regulations.
- Enhanced collaboration with technical schools, universities, and research institutes to define tailor-made regulations in line with the general regulation framework.
- Develop a set of guidelines, flexible enough to be applied across the different water services in the city.
- Train regulators into the use of the new guidelines. Trainings can also raise awareness among people working in the sector and the general population.

6

OUTCOME

- Comprehensive water-related services delivery regulation framework for the city of Kigali developed.
- Awareness raised on the importance of regulations amongst key stakeholders, professionals in the area, and the general population of the city.
- Proactive enforcement mechanisms to reinforce the implementation of the guidelines and regulations developed and set up.
- Well trained regulators that count on a support system to facilitate the implementation of regulations in line with the regulatory framework.

VISION 7

VISION STATEMENT

Build resilient water-related infrastructure in the city of Kigali

OPPORTUNITY STATEMENT

Improve the continuity of operations of key infrastructure in Kigali. For WASH systems, this will be addressed by strengthening WASAC's capacity for emergency and accident preparedness, response, and recovery planning and fostering coordination among the utility's agencies. For stormwater management, this will be fulfilled by incorporating climate resilience considerations in the planning and design standards of drainage (stormwater and roadside drainages) in the city.

RELATED CHALLENGE

#7 Vulnerable water-related infrastructure

VISION DESCRIPTION

The city needs to strengthen monitoring and maintenance of the existing network, to improve continuity of water supply service and to reduce activities that cause water losses (i.e., leakage), as well as diversify water sources at a community and household level (i.e., RWH) to mitigate the effects of water rationing. Improved monitoring and enhanced collaboration with all stakeholders can help the city reduce damage and destruction of water supply assets from vandalism or lack of coordination with other stakeholders. In addition, design standards for resilient infrastructure need to be established based on historic and projected climate risks in Kigali to ensure all future infrastructure investments are resilient and existing infrastructure can be retrofitted to mitigate risks, these include stormwater drainage channels as well as roadside drainage channels in the city.

Furthermore, in the city of Kigali the development of key water infrastructures such as the water supply and sanitation network and the stormwater drainage system, among others, is still not able to keep up with the rising demand due to population growth and rapid urbanization. Sanitation infrastructures are particularly under development in the city of Kigali. As infrastructure development is very challenging, there is a need to optimize the management of the existing water infrastructure in place and carefully plan for their expansion (with climate resilience in consideration) and future operations.

This vision supports the optimum operations and future expansion of water infrastructure in the city of Kigali, taking into consideration the climate related risks and availability of water to satisfy the rapidly growing demand in the city. The support will focus on i). setting up technical and climate resilient water infrastructures development guidelines for the city to ensure sustainable infrastructure development, ii). managing the water losses in the distribution networks by developing a water safety strategy for Kigali's water systems and tools for monitoring water losses and assets management; and iii). managing the increasing water demand by promoting circular water technologies in the construction regulations in the city of Kigali.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Improve continuity of water supply service by reducing activities that cause water losses (i.e., leakage), proactive maintenance of water facilities and networks and upgrading of aging ones in addition to strengthening monitoring of the existing network.
- Mitigate the effects of water rationing through diversifying water sources both at the community and household levels and promoting circular economy approaches to water use reduction, recycling and reuse.

7

- Reduce destruction of water supply assets by addressing the root causes of vandalism including collaboration with grassroot leaders and security agencies and promoting coordination among government and private agencies that are involved in providing utility services.
- Enforce existing standards/regulations/ guidelines that mainstream resilience (e.g., GBMCS) to improve water use efficiency, particularly in the retrofitting of existing building stocks (water saving devices etc.) while promoting innovations around reuse and recycling.
- Put in place climate-resilient and sustainable infrastructure standards to foster intention-driven designs and standardize infrastructure design, implementation, and operation processes for all water-related infrastructure in ways that maximize climate-proofing on top of social and economic benefits.
- Expansion and maintenance of a distribution network that improves the quality and safety of water services through engagement of all stakeholders.

RELEVANT ASSETS AND RESOURCES

- Supervisory control and data acquisition (SCADA) system used to automate operations of new water treatment plants. WASAC plans to optimize its use to perform purpose-oriented monitoring and control the water pressure in distribution networks and minimize the non-revenue water in the whole network.
- Risk-based analysis for pipe replacement is being carried out by WASAC to assess the probability of failure as well as the associated impact of failure for water distribution pipes.
- Water Assets Registry and Mapping
- National Water Supply Policy Implementation Strategy (NWSPIS) (2016)
- WASAC and Japan International Corporation Agency (JICA) project for a Water Supply Master Plan for the City of Kigali
- The National Integrated Water Supply and Sanitation Master Plans for Rwanda

SHOCKS AND STRESSES

- Water shortage
- Heavy rain, flooding, and landslide
- Environmental degradation
- High rate of unemployment
- Disease outbreak
- Vandalism
- Infrastructure failure
- Old infrastructure that is jeopardizing water quality

OVERALL CHAMPIONS

Lead

City of Kigali, WASAC, RTDA, RWB

Partners

GGGI, REMA, Ministry of Emergency Management, Rwanda Housing Authority (RHA), Security organs, Professional bodies (Environmentalists, engineers, plumbers), Ministry of Health, Local Banks, Water Users Associations, Joint Action Development Forum (JADF), Residents, Private sector (Suppliers of water equipment), MoE

Approval

Ministry of Infrastructure (MININFRA), Ministry of Finance and Economic Planning

ACTION 1.

Adopt technical guidelines for resilient water-related infrastructure in the city of Kigali.

DESCRIPTION

This action develops technical design guidelines and standards that define best resilience practices for key infrastructure and ensures they are effectively operated and heavily monitored. The design guidelines will incorporate a strong consideration on climate related risks in the city which will ensure that the upgrade and expansion of water related infrastructure is robust. Therefore, this will lead to robust water infrastructure with high resistance capacity (i.e., high pressure resistance water supply network, stormwater drainage with a high-water conveyance capacity, etc.). The expected benefits are, but not limited to, a reduction in non-revenue water in the water supply network, reduced economic losses and infrastructure damage (due to flooding). Resilience guidelines and standards will also help to prioritize infrastructure investments that consider mitigation measures for climate impacts besides considering how future risks will be addressed over the infrastructure's lifespan.

RESOURCES

- New York City Building Code for Flood Resilient Infrastructure: An example of how a city's construction and building code guidelines can be structured to incorporate aspects of flood and water resilience into the city's infrastructure. (Link)
- Peru Sustainable Reconstruction: Documents how the city of Peru integrated sustainable flood prevention measures into the infrastructure reconstruction process following the El Niño event in 2017. (Link)
- Water Resources Planning Guidelines: Guidance developed by the Government of the UK's Department for Environment, Food and Rural Affairs to facilitate the UK's planning for sustainable water supplies. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali
- **Approval:** Ministry of Environment, Districts, RURA, REMA, RTDA, WASAC, RWB, Professional bodies (Environmentalists, engineers, plumbers), Water Users Associations, Rwanda Standards Bureau
- **Approval:** MININFRA
- **NGOs:** Water for People, WaterAid Rwanda, UNICEF, World Vision, CRS, Living Water International Rwanda, JICA

NEXT STEPS

- Facilitate dialogue around climate-resilient infrastructure to have a common understanding and identify the existing knowledge gaps and good practices.
- Research activities for technical and vulnerability assessments and mapping during all WASH infrastructure project cycle processes.
- Pilot small-scale project adaptation measures and solutions identified as a result of the assessments.
- Recommend new business models through climate-proofed technical standards and guidelines for planning, design, construction, maintenance, procurement, retrofit, and rehabilitation of WASH infrastructure under a changing climate.
- Support capacity building and awareness tools for key stakeholders.
- Monitor the use of developed guidelines and standards.

7

OUTCOME

- Enhanced understanding of risks to water system infrastructure.
- Resilience mainstreamed in infrastructure planning, implementation, and management.
- Increased adaptability of infrastructure facilities to hazards and risks caused by extreme rainfall, and other climate and weather-related disturbances.
- Increased availability of water supply during emergencies.
- Basis for making the business case for resilience investments in place.

ACTION 2.

7

Long term – Develop a water safety strategy for Kigali's water systems.

DESCRIPTION

Because the water governance structure in Rwanda is complex and coordination amongst organizations is inefficient, it is very important that the city of Kigali, in close collaboration with water services providers and regulators, develops a concise water safety strategy that will help the city optimize its coordination and operation of its water supply network up to the beneficiary's level. To develop this strategy, a coalition team will be needed. This team should be composed of professionals with decision-making power and representatives from all key organizations will be required for the long-term management of water supply. This will secure the technical expertise needed to develop the water safety strategy and at the same time will open a new working space that is expected to improve cooperation between actors, as well as help stakeholders identify existing overlaps between organizations in Rwanda's water sector.

To characterize the shocks and stresses facing the water supply system, the task team will fully describe and assess the water supply system in the city of Kigali. The team will compile existing information, using the knowledge gathered from the City Water Resilience Approach as a strong foundation, and fill in the gaps with field work and research where necessary. The objective is to ensure the understanding of the entire system: raw to treated water supplied to the end users, as well as an assessment of risks and challenges specific to each stage of the water distribution chain.

The implementation of the water safety strategy will be conceptualized in phases, to facilitate funding. The characterization and assessment of Kigali's needs related to the water supply chain will enable the prioritization of interventions as well as the identification of key pilot areas. Pilot interventions will enable the water safety strategy team to assess the sustainability of the plan over time, finetune participation of communities and other non-governmental actors, while at the same time, enable the creation of tailor-made indicators for monitoring and evaluation.

RESOURCES

- WHO Water Safety Plan Manual: The World Health Organization's step by step manual on risk management for water suppliers in addition to water safety planning training videos and modules. (Link)
- Water Security in Cape Town, South Africa: A publication providing an example of how the relationships between water, environment, economy, and people can be described and how these relationships are affects by shocks and stresses. (Link)

STAKEHOLDERS

- **Lead:** RURA, WASAC, CoK
- **Approval:** JICA; RWB, REMA, Ministry of Health, Ministry of Infrastructure, Ministry of Environment, Development partners, CSOs
- **Approval:** MININFRA

NEXT STEPS

- Identify priorities at the local level based on a people-centred approach.
- Select appropriate and tailor-made regulatory standards.
- Define roles and responsibilities of the water safety strategy task team members (and organizations)
- Define the timeframe to develop the water safety strategy
- Gather existing water supply data and identification of data gaps that need to be filled for the water safety strategy.

- Develop a clear strategy for effective communication between team members
- Identify national and international programs and resources to develop an effective water safety strategy
- Identify key areas to develop pilot projects for implementation.
- Mobilize national and international resources to secure funding.
- Start a component of "lessons learned" to enable peer-to-peer knowledge transfer to other cities in Rwanda.

OUTCOME

- Detailed up-to-date description of the water supply system.
- Detailed understanding of the water quality variations currently being provided in the different stages of the water supply chain (catchment – treatment – distribution – consumer).
- Detailed understanding of stresses and risk for every stage of the supply chain.
- Development of a prioritized plan for the city of Kigali.
- Acquired lessons learned from pilot implementation projects.
- Successful implementation of the plan according to the prioritization of activities (based on Kigali's specific needs).
- Strategic monitoring of the implemented actions.
- Establishment of an experienced, multidisciplinary team that understands the component of the water system and has the capacity to assess the risks and hazards that may be associated to each component of the system.

ACTION 3.

7

Long term – Enforce/Promote circular water technologies (water reuse and recycling) through the building construction permitting process.

DESCRIPTION

This action aims to promote strategies that contribute to reducing dependence on the centralized water supply system and improved decentralized management of stormwater, through strengthening the building construction regulations and designing appropriate enforcement mechanisms of these regulations in the city of Kigali.

The intent of this action is on one hand to promote the adoption of circular water technologies at household and neighbourhood levels in the city of Kigali, and on the other hand to raise awareness of the financial benefits of sustainable lifestyles at the household level and socio-environmental benefits at the neighbourhood level. For instance, enhancing the household and neighbourhood capacity to i). use alternative water sources, such as rainwater harvesting or reuse of grey water, for improved demand management of main supplies and localized flood control; and ii). use decentralized sewage treatment using nature-based strategies for improved effluent release in the environment, will catalyse and accelerate the resilience of the communities against water disruptions and stresses.

The last component of this action will focus on designing enforcement mechanisms that will support an efficient implementation and uptake of circular water technologies in the city's building construction. This particular component shall focus on the process to obtain a building construction permit and its related inspection and associated sanctions in case of non-compliance.

RESOURCES

- Eco-District Waterway: The city of Lille transformed an industrial landscape into a sustainable green eco-district acknowledging and incorporating the natural water cycle into the eco-district's revitalized developments. (Link)
- Addis Ababa Resilience Strategy: Outlines an action on strengthening decentralized water treatment while incorporating water-sensitive designs (Goal 3.1, Action 35). Highlights the importance of circular economy approaches in the construction on new developments. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali, Rwanda Housing Authority.
- **Approval:** MININFRA, MoE, Ministry of Emergency Management, MoH, GGGI, REMA, RTDA, RWB, WASAC, Professional bodies (Environmentalists, engineers, plumbers), Local Banks, Water Users Associations, JADF, Residents, Private sector (Suppliers of water equipment).
- **Approval:** MININFRA

NEXT STEPS

- Develop a compendium of best practices and technologies for water reuse, recycling, and reduction in Kigali.
- Develop mechanisms for systems and technologies that improve water-use efficiency to be cost effective and trigger consumer demand.
- Establishment of health-based standards for safe use of circular water such as harvested rainwater, treated wastewater, effluent, and greywater.
- Facilitate acquisition, provide advice and other services related to installation and maintenance of circular water technologies for domestic, institutional, and industrial buildings.
- Strengthen the building construction permitting regulations by incorporating circular water technologies requirements and enforcement mechanisms.
- Require all potential new commercial, residential and government buildings to incorporate circular water technologies, in line with the strengthened regulations.

7

- Develop awareness raising materials and organize campaigns to increase public awareness on the multiple benefits of adopting circular water technologies in their homes.

OUTCOME

- Improved water demand management of main supplies and localized flood control.
- Reduced contamination of surface water with wastewater effluents.
- Financial savings at household, institutional and industrial levels.

ACTION 4.

7

Develop a smart monitoring tool for water losses and water assets management.

DESCRIPTION

This action aims to reduce non-revenue water and optimize the management of water assets in the city of Kigali. To achieve the goal of this action, focus will be invested on optimizing the monitoring of water losses and assets status using a combination of community engagement at the grassroot level, community-based monitoring mechanisms and smart technologies.

Community engagement will be done through collaboration with grassroots leaders and private sector actors to raise awareness of the value of infrastructure assets and the impacts of disruptions. The awareness raising will be completed using a programmatic approach as it requires time to achieve a community behaviour change that targets the increased sense of ownership of public water infrastructures.

Community based monitoring mechanisms will mainly be focused on enhancing local stewardship of water assets. These mechanisms will leverage on existing frameworks of community engagement at the grassroot level such as the youth volunteer network at the village level. Such types of monitoring mechanisms will constitute the basis of transition from a reactive approach to addressing vandalism (via a public toll-free hotline or via the utility's social media platforms) to a more proactive and dynamic approach that can predict the level of vandalism risk prior to any damage. These mechanisms are mostly efficient when combined with mapping technologies and citizen science to systematically address vandalism by collecting consistent (sometimes real-time) data on vandalism incidents, their severity, location and possible motives as these are needed and could inform timely measures to reduce the likelihood of future vandalism activities. The purpose of such mechanisms would be to provide an understanding of the nature of vandalism and support analysis around categorizing trouble spots, observing trends over time, understanding the effectiveness of existing measures and finding solutions to address the issue sustainably.

Non-revenue water is mostly related to water losses in the distribution network and technological failure to account for water consumed by consumers. Addressing these issues is mostly done through smart technological approaches of monitoring these losses within the distribution system (focusing on affordable technologies that could, for example, track abnormal changes of piezometric pressure within the distribution pipes to detect leakages, and so forth) and at consumers' level (by using for example smart water meters, as currently being deployed by WASAC).

RESOURCES

- National youth volunteers' network
- Smart meter project
- Distribution network spatial data
- Case Study* - Digital Neighbourhood (Barrio Digital) Tool: A mobile phone tool used in the city of La Paz that citizens can use to send real-time feedback, complaints, and requests directly to the municipal government from their device. (Link)

STAKEHOLDERS

- **Lead:** WASAC
- **Partners:** City of Kigali, MINALOC, RURA, Districts, Security organs, Professional bodies (environmentalists, engineers, plumbers), Water Users Associations, Residents
- **Approval:** MININFRA
- **NGOs:** Water for People, WaterAid Rwanda, UNICEF, World Vision, Catholic Relief Services (CRS), Living Water International Rwanda, JICA

NEXT STEPS

- Develop awareness materials for communities at the grassroot level with prioritization of the community around water assets and risks.
- Assess needs, engage relevant stakeholders, and develop data gathering methodology and monitoring system requirements.
- Assess suitable technological needs to serve the purpose.
- Develop the tool, collect, and analyse data as pilot program; and from the lesson learned develop sustainable strategies to achieve full deployment of the tool.
- Acquire funding for implementation.
- Procure the monitoring system.
- Implement the monitoring system.

OUTCOME

- Improved customer-WASAC relations.
- Increased customer ownership and awareness around water infrastructure.
- Strengthened law enforcement.
- Reduced water leakage from damaged infrastructure.
- Reduced non-revenue water in the distribution network in the city.

VISION 8

VISION STATEMENT

Enhance resilience of key water-related plans

OPPORTUNITY STATEMENT

To develop an integrative platform and tools for mainstreaming water-sensitive/resilient infrastructure planning and implementation through a strengthened cross-sectoral coordination and collaboration between institutions and other stakeholders.

RELATED CHALLENGE

#8 Low mainstreaming of resilience into key water-related plans

VISION DESCRIPTION

Mainstreaming the resilience concept is necessary to develop interest in and experience among future professionals to build integrated planning skills. In addition, increasing awareness around possible integration of green/blue networks, and nature-based solutions can enhance ownership and active participation of youth and communities in integrated planning processes.

In these terms, it would be useful to incorporate in the city water resilience dashboard a Resilience Virtual Library, intended as a web-repository bringing together all the existing knowledge (documents, reports, tools, plans, etc.), which will give increased visibility to locally produced knowledge. This would be used to break silos in plans that are integrated. As for this purpose, information, data and knowledge sharing are key, so part of the library's role would be to increase accessibility and transparency in data collection and sharing.

To facilitate the mainstreaming of water resilience in planning, it is paramount to develop a water resilience tool/checklist to serve as basis during planning processes. This will ensure integrated and water-sensitive planning, and the alignment and coordination of implementation to optimize value for investment. In addition, improved knowledge and understanding of each other's roles, responsibilities and priorities will improve equitable access to public resources (finance). This sharpens the role of Sector Working Groups as actors/vectors of integration across diverse knowledge streams at the local level.

Promoting water-sensitive approaches to plans and projects through integrated and participatory planning and implementation is key to any resilience-building efforts for the city of Kigali. As such, this vision is centred around the creation of an active ecosystem of knowledge resources, tools and guidance documents to enhance integrated planning and implementation efforts around stormwater and wastewater, as well as solid waste management, with a special focus on nature-based solutions and green-blue infrastructure approaches.

With the ultimate goals of ensuring sustainable use and access to water, reducing flood and associated landslide risks, while preserving and regenerating the city's water systems, this vision is set to promote the active role of integrative and nature-based approaches to stormwater and wastewater, as well as solid-waste management. This implies defining an integrative mechanism and tools for improving coordination around water sensitive infrastructure planning and implementation.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- The major need is for knowledge sharing and coordination platforms. This is further linked to the need for opportunities to practically engage different knowledge streams and sectoral expertise around pilots (experimentation and learning-by-doing opportunities).

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- A mechanism for coordination and use of existing knowledge to be shared (production and fruition), that in parallel fosters capacity development.
- Bring together aspects that are not usually linked to water issues: gender, traditional knowledge, and economic opportunities linked to integrated service delivery.
- Integrate the City Water Resilience Framework into urban planning processes in a holistic way, looking at the entire water cycle, studies around nature-based solutions, technical feasibility studies, etc. Use tools such as the natural capital accounting framework from NISR to make planning more integrated across the city.
- Increase skilled experts in the city to improve integrated planning efforts.

RELEVANT ASSETS AND RESOURCES

- The World Resources Institute's Urban Water Resilience Framing Paper, highlights how one of the priority pathways - "risk informed land management and water sensitive urban design".
- The WASAC Master Plan that is currently under elaboration (JICA) represents a chance to apply forward thinking, promoting integrated catchment planning and integrated water management approaches.
- There is substantial existing knowledge and tools, such as the flood hotspots mapping and the NBS study for Kigali, that should be collected and made accessible to all stakeholders.
- There is a realized pilot of a Rapid Planning Project in Agatare (implemented by UN-Habitat), providing a practical example for integrated planning and implementation of blue-green infrastructure for managing stormwater, wastewater, and solid-waste. This could be used as a testing ground for upscaling by students/universities/research centres in collaboration with CoK. (Link)

SHOCKS AND STRESSES

- Uncoordinated planning between future land use and infrastructure
- Lack of design guidelines and construction management standards
- Inadequate stormwater management systems
- Risks associated with the current on-site wastewater management systems
- High soil erosion leading to the siltation of water sources and overwhelming damage on wastewater treatment plants

OVERALL CHAMPIONS

Lead

MININFRA, RWB (co-lead)

Partners

CoK, MoE, RLMUA, WASAC, Ministry of Information Communication Technology and Innovation (MINICT), University of Rwanda, Rwanda Young Water Professionals (RYWP), Water Partnership-Rwanda

Approval

Ministry of Finance and Economic Planning (MINECOFIN), REMA

ACTION 1.

8

Develop water resilience checklist for relevant city of Kigali plans.

DESCRIPTION

This action aims to create an interactive web-tool or toolset to improve capacity and enhance cross-sectoral coordination and integration around infrastructure planning and implementation. The tool is envisioned as an online dashboard, facilitating a differentiated accessibility and user capacity, so as to enable access to specific web-tools and more advanced functions to city officials and other institutional stakeholders[1], while allowing access to information and knowledge to all other stakeholders, from communities and civil society organizations to private sector actors.

Similar to the Resilience Strategy for Mexico City, the tool would be structured around resilience qualities, domains of actions under each quality, and specific action-items against which to assess and score each project. In the Resilience Strategy for Mexico City, actions are defined following different types, depending on who is responsible for the action, the kind and role of stakeholders involved, the degree of relevance of each action, and their added value in terms of increased resilience. They are also defined by the time period (i.e., short, medium, long term).

The tool, which will be developed around a similar framework, will therefore provide a structure of reference to assess interdependencies and foster integration of various aspects of project planning, design and implementation in relation to water resilience, in the form of an easy-to-use checklist to be consulted and used online.

The checklist will be developed as a multidimensional assessment tool and will be built to be used in various phases of plan-making, project design and plan/project implementation. By addressing the multidimensional factors that ties any kind of urban transformation that might impact water issues to an analytical framework for enhancing water resilience. The aim of the checklist is to enhance integration and coordination aspects in planning and implementation while mainstreaming the use of NBS and blue-green infrastructure approaches to water-related plans and projects.

RESOURCES

- Case Study* - MiKaDo – The city of Dortmund's master plan integrated climate adaptation. This plan establishes a roadmap with the participation of different parties and citizens, and recommendations for each of the city's departments. (Link)
- Case Study* - Mexico City Resilience Strategy: A response prompted by the city of Mexico (CDMX) to foster public policies that contribute to strengthening the city's adaptive capacity. (Link)

STAKEHOLDERS

- **Lead:** CoK
- **Partners:** MININFRA, RWB, REMA
- **Approval:** MINECOFIN
- **NGOs:** RYWP, Water for People, Rwanda Initiative for Sustainable Development (RISD)

NEXT STEPS

- **Short term** – Needs and Knowledge Gaps assessment will be undertaken, together with the development of an initial concept for the tool. Commitment, funding, and endorsement from MINECOFIN for e-tool platform development will need to be secured. This will be followed by a request for proposals detailing the creation and operation of the platform, developed around differentiated accessibility and uses for the private and public sectors, education, and communities.
- **Medium term** – Creation and operation of the checklist, together with the design and development of associated user interface to enhance integration and coordination in the planning and implementation stages. All the main issues linked to the tool will be developed and managed (i.e., upgrading, modification, and other themes), together

with the development of a Resilience Screening/Checklist for plans and projects to be used by Sector Working Groups for sharpening the role as actors/vectors of integration.

- **Long term** – An impact assessment detailing how the tool has improved integrated planning and implementation efforts around water resilience will be performed.

OUTCOME

- Creation of an actionable tool that includes and expands integrated impact assessment and costs and benefits analysis for water-related projects with other fundamental dimensions of water resilience.
- Enhanced value of NBS options versus grey infrastructure options.
- Improved cross-sectoral integration and inter-institutional collaboration around integrated planning and implementation of water-related projects.
- Improved climate and water resilience of Kigali's urban development.
- Enhanced understanding and increased use of NBS, and blue-green infrastructure approaches in plans and projects across the city, and through the different project stages.

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(1) Several ideas were discussed as possible functionalities and interactive tools to be developed and dedicated to city officials and other institutional and sometimes non-institutional stakeholders. These ideas were not explored in depth, but they can be summarized as ranging from activation of online "collaboration rooms" for cross institutional collaboration on specific plans & projects, or "coordination dashboards" to control interdependencies across projects or across different contributions to the same project from various institutional and non-institutional stakeholders.

VISION 9

VISION STATEMENT

Flood resilient city with healthy water bodies

OPPORTUNITY STATEMENT

The city of Kigali is moving towards a green climate resilient community focused future in which stormwater is efficiently managed and water bodies in the city are pollution free and developed.

RELATED CHALLENGE

#9 Inadequate stormwater management system and downstream pollution (originating for the city)

VISION DESCRIPTION

As the country's magnet for economic opportunity, Kigali must account for the city's rapid expansion when planning for a more resilient future. The city planning speed needs to match the development speed and needs to be completed at a neighbourhood scale to account and guide for optimum land use development in the city. It is of paramount importance that the planning of the city be based on data and facts that help contextualize the hydro-geomorphological and socio-economic characteristics of the city into the plan up to the neighbourhood level.

Hydro-geomorphological understanding of the city will help the city leadership understand the relationship between the poor stormwater and wastewater management framework and the pollution of the city's water bodies. The city needs an adequate system of stormwater management that leverages on the nature-based opportunities within the city and a wastewater management system that is not directly connected with groundwater, as it is now. The planning and development of the city needs to incorporate a proper stormwater and wastewater management system that is green and climate resilient, as well as generate opportunities for the communities.
The communities' engagement in the planning of programs and projects at the city level is very crucial because it leads to efficient understanding and uptake of the socio-economic context of the city and ensures high level of ownership of the interventions implemented. Thus, it is most sustainable to include the community as part and parcels of the water system in the city.

Therefore, this vision focuses on i). promoting an engaged community and developing a bottom-up approach to water resource management and planning. Communities are inherently part of the water system and creating shared responsibility and accountability of finite resources is critical to a sustainable future. The city level governance and responsibility for water resources management and planning are also of key importance. Bridging the gap between ensuring that the needs of residents are met now and, in the future, could involve investing in further education around water resource management and the creation of a job market in this space; ii). Developing a resilient stormwater management plan that leverages on the city's nature-based opportunities. The complex topography of the city could provide, if properly done, an unlimited opportunity for nature-based stormwater management and hence water bodies pollution control. The vision will set a practical and bankable nature-based stormwater management framework for the city utilizing a holistic approach in a manner that will demonstrate the multiple benefits of the nature-based city development; iii). To protect the pollution of water bodies in the city, the vision will also focus on the management of wastewater, which is still under development. A strong component of nature-based wastewater management measures will be incorporated in the management to ensure cost effectiveness of the system and resilience. Additionally, the system will be conceptualized in such a way that it generates green jobs to optimize its autonomy, therefore ensuring its sustainability and adaptive capacity to increase at the same pace as the city's development.

A holistic approach, including stakeholders at all levels of the planning and implementation process, can promote sustainable and appropriate solutions in improving stormwater and wastewater management in unplanned settlements. Additionally, integrating practices of circular economy and nature-based solutions can improve both water system management as well as the wider ecosystem in the city.

As the Rwanda Water Resources Board (RWB) grows in both capacity and capability there is likely to be an increase in related water resources management expertise with needed skills such as water resources assessment, mapping and modelling. This could lead to improved wider capacity around operation and maintenance, infrastructure upgrades, and adaptation of policy and regulations protecting Kigali's water resources and water bodies.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Improve community inclusion in the planning and implementation processes for water resource management programs, particularly targeting solutions for unplanned settlements and their access to basic water services.
- Identify cross-sectoral opportunities to use circular economy approaches to allow Kigali to progress a wider vision of urban water resilience.
- Implement monitoring mechanisms and evaluation criteria to improve groundwater and water source quality. There is a need to conduct regular monitoring and evaluation of the implementation, as well as share the results of this monitoring.
- Utilize monitoring and evaluation data to influence infrastructure investment decisions to consider shocks and stresses.
- Develop a detailed nature-based solutions framework for the city of Kigali.
- Develop a stormwater management system, for the city of Kigali.
- Develop a wastewater management system, for the city of Kigali.
- Develop bankable projects to support the implementation of the develop stormwater and wastewater management systems for the city of Kigali.

RELEVANT ASSETS AND RESOURCES

- The National Integrated Water Supply and Sanitation Master Plan for Rwanda
- Water Supply Master Plan for the city of Kigali
- Kigali Bulk Water Supply Project
- Kigali Recycling Ltd – recycling the city's landfill and waste sludge targeting towards manufacturers, nurseries etc. This reduces hygienic diseases, while managing challenges of blocked stormwater drains and aiding with flooding.
- Kigali city nature-based solution framework.

SHOCKS AND STRESSES

- Root cause of immediate disruptions from flooding.
- Additional long-term stresses brought on by insufficient, water resource data and infrastructure.
- High water bodies pollution leading to health risks.

OVERALL CHAMPIONS

Lead

CoK, RWB, REMA

Partners

Schools and universities, private sector, research organizations, international organizations, National Institute for Statistics, Meteorological agency RTDA

Approval

Ministry of Finance and Economic Planning (MINECOFIN)

ACTION 1.

9

Develop a stormwater management plan for the city of Kigali.

DESCRIPTION

This action develops a concise stormwater management plan for the city of Kigali based on a detailed assessment of the topography, hydrology, and impervious area patterns in the city of Kigali as well as the projection of future development. Kigali city needs a holistic approach at small scale to fully understand the generation and conveyance of its runoff and how it can be managed to address the issue of flooding and water bodies pollution in the city. The action will go further as to analyse the economic viability of such a plan for the city of Kigali and will generate strategic policy recommendations that will help the city to make the right decisions. The plan will also indicate priority projects to help the city address its issues of flooding and pollution progressively.

RESOURCES

- The Pluit Reservoir Revitalization Project: An initiative of the city of Jakarta to reduce urban flooding, improve water storage capacity and the quality of its prime water source (Link).

STAKEHOLDERS

- **Lead:** City of Kigali, RWB
- **Partners:** MININFRA, MoE, MINALOC, MINEMA, RHA, RTDA, RLMUA, REMA, World Bank, Security organs, Professional bodies (environmentalists, engineers, plumbers), Water Users Associations, Residents, Rwanda Meteorology Agency
- **Approval:** City Council

NEXT STEPS

- Detailed meteorological assessment of Kigali city
- Detailed hydrologic and hydraulic assessment of Kigali city
- Detailed land use change assessment of Kigali city
- Detailed stakeholder assessment of Kigali city
- Detailed assessment of the current stormwater conveyance of Kigali city
- Develop a concise stormwater management plan at small scale for the city of Kigali
- Identify priority interventions to implement the plan
- Develop bankable projects from the identified priority interventions
- Mobilize financing

OUTCOME

- Proper and resilient stormwater management system in Kigali city
- Increase ability to withstand climate related shocks and stresses in the city
- Increase population security against climate related disaster
- Improved water related coordination in the city.

ACTION 2.

Develop a detailed nature-based solution framework for the city of Kigali.

DESCRIPTION

The incorporation of Nature-based solutions (NbS)in development plans has been seen as one of the most cost effective and sustainable ways to develop. The city of Kigali offers many opportunities to develop strategic NbS because of its geomorphology. More specifically, NbS in the context of Kigali city can contribute to greening the city, cost effectively addressing the challenge of flooding as well as heat (the latter is expected to grow with the city's development). This action will focus on increasing the awareness of decision makers and the community on the multiple benefits of NbS from a very practical approach through a framework that will guide the development and implementation of NbS in Kigali city and identify the expected benefits. In addition, a detailed cost benefit assessment of the framework will be completed to provide facts and insights on the policy recommendations for the city of Kigali. This action will leverage on the existing work that has already been completed for the city of Kigali.

RESOURCES

- World Bank NbS assessment for floods hotspot in Kigali city
- WRI NbS Framework for Kigali
- Kigali City Masterplan
- Kigali city land use land cover data at parcel level
- Natural capital accounting (all)
- Shanghai Urban Drainage Masterplan: A blue green masterplan which integrates green spaces and rivers with the urban drainage network in Shanghai. (Link)
- Global Sponge Cities Survey: An Arup survey to learn more about how green-blue areas can be used in cities to handle increasing rainfall and other water-related climate impacts. (Link)

STAKEHOLDERS

- **Lead:** RWB, REMA, City of Kigali
- **Partners:** MININFRA, MoE, MINALOC, MINEMA, RHA, RTDA, RLMUA, World Bank, Professional bodies (environmentalists, engineers, plumbers), Water Users Associations, Residents
- **Approval:** City of Kigali

NEXT STEPS

- Assessment of all existing NbS work in Kigali city
- Development of the remaining component to produce a full-fledged NbS framework
- Detailed cost benefit assessment of the NbS framework
- Development of the implementation mechanism of the NbS framework

OUTCOME

- NbS framework for the city of Kigali encompassing all NbS development opportunity
- Awareness raised on NbS multiple benefits
- NbS policy environment established in Kigali city

ACTION 3.

9

Develop a priority bankable nature-based solution investment program for the city of Kigali.

DESCRIPTION

This action will build on the previous action, Vision 9 Action 2, as a next phase. The intent of this action is to demonstrate the efficiency of NbS when properly implemented. As a result, this must be done with partners and stakeholders. From the cost benefit analysis conducted for the Kigali NbS framework, a prioritization of key activities will be done. The prioritization here will be using a set of criteria that will include community livelihood improvement to ensure sustainability of the NbS interventions to be implemented. Once the prioritization is complete, a bankable NbS investment program, including a component of technical assistance, will be developed for the city of Kigali with the intent to demonstrate the robustness, cost effectiveness and multiple socio-economic benefit of NbS when implemented. This program's concept note will be used to mobilize funding for implementation.

RESOURCES

- The GreenQuays: Tests a complex set of solutions for renaturing urban rivers in dense downtown areas in Breda, Netherlands where there is insufficient space to develop natural riverbanks. The solution is centred around Nature Inclusive Quay (NIQ) technology that is specifically designed to support the development of a complex vertical ecosystem, providing favorable conditions for flora and fauna (Link).
- Growing Green Guide: City of Melbourne's Green Infrastructure Program produced to cope with the difficulties of the future climate while maintaining the city's economic prosperity and liveability (Link).

STAKEHOLDERS

- **Lead:** RWB, REMA, City of Kigali
- **Partners:** MININFRA, MoE, MINALOC, MINEMA, RHA, RTDA, RLMUA, World Bank, Professional bodies (environmentalists, engineers, plumbers), Water Users Associations, Residents
- **Approval:** City of Kigali, MINECOFIN

NEXT STEPS

- Prioritize the interventions from the cost benefit analysis conducted in the previous action
- Develop criteria for program selection
- Define overall impact target from the selected program
- Develop a bankable NbS investment program for the city of Kigali
- Mobilize funds for implementation

OUTCOME

- Awareness raised on NbS multiple benefits
- Bankable NbS investment program developed
- Fund mobilized.
- Efficiency of NbS demonstrated.

ACTION 4.

Develop a priority bankable sanitation investment program from the city of Kigali (sanitation master plan under development).

DESCRIPTION

This action will support the development of the sanitation in the city of Kigali, which is currently very underdeveloped. The action will build on the ongoing development of the Kigali sanitation master plan. The masterplan is expected to be a roadmap showing the needs for the sanitation sector in Kigali in terms of policies, infrastructures, human capacity, and finances. Through this action, a coalition of partners will be assembled to strategically develop a bankable sanitation investment program for the city of Kigali, which will include a component of technical assistance, with the purpose to address the key needs highlighted in the master plan. Then work will be completed to mobilize funds to support the city of Kigali in implementing the program.

RESOURCES

- Kigali city Sanitation masterplan
- Kigali city Land Use masterplan
- National Water Resources Masterplan
- Kampala, Uganda: The Kampala Master Plan looks at decentralized sanitation and provides rigorous programs to better sanitation within the city (link not publicly available).

STAKEHOLDERS

- **Lead:** WASAC, City of Kigali
- **Partners:** MININFRA, MoE, MINALOC, MINEMA, RWB, REMA, RHA, RTDA, RLMUA, World Bank, Professional bodies (environmentalists, engineers, plumbers), Water Users Associations, Residents, GGGI
- **Approval:** MININFRA, City of Kigali, MINECOFIN.

NEXT STEPS

- Assess the sanitation master plan to understand the identified prioritization of interventions in the city of Kigali
- Group the interventions into phases or programmatic outputs
- Develop bankable sanitation investment program as agreed with the city of Kigali
- Mobilize funds for implementation.

OUTCOME

- Improved sanitation service delivery in the city of Kigali
- Reduced water bodies pollution in the city of Kigali
- Generation of green jobs in the city of Kigali.

VISION 10

VISION STATEMENT

Ensure sustainable water investments

OPPORTUNITY STATEMENT

The city optimizes and increases investment in equitable and resilient water initiatives by prioritizing high impact solutions that appropriately balance between operations and maintenance (O&M) and new capital investments and resources towards new plans versus implementation of existing plans, diversifying funding sources (enhancing private sector and international investment through innovative business opportunities using different contracting schemes such as PPPs, municipal bonds, payment for ecosystem services, carbon credit, etc.), and increasing capacity for robust financial planning and mobilization of water sector projects.

RELATED CHALLENGE

#10 Unsustainable water investments due to low economic return

VISION DESCRIPTION

In order to optimize the available funding and use it with the highest efficiency, the city needs to prioritize equitable and resilient water solutions that ensure the needs of the most vulnerable communities are met first and investments are resilient and therefore not compromised by emerging and historic risks (climate and environmental risks). To achieve this goal, this vision supports creating better alignment between national mandates and city priorities in the water sector. This can be enhanced through the adoption of outcome-based budgeting processes in the city budget office and improved coordination with central institutions, mainly MINECOFIN to align national and local priorities in the water sector considering economic, social, and environmental cost-benefits of projects. This system of outcome-based budgeting will help the city to better balance investments between pending O&M needs and new capital investments, as well as balance resource deployment towards implementing existing plans versus developing new plans and studies.

In addition, this vision supports prioritized, practical and coordinated capacity building for city staff to enhance knowledge and performance in key areas of financial planning, followed by performance monitoring and a robust retention policy. This includes skills development on project business planning and structured funding and financing, including policy incentives to attract private sector investment in the water sector. City capacity will be further enhanced through the creation of a pool of empaneled external experts to support in the financial planning of complex, strategic projects. Particular areas of knowledge building identified include land-based financing strategies for water infrastructure, structuring of municipal-bonds/green bonds for grey-green solutions and implementing payment for ecosystem services to protect and restore key natural water assets. This can be accomplished by working in close partnership with professional networks/associations, chambers of commerce, private sector consultancies, academic institutes, city human resource departments and key city agencies in the water sector. This would include implementing performance management measures such as incentivizing securing funds through effective proposals, requiring professional accreditation of water sector officials to ensure ethical conduct, and improving access to professional training/knowledge resources available through professional networks for city staff.

This vision recognizes that improving the financial sustainability of the water sector is critical for long-term sustenance and continued service provision. It supports two critical strategies towards this goal, the first is to invest in cost-recovery and the second is to reduce

10

waste in the water sector. Measures to improve cost recovery for existing services will include investment in smart payment systems. Reducing waste in the water sector will be supported by improving coordinated planning and implementation, as well as creating ownership and stewardship of water assets among stakeholders through engagement and initiating demand management strategies that establish clear water-use efficiency targets for various water users and supporting capacity building measures to achieve those targets.

THE FOLLOWING NEEDS ARE ADDRESSED BY THE VISION

- Proper coordination of investments between government institutions, with central institutions (including finance ministry) coordinating investment based on emerging city needs and priorities. And city managers aligning investments with national priorities.
- Skills development and knowledge to create project plans with funding and financing approaches to incentivize private sector investment in water resilience initiatives. Including Policy incentives to attract private investment.
- Enhance and harmonize the role of Academic institutions, Chamber of Commerce, professional alliances, to support in government capacity building. Including leveraging a pool of external experts to support/advise on large complex projects.
- Require professional accreditation of water sector officials to ensure ethical conduct and access to professional training/knowledge resources and incentivize securing funds through effective proposals. Including provide city staff with incentives to source funding.
- Ownership of investment through stakeholder engagement and awareness building looking at both qualitative and quantitative indicators.
- Improve understanding of critical areas where infrastructure is outdated and there is urgency to start replacement.
- Equitable water resources management development taking into consideration different uses.
- Optimize water use efficiency and cost-recovery of existing water services, through increasing awareness and enhanced coordination and planning in water sector.
- The needs to forecast future demand accurately and ensure that funding can be used flexibly for both long term planning and immediate maintenance needs.
- The need to leverage private sector and international investment to meet the funding gaps and meet future needs and address future risks.

RELEVANT ASSETS AND RESOURCES

- The National Integrated Water Supply and Sanitation Master Plans for Rwanda.
- Green growth and climate resilience development strategy.
- Kigali City Master Plan.
- Decentralization policy.
- FONERWA Resources Mobilization strategy.
- FONERWA Water Sector working paper.
- Hydro-Economic Analysis.
- National Water Resources Master Plan.
- Nyabugogo catchment management plan.
- Rwanda revised Nationally Determined Contributions (NDCs)

SHOCKS AND STRESSES

- City management structure restructuring
- Health crises
- Water pollution
- Water resources mismanagement
- Overlapping and contradicting plans and programs
- Decreasing availability of funds
- Floods
- Lack of beneficiary ownership
- Capacity gaps

OVERALL CHAMPIONS

Lead

City of Kigali

Partners

MINALOC; MINECOFIN; RURA; RHA; MoE; WASAC

Approval

City Council

ACTION 1.

10

Develop a priority bankable nature-based solution investment program for the city of Kigali.

DESCRIPTION

To ensure achievement of holistic water resilience goals across all city led infrastructure projects that impact the water cycle and ensure the integrated resilience drive decision making the city can adopt several measures. The city could adopt using a resilience screening tools for project level assessment of resilience dividends. There are many examples of resilience screen tools that have been developed to integrate resilience thinking into projects based on several resilience criteria. An example of such a tool is the Resilience Lens tool developed with support from Rockefeller Foundation. The city could adopt such a screening tool for assessment of its water related investments - resiliencelens.woodplc.com. This is a web-based tool that is available for access to all project owners and cities across the work.

In addition, given that the city has gone through a holistic performance assessment of the city's entire water system using the city water resilience framework and the actions that have been identified in this Action plan refer to specific performance indicators (qualitative and quantitative) that are part of the City Water Resilience Framework it is suggested that the CWRF framework be used to assess all future water related infrastructure investment projects ongoing and planned in the city. Investments that address the indicators that are marked the weakest in the current performance assessment (see scored performance wheel included in the action plan) should be prioritized for advancement. All Infrastructure projects in each capital planning cycle (every 3-5 years) should be scored against the CWRF wheel, this should be done through a multi-stakeholder process using the guidance that is provided for scoring each indicator, projects with the highest benefit scores addressing the indicators where the current performance is the weakest should be prioritized for investment in the upcoming planning cycle to ensure improvement in performance for those areas.

In addition, the city could establish a multi-agency design review committee that will review all water resilience projects that are funded as resilience projects and or have storm water management and green infrastructure components. The committee should consist of representatives from key agencies like the planning department, the capital projects agency, the water and sanitation authority, the forest, water and land conservation agencies etc. The role of this committee would be to review projects at stages early enough to effect efficacious design to address key water resilience needs. Cities like New Orleans have established such committees, details of how they function, the procedures they follow, and the stages of project review they offer can be further refined to suite Kigali's administrative structure and context.

RESOURCES

- New Orleans Resilience Design Review committee: A multi-agency committee instituted to review and make recommendations to improve resilience of projects funded under the resilience program. The procedures followed, the criteria established, and stages for review defined can be found in the city website (Link).
- ResilienceLens: This Resilience screening tool was developed to assess project level resilience benefits. It has been developed through an extensive process of research, review and consultation process with support from Rockefeller Foundation (Link).

STAKEHOLDERS

- **Lead:** City of Kigali
- **Partners:** MINECOFIN, MININFRA, MoE, RWB, WASAC
- **Approval:** KCC (City Council), MINECOFIN
- **NGOs:** RWYP, GGGI, IUCN, WaterAid, Water for People, etc.

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NEXT STEPS

- Review existing resilience screening tools available to conduct project level resilience assessment and assess fit for use in Kigali. Secure support from tool developer to initiate training for city staff to use the tool on all water projects.
- Review Cape Town's effort to use the CWRF framework as a performance monitoring framework for appraisal on performance of water resilience projects on a recurring basis to assess how CWRF could be adopted for ongoing project appraisal and prioritization
- Review efficacy of setting up a cross agenda Resilience design review committee that could review existing projects to improve and inform the resilience approach. And identify a path forward to create such and quality assurance committee for all water resilience projects in the city and perhaps even all resilience projects.

OUTCOME

- The city has a robust review mechanism in place that enhances the resilience design of water infrastructure projects
- The city has tools in place to review planned infrastructure projects to improve their resilience benefits and has capacity built among project managers to use the tools for project review
- The city can demonstrably reduce its water risks and risks from water related shocks through the initiation and implementation of well-developed water resilience projects.

ACTION 2.

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Develop mechanisms to optimize the economic returns of water resilience investments.

DESCRIPTION

To optimize returns from water resilience projects it is essential that projects are designed holistically with environmental, social, and economic benefits in mind. Water resilience projects are complex in nature and their financial planning requires expertise in valuation and analysis across various dimensions. Most of the water related resilience projects in the city today face problems in funding and financing at different stages because of a lack of understanding of how to connect the project design and management costs with its financial benefits, this is even worse when the impact of the project is not physically measurable and requires a certain period to manifest (for example nature-based solutions or wetland restoration project for flood control). Planning, developing, and implementing such resilience projects requires specific skills in detailed cost-benefit analysis across environmental, social, and economic parameters. Such analysis is especially important to ensure all benefits and costs are accounted for and all potential revenue sources are examined to optimize return on investment. However, skills to develop robust financial plans accounting for the full lifecycle costs of the projects across these dimensions are not available commonly and within city government staff or locally. To address this issue, this action suggests initiating a pilot program on an upcoming investment to deploy triple bottom line cost benefit analysis methodology to assess benefits across environmental, social, and economic parameters fully valuing and quantifying all benefits (including ecosystem services, health benefits, job creation benefits, etc.) to ensure optimized return on investment and to advance a learning-by-doing approach. The pilot assessment on a priority project can then be used as a case study to train city staff on developing such analysis on other projects in the city.

While skill development in financial planning within city management will take time and effort to develop, the city needs to continue to mobilize funds for a growing portfolio of resilience projects. To address the limited set of skills within city management to do this work in-house, it is therefore critical to leverage outside resources/ expertise in a more structured way. Existing expertise in the country can be used to support the city on an ongoing basis to achieve this, through setting up a framework that can help the city easily access a roster of such expertise in project financial planning, Triple Bottom Line cost benefit analysis, marketing & investor outreach, transaction advisory to mobilize funds for planned and critical water sector projects. This can support the city in design, implementation, monitoring, and evaluation of water sector projects that optimize economic returns while maximizing social and environmental benefits. Therefore, the second mechanism this action proposes is to create an empanelment structure of outside experts to support in robust financial planning of complex and strategic water resilience projects in the city.

Other mechanisms that the city could adopt to optimize returns on investment are adopt performance-based budgeting across city government to encourage cross departmental coordination to deliver on policy priorities and projects that achieve multiple benefits. Rwanda already has experience implementing this at the national level, it will be critical to adopt the national approach to the city level (https://blog-pfm.imf.org/pfmblog/2021/04/-rwanda-a-home-grown-performance-based-budgeting-approach-.html). In addition, the water sector could lead by initiating outcomes-based procurement methods that make sure project outcomes are sustained through the entire lifecycle of the project from construction to delivery.

RESOURCES

- Autocase for Sites: In the city of New Orleans the Rockefeller foundation supported the city in developing triple bottom line cost benefit analysis (through a green infrastructure challenge) on a proposed urban storm water park project

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named Mirabeau Garden. This analysis helped the city identify additional benefits and beneficiaries of the project to assess additional revenue streams that can help optimize economic returns on such projects in the future. (Link)

- Green Bond: Instruments like social impact bonds and environmental impact bonds are other instruments that are emerging as instruments for raising private sector investment in water resilience initiatives in Africa. Examples include a ZAR 1billion green bond issued by the city of Cape Town to raise funding for a number of water security measures during the worst drought that impacted the city. (Link)
- Performance Based Budgeting (PBB) initiative: Undertaken by the Rwanda national government in 2018, helping to improve transparency and accountability in budget allocations towards national strategic priorities. This could be adopted at the city level for water resilience priorities that are identified in this action plan. (Link)
- Problem-based procurement for waste management in Athens: Outcome based procurement processes as well as problem-based procurement approaches have been adopted by many cities to support innovative market-based solutions. Some examples include the problem-based procurement for waste management that Athens initiated (Link).
- Case Study* - Western Cape Industrial Symbiosis Programme: Building resilience by improving resource efficiency, stimulating economic growth and job creation. (Link)

STAKEHOLDERS

- **Lead:** City of Kigali
- **Partners:**MINECOFIN; MININFRA, MoE, FONERWA, REMA, RWB, RFA, WASAC, REG, LODA, World Bank, etc.
- **Approval:** KCC (City Council), MINECOFIN
- **NGOs:** GGGI, IUCN, WaterAid, Water for People, etc.

NEXT STEPS

- Identify the ongoing and planned water project development that can serve as an opportunity for piloting detailed financial planning
- Secure project owners' commitment to implement project in accordance with financial assessment and ensure owner will support assessment by providing required data and information as needed by experts
- Identify experts to develop and implement financial analysis on the selected project, secure funding for TA and develop TA scope of work
- Implement detailed TBL CBA assessment on pilot project. Develop case study to share with other city staff.
- Identify and develop new revenue streams as appropriate for the projects based on the detailed CBA valuation. Develop proposals, put project proforma together to mobilize funding and financing for the project
- Design a training package and materials to be used by other city staff to conduct such analysis on other such projects.
- Assess the feasibility of incorporating the longer-term capacity building program in city
- Train the city staff on water related financial planning.

OUTCOME

- Increase city capacity for financial planning of water resilience projects.
- Increase city capacity to mobilize funding and additional revenue sources for water resilience projects.
- Priority bankable project proposal developed.

ACTION 3.

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Review and adopt policies to attract private sector investments in the water resilience in Kigali.

DESCRIPTION

The private sector can play an important role in bridging the investment gap in the water and sanitation sector. Private sector participation could take many forms including direct financial contributions and investments, partnerships for service delivery, contribution to sustainability as water users, support in technology transfer through entrepreneurship and innovation in water service delivery. These are some of the forms of private sector investment that could contribute and bring great efficiencies in water use, delivery and build resilience of the water system. However, there are significant barriers to increased private sector engagement and investment in the water sector, many of these can be addressed by the public sector taking an active role in creating the enabling environment on areas that are most relevant for each local context. These could include a stable regulatory and policy environment favourable to private investment. Including procurement and bidding processes that support balanced risk sharing and respect contractual arrangements with the private sector. Clear and predictable rules around tariffs, taxes and transfers indicating opportunities for cost recovery and potential return of investment in the water sector. Once these systemic barriers are understood and appropriate policy and regulatory measures identified to address them then it would be important for the city to assess opportunities for private sector engagement on specific pilot projects.

To assess this this vision proposes to host a multi-agency resilience finance workshop to assess funding and financing needs on 2-3 priority water resilience projects. The workshop will assess funding and financing needs across the project life cycle to better understand the types of partnerships and investments that can be supported by the private sector. Experts from the finance sector will be invited to review the needs on these priority projects and suggest high level strategies for private sector engagement. Key private sector institutions from the region will be invited to the workshop to provide input and ensure buy-in on strategies recommended.

Commitments will then be secured from the respective project owners to take action on the recommendations from the workshop with support from national and local government leadership.

RESOURCES

- OECD Checklist: Resources like this checklist for enabling increased private sector investment in the water sector are important guidance documents that can be reviewed by the city lead to determine an appropriate strategy for action in Kigali. (Link)
- Global Infrastructure Hub: Platform developed by the International Finance Corporation (IFC) to provide guidance, capacity building programs and case studies on effective strategies for funding and financing water infrastructure projects. (Link)
- FONERWA: Institutions like FONERWA are important local institutions set up to build capacity and connect private sector financing to public infrastructure projects and investments. They should continue to be a partner in advancing the strategic priorities outlined in this water action plan for Kigali (Link)
- Case Study* - ADAPTUR: Ecosystem-based Adaptation to Climate Change with the Tourism Sector in Mexico which aims to mobilize the private sector and its resources to bolster finance and climate adaptation measures. (Link)

STAKEHOLDERS

FONERWA, Rwanda Development Board (RDB), South Bridge Investment, Development Bank of Rwanda, Ministry of infrastructure (MININFRA), Chamber of commerce

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NEXT STEPS

- Review existing guidance tools/check lists to assess and understand the enabling environment required to incentivize and scale private investment in the water sector in Kigali. Identify, develop, and implement regulatory and policy changes needed to create such opportunities for private sector investment.
- Conduct a financial planning workshop to assess needs and requirements for investment on 2-3 priority projects within the city of Kigali. Engage required local and global experts to provide an assessment of funding and financing needs that could be met by private sector investors and strategies to do targeted outreach to secure commitment.

OUTCOME

- The pilot projects serve as test beds to assess what parts of the project development could be funded by the private sector and what would be the expects ROIs and terms of engagement for private sector investment
- Enabling environment review would help assess near term and medium-term reforms needed to enhance private sector investment in the water sector
- Together the 2 approaches and assessments help increase opportunities for immediate and long-term private sector investment in the water sector in Kigali

NEXT STEPS

In the coming months, WRI will convene key organizations and stakeholders to assess and identify where actions can be integrated into other plans and where new actions will remain as part of this water resilience strategy. Key actions will be reviewed and refined by stakeholders to ensure they include all relevant perspectives, including of those who may not have been able to participate in the workshops.

Using evidence based spatial analysis, WRI will work with action owners to further phase and prioritize place-based interventions. WRI will engage external subject matter experts and consultants as needed to implement technical analysis needed to assess feasibility and scope specific priority actions. This process will require time, resources, and effort from all stakeholders. This is expected to be an ever-evolving and improving blueprint of actions - one that takes advantage of existing programs and relationships while advancing change through new individual or collaborative actions to build resilient and equitable water systems and services.

APPENDICES

CASE STUDIES

DATA EYE: INTELLIGENT ICT IMPLEMENTATION PROJECT IN THE TAKAHASHI RIVER BASIN

RELEVANCE (IMPACTS):

The project provided training for 46 citizen data scientists over five years, who have mastered the basics of statistics at a level capable of conducting basic practical data analysis. Effective use of data and know-how accumulated through this project has helped generate the following data utilization projects other than city projects:

- Victim support project in response to the heavy rainfall disaster in July 2018 based on effective use of data;
- Data marketing using combined data held by private businesses and stores and public entities;
- Training in local high schools for data utilization to solve regional issues;

BACKGROUND AND KEY CONCERNS:

The "Takahashi River" is a first-class river that originates in Mt. Hanami (elevation 1,188m) in Niimi City, on the border of Tottori Prefecture, in the northwestern part of Okayama Prefecture, and flows into the Seto Inland Sea through a flow of 111km. It boasts a basin area of 2,670 km2 throughout the prefecture.

The 7 cities and 3 towns located upstream and downstream of the Takahashi River1 have different climates and have a wide variety of major industries. The population of the area is about 770.000 of which Kurashiki City is about 480,000.

With Kurashiki City at the core, the 7 cities and 3 towns in the sphere are working to respond to the declining population, declining birthrate and aging society, and are promoting efforts aimed at economic growth in the entire sphere.

The main source of employment in Kurashiki City is manufacturing for leading industrial and textile industries in Japan. However, a study by Regional Economy and Society Analyzing System (RESAS) found that the coefficient specialization rate (Japan was set as 1.0) of the number of employees in the information services business in the city is 0.13. This demonstrates the employment level in this area, where future growth is expected, is significantly low and the City needs to put more effort into developing the ICT industry.

IMPLEMENTATION:

Takahashi River Basin Data Portal Site

Takahashi River Basin Data Portal Site “data eye” is an open data catalogue site in the Takahashi River basin. It publishes visual content of analysed regional features and enables the disclosure, sharing, discovery and utilization of data.

People-flow analysis by IoT

The system analyses images taken by the cameras installed in several spots in the Bikan Historical Quarter, a notable tourist spot of Kurashiki City. It collects coordinated information and attributes information (gender and age) to figures on the screens as data. It is designed to collect only such data but not the images themselves to avoid retaining personal information. The acquired data is published as visualized content of “data eye” called People-

Flow Now in Kurashiki Bikan Historical Quarter. It also estimates and shows in a graph, future visitor traffic by using computing regression analysis of combined past accumulated data and weather data.

AI application

1. Travel concierge "Tabit": Tabit is a voice-response AI application developed as a smartphone app and designed to provide local tourism and culture-related recommendations.
2. FAQ Chatbot "Coton": This is an AI chatbot that auto-responds to queries from citizens on general government services, based on FAQ information released by Kurashiki City.

Human resource development-related

The City runs an e-learning platform, data eye Web Lesson, which allows citizens to take online lessons on data utilization techniques, to nurture citizen data scientists. The city has also held many events to promote effective use of data and regional data and seminars to promote teleworking and entrepreneurship.

Features and innovations

The visual content published by data eye is characterized by the granularity required for community-based analysis. For example, while analysis by RESAS offered by the national government provides analysis only at the municipal level, data eye's Takahashi River Mirai (future) Map can provide analysis at suburb or street number level or at a level called 500 meter-mesh.

TAKEAWAYS

This project is a comprehensive project that covers all measures on data utilization. In particular, the project engages in the development of human resources who can effectively use community-wide data, considering human resource development in anticipation of future industrial growth.
The analysis of the statistical information based on mobile network revealed that more women visit Kurashiki City than men. Also, People-Flow Now in Kurashiki Bikan Historical Quarter helps understand the visitor traffic and attributes in Bikan Historical Quarter, while analysis of free-Wi-Fi access allows us to see how people travel around the area. Utilizing such data will help develop measures to promote tourism and improve and maintain the beautiful landscape for city development.

For the next step of the data-driven city development, the City is considering the "Smart Park & Ride" project for the development of a safe and secure urban environment around Kurashiki Station, and mitigating traffic congestion caused by tourists. For that, the City will be forecasting and capturing real-time data of both people and vehicle traffic and congestion using AI and IoT technologies based on the people-flow analysis technology.

CHALLENGES

When the project initially started, an issue arose regarding the large amount of man hours required for primary work such as data cleansing, which resulted in a shortage of human resources for the primary duty, advanced data analysis. To solve the issue, the city has established a work system based on tele-working, which broadened the base of human resource development and allowed jobseekers to obtain jobs and engage in data processing activities which can be performed with basic skills.
The people-flow analysis using IoT has received a favourable response from various sectors. However, the current system, which processes big data collected through IoT in real time, is costly and therefore it is hardly implemented by other entities. Therefore, the City is currently considering the implementation of a low-cost people-flow analysis system by replacing the components with lower-priced ones or replacing the system with a simplified model that focuses on data collection rather than data analysis.

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SIGEO: INTEGRATED GEOINFORMATION MANAGEMENT

BACKGROUND AND KEY CONCERNS:

The city of Niterói, with an area of 129.3 km2 and a population of some 500,000 inhabitants, is the former capital of the state of Rio de Janeiro in Brazil. Before the GIS integration project, Niterói struggled to coordinate across departments and envision a long-term plan for the city. The city was confronted with an anachronistic administrative structure with more than 40 different protocol systems and 10 different payroll systems. The development of the geo-information management system SIGeo was part of a series of programs implemented by the city to improve and modernize administration and management systems across the local government.

Niterói's new geoinformation management system SIGeo was conceived in 2014 and rolled out in 2016, following the enactment of the National Policy for Civil Defense and Protection (PNPDEC), which authorized the creation of monitoring and information systems for disasters. This national policy was itself created following a series of landslides and disasters that affected several cities in Brazil between 2008 and 2011, including Niterói in 2010.

RELEVANCE (IMPACTS):

The system has provided open access to the city government's geoinformation and fostered closer coordination among the various departments. It has simplified plot-mapping processes and enabled monitoring of data regarding urban mobility and water quality, among other key indicators. The system also facilitates the simulation of flooding patterns and the monitoring of forest fire risk as well as having other uses directly related to risk management and resilience.

SIGeo has been essential for the creation of the city's risk monitoring center, allowing for the simulation of floods, landslides, and fire risks, which facilitates decision-making. It has also been key to the implementation of the city's sustainable mobility plan, with real-time tracking of bus circulation and traffic in the city. The city has also engaged unemployed youth by teaching them GIS technology so they could take on reforestation, environmental education, and sanitation activities.

Providing open access to the information has also brought benefits to entrepreneurs and citizens, providing them easy access to information about services, facilities, and economic activities in the city, land-use regulations, and basic GIS data for the development of new applications.

IMPLEMENTATION:

The first phase of the project, which took place in 2014 and 2015, involved the acquisition of orthophotos and laser profiling, which would become the basis on which all the city's georeferenced information and systems could be compiled. This data was made available free of charge for the first time by a city in Brazil through the website of the Department of Urban Planning. The development was carried out by Imagem, one of the country's leading companies specializing in GIS, and financed by the Inter-American Development Bank (IDB).

Starting in 2016, the actual SIGeo platform was launched, integrating the city's Multipurpose Technical Register (CTM) with a mobile application that allows city staff to carry out updates directly from the field, upload pictures of buildings and plots of land, and immediately verify the city's database to facilitate monitoring, assessment, and updating processes. Georeferenced data previously managed separately by the individual departments of the city (Finance, Urbanism and Mobility, Civil Defense, etc.) has been integrated into one instrument. New systems were also developed in order to monitor the risk of forest fires, flood-prone areas, and landslides, including forecasting and simulation tools to facilitate decision-making of mitigation and prevention measures.

Following this second phase, the city has continued to develop new features and tools, facilitating the monitoring of traffic and mobility in the city, the water quality of its beaches, and the green areas of the city, with most of this data accessible to citizens through its open platform.

Development of the system continues to this day, including systematizing of the geoinformation developed and used by the different departments in the city and adding new features to facilitate the management processes. Currently, the platform provides information about different

services, projects, land use, and businesses, as well as open access to the geoinformation and orthophotos of the city.

The system is considered to be part of a strategic investment made by the city. As Mayor Rodrigo Neves explains, "SIGeo is part of a strategy that we have structured since 2013 so that Niterói could not only survive but also thrive following the worst crisis in the history of the country and Rio de Janeiro with gradual and consistent progress. It is particularly important that we understand that being a smart city is not just about developing technology. Above all, it is about involving society, reducing social and territorial inequalities, generating opportunities for young people, and ensuring that there is a more active and participatory citizenry so that society can appropriate these tools and contribute to the building of a smart city."

RESOURCES

The implementation of the platform, developed with the company Imagem Geosistemas e Comércio Ltda, represented an investment of R$ 5 million, which was financed by the Inter-American Development Bank (IDB) under its Urban Development and Social Inclusion Program for Niterói.

The first phase involved the participation of the following departments:

- Finance
- Urbanism and Mobility
- Civil Defense
- Water Resources and Sustainability
- Conservation and Public Services

The rollout of the new GIS system required the training and availability of human resources from different working areas. The geoscience technical sectors of the city, together with the IT team, offered specific courses on multiuser geographic databases, integration, and other functionalities. In addition, general technicians from the city government offer periodic courses on the Civitas platform (SIG-Web) for improving work with the system on an ongoing basis.

TAKEAWAYS

SIGeo is part of a city-wide program to improve its administration and define a vision for the future. By combining disparate information from all city departments and gathering input from citizens, the city was able to have a clearer picture of the issues facing it and track the implementation of solutions and goals to confront these problems.
Providing open access to the database information has also been beneficial for economic development, allowing citizens and the private sector to benefit from it and stimulating transparency and engagement with the government.
An appointed officer took a key executive role, coordinating the work of focal points in different departments and agencies in the city.
The project has already attracted the interest from other cities in Brazil. SIGeo was recognized as the best municipal geoinformation management initiative in the country, receiving the MundoGEO#Connect 2017 Prize in the category of Municipal Management. In 2018, the city engaged in an exchange of policies and experiences with the city of Salvador. Other cities from Latin America have also come to learn about the project.

CHALLENGES

In public administration, as in private companies, organizational and management changes are always difficult to implement. Many employees are used to working in the same way for years, using the same systems, protocols, and processes, and there is always resistance to new systems. This is particularly true when they are perceived as periodic changes coming with each new elected leadership.

Niterói managed to overcome this barrier by starting the project with those departments that already worked with spatial analysis and had employees familiar with geoinformation systems. After this first stage, the project moved forward with institutional support through promulgation of a municipal decree that defined roles and responsibilities. The visible results help to break down barriers and resistance from some departments, and today, SIGeo has become a reliable system with the proactive participation of many secretariats.

Guaranteeing the system's credibility and reliability as it expands will be a key challenge in the future. There are unlimited possibilities when it comes to the territory's statistical analysis and geoprocessing techniques. However, the city will need continuous quality control, reliable basic data, and infrastructure monitoring to make sure the system continues to work.

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SEMARANG ECO-DISTRICT: WATER MANAGEMENT-BASED URBAN PLANNING

BACKGROUND AND KEY CONCERNS:

Th Kaligawe and Sawah Besar are urban villages located in the low-lying areas of Indonesia that have been experiencing an increased risk of flooding and tidal inundation. Only ± 1.5 km away from the sea and 1.5 to 4.5 meters above sea level, they reported no less than 30 flood events annually from 2012 to 2018. The current road network is not suitable for evacuation in case of fires and flooding events. The area has limited accessibility to the main roads, poor connection to public transportation, and insufficient walking and cycling zones. High levels of motor-vehicle traffic and carbon emissions are critical issues to be addressed.

The area is in a land subsidence zone (up to 17 cm per year in certain locations) due to the excessive groundwater extraction to meet both personal daily needs and industrial needs. Wastewater treatment and collection are also still not available, and the solid waste issue is compounded by the fact that most of the local people deposit garbage into the river.

Almost 70% of the total 19,300 inhabitants (2018) are in productive ages, with most individuals working in informal sectors. Accordingly, job opportunities are vital for local populations, as are access to communal education facilities and community support networks, including child- and elder-care.

Given these issues, the proposed strategy aims to:

- Contribute to the reduction of flood occurrence in the project area by developing the drainage network, increasing the water storage, and reducing runoff;
- Provide the eco-district with a resilient mobility infrastructure that will guarantee access to existing and projected functions;
- Engage with the community from the beginning of the Eco-district Program and improve its economic resilience;
- Develop and create urban utilities that will concomitantly reduce pollution in the perimeter of the Eco-district and beyond.

RELEVANCE (IMPACTS):

The current Sustainable Urban Development in Indonesia (SUDI) Eco-district program grew out of the Green City Development Program (GCDP), originally launched in 2011 by the Ministry of Public Works and Housing (MoPWH). In 2013, MoPWH provided a methodology to explain how to design and implement eco-districts based on the eight "attributes" for guiding the development of green cities, which were the backbone of the GCDP.

On this basis, in order to further build upon local knowledge, the expert team developed a tool adapted to the existing strategy, based on eight key Attributes to evaluate the impact of the project:

- Green Water and Sanitation
- Green Economy
- Green Building
- Green Community
- Green Solid Waste
- Green Energy
- Green Open Space
- Green Transportation

For each Attribute, Targets - Sub targets - Technical Recommendations and Indicators have been defined. This structure creates a tool (Table of Indicators) which plays the role of a benchmark for individual Eco-district programmes to reflect on during the definition, design and post evaluation of projects. The table and list of Indicators is a potential guideline for future projects within Eco-district boundaries. With a list of Indicators measured periodically, owners of Eco-district will also be aware of the gap to be fulfilled and build for themselves a pipeline of possible interventions.

In this framework, and related to the Attributes mentioned above, the expected outcomes foreseen for the Semarang Eco-district Program are related to the following topics:

- Drainage improvement
- Solid Waste Management
- Climate Change Adaptation and Mitigation
- Settlement Development
- Local Economy Resilience.

IMPLEMENTATION:

Based on an understanding of the context, a spatial framework is defined in order to connect all the interventions into one easily communicable narrative.
The project is structured in four main clusters which address the issues above:

- Blue Network
- Green Mobility
- Efficient Public Facilities
- Sustainable Urban Utilities

Existing wetlands and ponds in Semarang are connected by drainage and collector canals to each other. They form a blue network, which is one continuous system with a large retention area. Drainage canals perpendicular to the main north-south collector canals follow a long and narrow urban block typology. The ponds and wetlands are protected and made accessible in order to create public awareness towards the significance of the wetlands. Now located at the back of the houses, they are made into public spaces with boardwalks around the watersides. The adjacent dwellings will have their front facades turned towards the water. Occasionally, they are connected to a dry, open area offering space for children to play and others to practice sports or enjoy the green landscape.

The Eco-district site provides a shared-space principle, where cars, bikes and pedestrians interact safely and sustainably. In the residential neighbourhoods, the trees are placed in the street itself, providing sufficient space for a car to pass, but at the same time slowing it down. The streets subsequently become a true green mobility project; they promote walkability and therefore reduce the need for motorized transport.

By renewing the infrastructure of an existing market, efficient public facilities are used to improve the economic benefits for the residents. The improvement of a market will create a food court and engage the creative sector as well as Kampong residents. The buildings will reduce their impact on climate change significantly by using resilience-focused designs as well as natural cooling systems and bio-based construction materials.

Sustainable urban utilities, such as wastewater collection and treatment, and a solid waste treatment plant, are implemented to reduce pollution on the streets and open spaces and to keep the water in the Blue Network clean. Clean water access will be made possible for each household, reducing the need for underground water extraction and preserving the territorial assets.

TAKEAWAYS

The lesson learned from the Eco-district pilot is that an intelligent urban development approach integrates smart design solutions, such as a resilient water management system, with a good understanding of local and national legal frameworks and policy objectives. If this combination leads to implementation of the pilot – the process is currently ongoing – then the project can serve as a model for replication in other Indonesian municipalities and lead to a new standard of mainstreaming green urban development principles in urban planning.

The approach consists of sustainably integrating all urban components (water, solid waste, energy, transportation, business activity, open space and community) in the planning and design of urban projects. A spatial framework is defined as a platform able to keep together multiple projects and different stakeholders, enabling a sustainable design process. Based on an understanding of the social, economic, geographic and cultural-historical context of the site, the method can be applied to any typology of cities across the country regardless of whether the starting point is scale, density, wealth, level of pollution or vulnerability.

CHALLENGES

After stakeholder meetings were held and sites had been visited, the main objective in Semarang was determined to be decreasing vulnerability via flood reduction through urban design.
While the expert team very carefully analysed the governance structures and the boundaries of the legal framework the projects operate in, it proved not always easy to navigate the political landscape of various policy objectives of the national level partners. Enabling cross-department communication among national

stakeholders was at the same time important for the project success, yet beyond the scope of the assignment. Therefore, the expert team tried to balance representation and communication between Indonesian partners, French donors, and the team itself through its presence in Jakarta and frequent visits in the pilot cities. In a similar fashion, the interests of the municipality (often related to new infrastructure), the interests of the national government (meeting certain policy indicators, e.g. PUPR's targets regarding access to potable water, slums reduction, and access to sanitation), and the results of the expert assessment, needed to be harmonized.

We also found our city partners to be engaged, but having less technical capacity, while the national partners were knowledgeable, but overloaded, with the donor agency not yet having had the opportunity to form profound relations with the Indonesian stakeholders to successfully address this human resource imbalance.

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XXXXXXXXX DUPLICATED TITLE

BACKGROUND AND KEY CONCERNS:

In 2008, the City of Gwangju has initiated a program to spark voluntary carbon-saving steps by citizens. Five years later, 1.5 million Gwangju citizens were already participating or 62 percent of the city's population.

Gwangju's Carbon Bank system calculates reduced amounts of carbon dioxide through voluntary energy-saving efforts by household (regarding electricity, city gas, and waterworks) and turn them into points. Then it provides those points to participating households, thus helping them to save money. Kwangju Bank issues participating households the Carbon Green Card through which households receive points. Through the system, the city can analyse and evaluate reduced amounts of greenhouse gas emissions each year and expand the system through continual monitoring in the years ahead. While the city pays for educational and operating costs, a Green Star Network is responsible for implementing the education and promotion activities. Greenhouse gas emissions have decreased each year, most recently by 135,000 tons.

RELEVANCE (IMPACTS):

Through MOU agreements with relevant agencies, systemic and credible data could be secured and, based on standards for reduction amount, participating households are given points as incentives.

In 2008, the number of participating households was approximately 20,000. In five years, that number has increased to approximately 330,000 households, drastically changing the degree of civic participation. Among participating households, 60% of them have succeeded in reducing targeted greenhouse gas emissions. In turn, the amount of emitted greenhouse gases has decreased each year, currently amounting 135,000 tons of gases. This reduction was made possible by systemic cooperation among data-providing agencies regarding greenhouse gases emitted from households. The most important issue, obtaining financial resources, was resolved by the participation of the local bank, Kwangju Bank, which focuses on being a "green bank." Carbon points were issued through the Carbon Green Card.

Locally, the system prepared for Gwangju to become a "carbon neutral city" adapting to climate change, which is a general trend worldwide for environment-friendly local governments. It helped Gwangju citizens strengthen their capacity to deal with climate change. The "good governance" surrounding the system has also contributed to cementing cooperation among various groups forming the city. Lastly, the circulation of points across the city has stimulated the local economy.

IMPLEMENTATION:

Gwangju City is in charge of the Carbon Bank system whereas Kwangju Bank provides points to participating households. The data for the initiative have been provided by Korea Electric Power Corporation, Gwangju Metropolitan Waterworks Authority, and Hae Yang City Gas based on each household's usage. The Green Start Network (involving 31 non-governmental organizations) is responsible for promotion and education regarding the system. In addition, local organizations including Local Community Head Group, Saemaeul Women's Association, and Carbon Coordinators also actively encourage residents to participate in the system.

Based on the data provided, Gwangju City calculates the reduction amount of greenhouse gas emissions and turns the amount into points following certain standards. The city, then, notifies Kwangju Bank of the calculation which issues points to the Carbon Green Card. This method was used until 2012.

Since 2013, each self-governing district of the city inputs household usage of electricity, water, and gas into the Carbon Point system. Then, based on certain standards, the Korea Environment Corporation calculates points. Once points to be issued are finalized, each district offers points to individuals through BC Card. In this way, each district can measure the amount of reduced greenhouse gas emissions.

The city also implements the initiative with the Low Carbon Green Apartment Project. In this way, the city helps build green communities through participation and cooperation of local residents, contributing to reducing greenhouse gas emissions. The city also nurtures "carbon

coordinators" and assign them to households, performing diverse, coordinating roles to reduce greenhouse gas emissions.

TAKEAWAYS

The initiative introduced by Gwangju has been effective in inducing voluntary citizen participation to reduce greenhouse gas emissions. A greenhouse gas emission reduction program in the non-industrial sector is critical as part of the Clean Development Mechanisms of a city. Premised upon systemic, credible data, the initiative by Gwangju can expand to an emission trading system in the non-industrial sector. Operated by collaborative governance, the initiative helps stimulate cooperation among local communities for their revitalization. The effective combination of voluntary citizen participation and local resources is the most critical factor for the success of the initiative.

The initiative as an efficient way to reduce greenhouse gases emitted from households has been introduced to local governments around the world. The initiative was presented as an excellent practice in the area of low carbon policy during the 2011 Gwangju Summit of the Urban Environmental Accords and RIO + 20- United Nations Conference on Sustainable Development, helping improve the city's reputation as a leading green city. And many local governments around the world have tried to emulate the initiative. Nationally, the system laid the foundation for the Ministry of Environment to introduce the Carbon Point system across Korea in 2009.

CHALLENGES

The initiative is premised on voluntary participation of local residents. Initially, many local residents were not aware of the need to adapt to climate change and it was difficult for the project team to foster participation among them. In addition, ensuring systemic, reliable data was critical, and this required personal information of local residents, making them hesitant to participate in the initiative.

To resolve these issues, the city made strenuous efforts to promote the initiative through TV/radio advertisements, city bulletin boards, subway/ bus signs, advertisement through public utility bills, stickers attached to elevators in multi-unit housings, and pamphlets. These diverse, active promotional efforts led to an increase in the number of local residents participating in the Carbon Bank system.

Another difficulty was to ensure that the system leads to actual reduction of greenhouse gas emissions. But, based on the analysis of the data one year after the implementation of the system, it turned out be effective in reducing greenhouse gas emissions.

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"CLIMATE PROTECTION CONCEPT RENEWABLE WILHELMSBURG": INTERNATIONAL BUILDING EXHIBITION.

BACKGROUND AND KEY CONCERNS:

To support the new urban development program of the City of Hamburg, called "Leap over River Elbe", and to connect the city center with the southern city districts, the Hamburg Senate decided in 2005 to present the International Building Exhibition IBA and the International Garden Show in the district of Wilhelmsburg. To organize both events the Hamburg government founded in 2006 two city owned companies linked in terms of structure and management.

The foundation for making the IBA area a more energy efficient environment is the "Climate Protection Concept Renewable Wilhelmsburg", which was developed by an international committee of experts in collaboration with IBA in the years 2008 to 2010. The idea behind the resulting "Energy Atlas", is to utilize the city's (or district's) local energy resources to supply renewable energy and at the same time to considerably increase the efficiency of local energy consumption.

The conducted research and studies demonstrated that it is possible to supply the Elbe Islands by local renewable energy sources by 2050 even when taking into consideration populations growth. The estimation is an increase of the local population from 55,000 up to 73.000.

RELEVANCE (IMPACTS):

All projects related to the International Exhibition IBA (executed and schedule during 2013) were expected to generate a renewable power production of 54% and a renewable heat production of 14% of the overall demand by the end 2015.
After the realization of the IBA projects, a new implementation plan was conceived, this action plan aims to:

- Finalized started IBA projects.
- start the implantation of all planned projects.
- transfer existing IBA structures, concepts, and networks into a "post IBA period".
- develop new projects, and support the city development, asIBA and the "Climate Protection Concept Renewable Wilhelmsburg" are named as prototypes for further urban developments within the Hamburg area.

IMPLEMENTATION:

It is a typical feature of an IBA to be structurally separated from "normal" administrative units and usually incorporated as a limited liability company. It thus has a certain amount of independence from classic administrative hierarchies and can act more like a private enterprise. Because of the lack of sovereign rights and administrative tasks, IBA has to work with several official administrations of the city and the municipal government as well as with relevant city owned companies. Additionally, IBA organized an official "IBA-partnership" with about 150 companies and institutions. Inhabitants were also included in numerous workshops and forums.

The first projects like the "Energy Bunker", the conversion of a former World War II aircraft shelter into a power station and heat storage and the "Energy Hill", the transformation of a toxic landfill into a location of wind turbines and PV as well as a public park have been realized in close cooperation with local people and will be continued.

To implement the IBA project, the Hamburg government spent 90 Million Euros on the development of the projects, the coordination of the elements and the implementation of the final event in 2013. Additionally, about 700 Million Euros were spent by private investors to realize the projects it selves.

After the realization of the IBA exhibition in 2013, a follow-up organization has used the existing competence and network to develop and market several new development areas, both within the borders of the exhibition area (central Wilhelmsburg area, "Haulander Weg") as well as in areas located outside the former area ("Elbmosaik", former barrack area "Röttiger-Kaserne").

Several universities worked together with a high number of energy supply and distribution companies as well as housing companies and house owner associations to verify the results of the monitoring and to motivate them to cooperate to implement the elements of the climate protection concept.

The main objective of the "Climate Protection Concept Renewable Wilhelmsburg" is to tackle the challenges of global climate change by:

- the development and the implementation of measures "intra muros" ("within the border of the city or districts"),
- energy savings and energy efficiency,
- the use of local renewable energy sources and
- how local economies can be strengthened as a result.

TAKEAWAYS

The IBA Hamburg examines ways in which maximum use can be made of local renewable energy sources "intra muros" ("within the border of the city or districts"), such as energy savings and energy efficiency, and how local economies can be strengthened as a result.

Combined with the evaluation and monitoring concept, the lessons learned will be used to upgrade and adjust the "Climate Protection Concept Renewable Wilhelmsburg" to reach the goals in 2050.

Additionally, IBA is involved in several national and international projects and will share the experiences with the involved partners and cities like Copenhagen, Amsterdam, Vienna, Lyon, Genova, Stockholm, Barcelona and Munich.

Challenges
One relevant barrier is the financial situation of house owners which prevents even high economic efficient refurbishments or technical installations. IBA delivered information and consultancy to facilitate the implementation of the measures.

Another barrier are the risks of investments in district heating grids in existing areas with high number of house owners. IBA organized round table discussions as well as joint and integrated planning workshops to achieve best results for all stakeholders.

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COMMUNITY RESILIENCE THROUGH WOMEN IN LEADERSHIP ROLES (DHAKA, BANGLADESH)

BACKGROUND AND KEY CONCERNS:

The Participatory Development Action Program (PDAP) was launched on 6 March 1994. PDAP works with people whose lives are dominated by extreme poverty, illiteracy, disease, and other environmental problems. With multifaceted development interventions, PDAP strives to bring about positive change in the quality of life for these people, especially women, adolescents, and children.

PDAP is committed to making its programs socially, financially, and environmentally sustainable using new methods and technologies. PDAP is actively involved in promoting human rights, dignity, and gender equity. The slum dwellers living in Bhola Bastee in Mirpur, Dhaka (Bangladesh) come from different areas of the Barishal district. Due to river erosion, they have lost their property, resources and shelter. Most of them are Richshaw pullers, vegetable and fish sellers, garment workers or home workers.

RELEVANCE (IMPACTS):

As a result, the NGO DSK provided some sanitation facilities. Road repair requires permission from the local Member of Parliament, a group of women living in the slum area applied for permission for the work to be done by World Vision. World vision have organized the repair of the road by providing slabs of concrete to cover the open drains.

IMPLEMENTATION:

The Participatory Development Action Program has been engaged in the following activities:

- Identification of challenges in the area through mapping and household survey.
- Training in leadership development skills.
- Awareness raising activities on empowerment issues.
- Teaching the Local-to-Local methodology.
- Use of the Local-to-Local methodology within the community and at a national level workshop.

The organized groups received leadership training as well as disaster risk reduction training from the Participatory Development Action Program. PDAP also encouraged them to contact NGOs directly to address their problems. The groups' leaders contacted World Vision, DSK and the Association for Realization of Basic Needs (ARBAN).

TAKEAWAYS

Other NGOs have shared their experience with the Participatory Action Development Program.

Ms. Naseem Sheikh, member of the Senior Management Team of SSP India ("Empowering women as leaders and entrepreneurs"), came to the Participatory Development Action Program to share her experience with the program leaders. She said that in their area, Maharastra, they do everything through the community group members. She gave a power point presentation, explaining about the Community Practitioners Platform for resilience ("an organizing and networking mechanism connecting grassroots community-based groups working to reduce their vulnerability to disaster and climate risks in rural and urban areas") and how they improved their community through this platform and are now self-sustainable.

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MENTORSHIP LILONGWE - JOHANNESBURG

BACKGROUND AND KEY CONCERNS:

Traditional planning tools such as master plans and structure plans were not able to deal sufficiently with complex social and economic developmental challenges found in Lilongwe. These and global environmental challenges required development of long-term plans to ensure sustainability in Lilongwe.

In 2007, Lilongwe, member of the network UCLG-Africa, participated at a city future workshop in Johannesburg where the city of Lilongwe submitted a proposal requesting to be mentored by a member city which had already developed a productive City Development Strategy (CDS). An approval was granted by a City of Johannesburg mayoral committee, UCLG-Africa and South African Local Government Association (SALGA) in 2008. Johannesburg provided expert advice and technical assistance to Lilongwe to develop its own City Development Strategy (CDS), a document explaining key decisions in relation to what should or needs to be prioritized in order to accelerate growth, to reduce poverty, build sustainable settlements, and contribute towards Millennium Development Goals achievement.

The programme ran from 2008 to 2012, and the initiative was financed mainly by Cities Alliance, Malawi National Government. After the first contact session in April 2008, Lilongwe City Council submitted funding request to Cities Alliance of USD 72,000 for development of 1st CDS phase, which was approved in October 2008. Cities Alliance has also approved granting USD 249,000 for CDS implementation. The designed City Development Strategy was designed to be valid for the period from 2010 to 2015.

RELEVANCE (IMPACTS):

The innovative mentorship resulted in changes both at institutional level and city level. The city of Lilongwe formulated an ambitious City Development Strategy (CDS) and started implementing in 2010. After the end of the city Strategy (2015) the CDS was evaluated, amended, and renewed for another phase.

For Lilongwe the mentorship programme signified the start of a process to build good governance practices, to change institutional behavior, to focus on public good and community needs, to prioritize, and to be accountable.

IMPLEMENTATION:

Parties and partners in the initiative, resources used for implementation:

- Lilongwe City Council (LCC)
- Malawi Government
- Cities Alliance
- City of Johannesburg
- United Cities and Local Governments (UCLG)
- South African Local Government Association (SALGA)
- Lilongwe business community representative
- Academia
- International organizations (JICA, UN Habitat, subsequently GIZ)
- Community Development Committees CDC and other local organizations in Lilongwe.

Following the mentorship request, a Johannesburg team visited Lilongwe several times to assist them to develop their own City Development Strategy (CDS), an implementation plan, and to ensure skill transfer and capacity building. At the time, Lilongwe governance was in disarray, most senior positions were being filled by staff in acting capacity only. This meant that decision-making and implementation took place in a disorganized, ad hoc fashion.

The City of Johannesburg volunteered to mentor LCC on the following:

- advice and technical assistance in development efforts.
- assistance in developing a strategy document giving guidance in relation to what should or needs to be prioritized to accelerate growth, reduce poverty, and build sustainable settlements.

Phase one, the preparatory phase, focused on understanding Lilongwe and key challenges. This involved an institutional, stakeholder and donor project analysis. Access to quality data was a major issue, problems for residents ranged from poor sanitation and water provision, to crumbling infrastructure and poor health services.

Phase two was structured around five key areas of concern - governance; shelter and land; infrastructure and environment; community development; and economic development. A five-year implementation plan was developed.

Phase three was implementation of the plan, with a permanent CDS unit established. The unit was involved in creating the 2010/2011 business plans and budget estimates, as well as identifying funding sources and preparing departmental score cards.

During the mentorship, on-going face-to-face interaction took place between officials from both cities. The City of Johannesburg had the necessary experience, capacity, and expertise to fulfil this mentoring role.

Some concrete actions related to the governance structure in the city of Lilongwe are:

- Lilongwe has managed to computerize the accounting and billing system. All collected revenue is monitored by more than one person, and defrauding Lilongwe has therefore been halted; as a result, revenue has been improving annually since 2010.
- The city is increasing salaries for employees at least annually.
- Performance management system has been formulated and is currently being enforced. This has enhanced staff retention.
- Lilongwe undertook an institutional capacity and skills audit. Many previously vacant positions have now been filled, ghost workers were identified in the process and those responsible have been prosecuted.

Some of the outcomes at city level are:

- Water and sanitation improved, a livelihood programme helps to improve residents' socio-economic status through the Community Savings and Loans Association (CSLA) component and reflect adult circles. Many women have already ventured in income generating activities (IGAs) using the loans they borrow from CSLA. There is also linking to commercial banks from which poor people are obtaining adequate loans
- The city received a grant from UN Development Programme in order to implement a project entitled "WASTE FOR WEALTH PROJECT: PROMOTING A ZERO WASTE ENVIRONMENT" in two traditional housing areas. More people in these areas are currently preparing compost manure and selling it to obtain money for their own use. This is a popular business and has managed to improve many lives in the project impact areas.
- Lilongwe has also attained improved health in the city and residents have developed proactive measures, preventive and disease control actions. In the financial year 2011/2012, for the first time in the city, there were no cases of cholera outbreak and this was due to a scaled-up cholera campaign.
- The initiative has improved how services are delivered to inhabitants. Communication on services and projects has also improved.

CHALLENGES

The programme faced resistance from Lilongwe City Council staff. Some officers did not want to support it because they thought it would only burden them with a huge task while salaries were very low. To overcome this resistance, internal capacity-building workshops were conducted to give staff adequate information about the programme.

GENERAL CHALLENGES:

- state of public administration (leadership, commitment, and capacity)
- political context (actual level of decentralized decision-making)
- lack of access to available information (local and national), determining status of information
- no established communication platforms to share information, tasks, etc
- lack of basic resources – mass photocopying, computer virus protection, transport, meeting venues, etc.

- mentors are not to have any vested interests
- capacity building is extensive –from most basic to more complex issue.

TAKEAWAYS

Lilongwe City Council is a member of Cities Alliance City Future programme which supports exchange of experience and best practice in the region. Lilongwe offered support by linking Blantyre, Zomba and Mzuzu to other mentor cities so that these cities, too, were to develop their own City development Strategy (CDS). This shows successful transfer of the mentorship process. The mentorship methodology proved to be interesting and effective for both cities.

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HELSINKI CLIMATE STREET PROJECT

BACKGROUND AND KEY CONCERNS:

Learning from climate-smart initiatives in Amsterdam and Cologne that proved the value of piloting small-scale solutions in specially chosen streets, the City of Helsinki has developed its own Climate Street project.

Iso Roba is a neighbourhood with a mix of traditional jewellery and florist shops and 'hip' restaurants, cafes and boutiques. It is home to a growing community of climate-aware professionals who are committed to securing the long-term environmental sustainability of the area. The street was scheduled for repairs and refurbishment which meant Climate Street could access some of the €1,300,000 allocated for improvements by the city administration for its initiatives.

The agile pilot programme is a key component of the Climate Street project. It enables experimentation with prototypes in real life situations by real users. The municipality runs competitions for proposals and acts as a matchmaker, bringing together local people, specialists, start-ups, and SMEs. Climate Street purchases ideas worth €1,000 to €7,000 to support the emergence of innovative climate change actions. The winning ideas are supported for a period of 1 to 6 months to become new start-up businesses.

Ideas selected support the:

- reduction of energy consumption of residents and businesses in the street
- introduction of renewable energy sources in the area
- food waste reduction
- increase the area's attractiveness and climate-friendly business operations

Lead agencies for the project are the City of Helsinki, Vantaa and Helsinki Environment Centres, the Green Building Council, Helsinki Region Environmental Services and Aalto University. The project received funding of €820,000 from the European Regional Development Fund and €100,000 from the Helsinki City Innovation Fund.

RELEVANCE (IMPACTS):

Pilot projects implemented at Iso Roba, Tikkuraitti and Asematie streets include installing eco-friendly lighting on restaurant terraces, planting climate-resilient trees, and creating underground storm water retention tanks. Further pilot projects have introduced a new method to monitor energy rates in buildings and minimize food waste in grocery stores.

Climate Street has already met many of its initial targets. Its impact owes much to the way the views of all the different stakeholders were sought from the start and how trust and engagement was carefully established. Moreover, the project has a self-sustaining future. Residents are educated and engaged and members of the business community who participated in the networking boot camps will continue to share ideas and information and partner on other projects. Young people have been inspired through events such as Earth Hour, which saw 1500 school children gather on Iso Roba to learn about climate protection.

IMPLEMENTATION:

Three streets were chosen as climate-smart frontrunners and testbeds for resource-efficient, low-carbon services and products: Iso Roba, one of Helsinki's central shopping and restaurant streets, and Tikkurila and Asematie in neighbouring Vantaa. The Climate Street team then set about working with local residents, property owners, housing associations, businesses, solution providers and NGOs to co-create and share knowledge of smart and clean solutions and implementations.

Climate Street has encouraged local residents to look at how their homes could be more energy efficient and sustainable through workshops and events. 'Happy Houses' workshops, run by environmental organisation Dodo brought several housing associations and residents together to share their ideas and concerns and explore opportunities and costs. Many residents have signed up for energy audits, advice on reducing their CO2 footprint and to understand their home's solar energy potential.

The solar power campaign has been one of the most effective to date. Many residents received detailed practical guidance on installing solar panels on their roofs. The city also now has its first apartment building solar power plant in the historic downtown area. This was built in collaboration with Climate Street, who provided technical, practical and personal support to the residents involved. A similar process has been used to stimulate the transformation of the inner courtyards of housing association properties into attractive climate-adapted green urban spaces.

The issue of food waste has inspired four agile pilots and crowd-sourced solutions. From Waste to Taste uses ingredients that would otherwise be wasted for snacks it offers from its ingenious solar-powered rickshaw. A local NGO has partnered with a supermarket to reduce food waste through the use of its location-based social web service, which has been specifically designed to provide unused food for community use.

TAKEAWAYS

Climate Street has shared its learnings; nationally through the active climate network of Finland's six largest cities, and across Europe via ClimateKIC, the Covenant of Mayors and the Smart Cities Network. Cities in neighbouring Nordic countries and Italy have expressed interest in Helsinki's ideas-to-action model, which is transferable to any urban environment irrespective of infrastructure and building age.

CHALLENGES

To become carbon neutral and resilient as rapidly as required by its Climate Roadmap, The City of Helsinki has had to accelerate the development of innovative solutions for reducing greenhouse gas emissions and energy use. While general awareness of environmental issues is high, motivating people and organisations to take action remains a challenge. To address this, the city realised it needed to take a cooperative approach and open up the conversation to mobilise stakeholders and introduce climate-friendly choices.

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IMEPLAN. CITIZEN-LED GOVERNANCE OF THE METROPOLITAN AREA OF GUADALAJARA.

BACKGROUND AND KEY CONCERNS:

Learning from climate-smart initiatives in Amsterdam and Cologne that proved the value of piloting small-scale solutions in specially chosen streets, the City of Helsinki has developed its own Climate Street project.

Iso Roba is a neighbourhood with a mix of traditional jewellery and florist shops and 'hip' restaurants, cafes and boutiques. It is home to a growing community of climate-aware professionals who are committed to securing the long-term environmental sustainability of the area. The street was scheduled for repairs and refurbishment which meant Climate Street could access some of the €1,300,000 allocated for improvements by the city administration for its initiatives.

The agile pilot programme is a key component of the Climate Street project. It enables experimentation with prototypes in real life situations by real users. The municipality runs competitions for proposals and acts as a matchmaker, bringing together local people, specialists, start-ups, and SMEs. Climate Street purchases ideas worth €1,000 to €7,000 to support the emergence of innovative climate change actions. The winning ideas are supported for a period of 1 to 6 months to become new start-up businesses.

Ideas selected support the:

- reduction of energy consumption of residents and businesses in the street
- introduction of renewable energy sources in the area
- food waste reduction
- increase the area's attractiveness and climate-friendly business operations

Lead agencies for the project are the City of Helsinki, Vantaa and Helsinki Environment Centres, the Green Building Council, Helsinki Region Environmental Services and Aalto University. The project received funding of €820,000 from the European Regional Development Fund and €100,000 from the Helsinki City Innovation Fund.

RELEVANCE (IMPACTS):

Pilot projects implemented at Iso Roba, Tikkuraitti and Asematie streets include installing eco-friendly lighting on restaurant terraces, planting climate-resilient trees, and creating underground storm water retention tanks. Further pilot projects have introduced a new method to monitor energy rates in buildings and minimize food waste in grocery stores.

Climate Street has already met many of its initial targets. Its impact owes much to the way the views of all the different stakeholders were sought from the start and how trust and engagement was carefully established. Moreover, the project has a self-sustaining future. Residents are educated and engaged and members of the business community who participated in the networking boot camps will continue to share ideas and information and partner on other projects. Young people have been inspired through events such as Earth Hour, which saw 1500 school children gather on Iso Roba to learn about climate protection.

IMPLEMENTATION:

Three streets were chosen as climate-smart frontrunners and testbeds for resource-efficient, low-carbon services and products: Iso Roba, one of Helsinki's central shopping and restaurant streets, and Tikkurila and Asematie in neighbouring Vantaa. The Climate Street team then set about working with local residents, property owners, housing associations, businesses, solution providers and NGOs to co-create and share knowledge of smart and clean solutions and implementations.

Climate Street has encouraged local residents to look at how their homes could be more energy efficient and sustainable through workshops and events. 'Happy Houses' workshops, run by environmental organisation Dodo brought several housing associations and residents together to share their ideas and concerns and explore opportunities and costs. Many residents have signed up for energy audits, advice on reducing their CO2 footprint and to understand their home's solar energy potential.

The solar power campaign has been one of the most effective to date. Many residents received detailed practical guidance on installing solar panels on their roofs. The city also now has its first apartment building solar power plant in the historic downtown area. This was built in collaboration with Climate Street, who provided technical, practical and personal support to the residents involved. A similar process has been used to stimulate the transformation of the inner courtyards of housing association properties into attractive climate-adapted green urban spaces.

The issue of food waste has inspired four agile pilots and crowd-sourced solutions. From Waste to Taste uses ingredients that would otherwise be wasted for snacks it offers from its ingenious solar-powered rickshaw. A local NGO has partnered with a supermarket to reduce food waste through the use of its location-based social web service, which has been specifically designed to provide unused food for community use.

TAKEAWAYS

Climate Street has shared its learnings; nationally through the active climate network of Finland's six largest cities, and across Europe via ClimateKIC, the Covenant of Mayors and the Smart Cities Network. Cities in neighbouring Nordic countries and Italy have expressed interest in Helsinki's ideas-to-action model, which is transferable to any urban environment irrespective of infrastructure and building age.

CHALLENGES

To become carbon neutral and resilient as rapidly as required by its Climate Roadmap, The City of Helsinki has had to accelerate the development of innovative solutions for reducing greenhouse gas emissions and energy use. While general awareness of environmental issues is high, motivating people and organisations to take action remains a challenge. To address this, the city realised it needed to take a cooperative approach and open up the conversation to mobilise stakeholders and introduce climate-friendly choices.

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ESTIDAMA SUSTAINABILITY PROGRAM (ABU DHABI)

BACKGROUND AND KEY CONCERNS:

In one of the world's most rapidly growing cities, a new government-mandated program – Estidama (Arabic for "sustainable") - aims at making all new buildings in UAE more environmentally responsible and sustainable. The program targets reducing energy usage by 31 percent, water usage by 37 percent, and diverting 65 percent of construction waste from landfill. There will be a mandatory audit procedure for each project. The rules ran into initial resistance from industry groups that feared increased costs and more difficult project approvals. But independent analysis has confirmed that cost increases are negligible.

The Emirate of Abu Dhabi has created a vision through its "Plan 2030" urban structure framework. It establishes sustainability principles as the foundation of any new development and reflects the values and ideals of the nation. Estidama is a holistic framework that enables the implementation of these sustainability principles to all scales of development and promotes a new mindset for building a forward-thinking global city. Estidama is the symbol of inspired governance and community improvement.

RELEVANCE (IMPACTS):

The ultimate goal of Estidama is to preserve and enrich Abu Dhabi's physical and cultural identity, while improving the lives of its residents on the four equal pillars of sustainability: environment, economy, society, and culture. It touches all aspects of life in Abu Dhabi - the way we build, the way we use our resources, the way we live, the choices we make - all in an effort to attain a sustainable state of living. By working closely with all stakeholders, Estidama has already improved the mind-set and implementation practices of the construction industry and will continually develop to encourage improvement for all of society.

In the past 4 years Estidama has evolved from a vision to an accepted sustainability framework. The Pearl Rating System provides regulatory guidance on design, construction and operational performance. Sustainability principles are also embedded in new planning documents through Estidama's continual improvement and participation in policy development.

Estidama buildings have designed energy use reduction of 31% and designed water use reduction of 37%. More impressively, 65% of construction waste has been diverted from landfill. There are other unquantifiable impacts such as improved health of buildings and quality of life for residents due to mandatory reduction of unhealthy materials and the encouragement of passive design measures. These and many other improvements occur at all scales from single homes to whole communities through the Pearl Rating Systems for Villa, Building and Communities.

IMPLEMENTATION:

Primary stakeholders include the Executive Council of Abu Dhabi and the Urban Planning Council. Additional stakeholders include all government agencies and private industry who participate in the development of the program and ensure that its implementation is managed responsibly. Estidama has strong links with other parties committed to sustainability globally and in the Middle East and North Africa region, including the Emirates Green Building Council and World Green Building Council.

To support and to accelerate the implementation of sustainability principles, a key component of the Estidama program is the Pearl Rating System (PRS) which received government mandate in July 2010; adherence is therefore compulsory to ensure all new projects are included and supported. Training is also actively provided to raise awareness among people working in the construction industry and the public.

The Pearl Rating System is flexible, allowing it to be applied across all building typologies and scales. Trained consultants, or Pearl Qualified Professionals (PQPs), guide projects through the Rating System from the early concept stage through to construction. Ratings range from 1 to 5 Pearls; with 1 Pearl being the minimum required for non-government buildings and 2 Pearls for government buildings.

The Government of Abu Dhabi is also committed to improving the management of services through its E-Governance Program. Estidama and the Pearl Rating System are in the process of migrating to this online platform that will inte-

grate other government services for improved performance and customer service.

Besides calculation tools, multiple training, support, and submission documentation has been developed by Estidama for the industry sector and made available at no cost. Free training is provided and introduces even non-technical individuals to sustainability principles and the way Estidama will improve the built environment. An extensive website, which provides all information required, encourages communication between Estidama and urban design teams. As Estidama develops in line with Abu Dhabi's E-Government initiative, it will become even easier for project teams to submit projects for approval and to share knowledge for facilitating continual improvement.

CHALLENGES

Challenges were identified during the initial role out of policies and regulation in the first 2 years of implementation. Early resistance came from the industry sector who believed that new sustainability requirements would increase costs and make approval for developments more challenging. Estidama extensively supported new developments to facilitate compliance and demonstrated through independent empirical analysis that increased costs were negligible. Early resistance has given way to acceptance and support for the program and benefits can be demonstrated through evidence of resource savings and improved design.

TAKEAWAYS

A unique and innovative feature of Estidama is the Construction Audit Protocol, a mandatory element of the Pearl Rating System. To ensure technical compliance with original design intent during the construction stage, construction audits are carried out at five key stages. These are:

- Site set-up and Substructure
- Superstructure and Building Envelope
- Internal Fit-out and Services
- Commissioning & Documentation
- Final site visit & sign off

The technical features of sustainable buildings are increasingly complex. The design and construction process requires systems of verification to ensure the design intent is realized during the operation of buildings. On-site audits of the construction process reduce defects and liability issues and removes instances of non-compliance. This in turn improves the efficiency of the construction process and reduces maintenance and operational costs.

The Pearl Operational Rating System (PORS) is another unique element to Estidama and the Pearl Rating System. Resource use during buildings operation far outweighs that during the design and construction phases. The continual efficient operation of building systems is critical to ensure that the resource savings calculated during the design process become real.

The Pearl Operational Rating System set out policies and procedures for the building owners and operators. Guidance is also provided for facilities management teams and building users to undertake tasks on a regular basis throughout the lifetime of the building. These include continual monitoring of building performance through mandatory operational maintenance protocols and procedures for remedial works. All building performance data is supplied to Estidama for monitoring purposes and is fed back into the application of the design tools to ensure continual optimization of the design, construction, and operation processes.

There are sustainability rating systems implemented all over the globe that Estidama was able to learn from. Estidama is the only sustainability program designed and implemented in the middle east. As a holistic sustainability program, Estidama requires innovation in government strategy and policy and also in the planning, design and implementation of all development projects. The Operational Rating System implemented by Estidama will require innovative technology and behavioral change.

As Estidama becomes more recognized, it is also being implemented in other Emirates and countries in the region including Bahrain and the Seychelles.

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BARRIO DIGITAL, LA PAZ (DIGITAL NEIGHBOURHOOD)

BACKGROUND AND KEY CONCERNS:

In October 2016, the city of La Paz in Bolivia launched Barrio Digital (Digital Neighbourhood) to communicate more effectively and efficiently with citizens living in poor neighbourhoods and encourages civic participation and responsibility.

The objectives of Barrio Digital are:

- Increase citizen participation for evidence-based decision-making,
- Reduce the cost of submitting a claim and shorten the amount of time it takes for the municipality to respond, and
- Strengthen the technical skills and capacity within the municipality to use ICT tools for citizen engagement.

The Lead agency for Barrio Digital is the Le Paz municipal government with support from the Cities Alliance Catalytic Fund via the Cities without Slums program. The World Bank sponsors the Neighborhoods and Communities of Truth program (PBCV).

RELEVANCE (IMPACTS):

Using ICT to enhance citizen feedback helps the municipal government become more efficient in its own operations and maintenance. Instead of sending its technical team or engineers to fix clogged storm drains, fill potholes, or repair community centres across various neighbourhoods on a rotation-basis, the program can now categorize and map complaints and reported problems to prioritize the issues and deal with them accordingly.

IMPLEMENTATION:

Barrio Digital relies on SMS and web technologies. If a citizen has a question or complaint, they can text it to a local phone number; the person receives a tracking number by return txt, and they can use this tracking number to follow up and monitor the municipality's response over time. Residents can also submit questions or complaints via a website. The website offers other features too, such as geo-referenced data on projects in each neighborhood.

The program thus helps those in lower income groups save time and money when expressing grievances to their municipality. It helps them keep their local government accountable and encourages civic participation and responsibility.

What is more, using ICT to enhance citizen feedback helps the Barrios de Verdad team become more efficient in its own operations and maintenance. Instead of sending its technical team or engineers to fix clogged storm drains, fill potholes, or repair community centers across various neighborhoods on a rotation-basis, the program can now categorize and map complaints and reported problems to prioritize the issues and deal with them accordingly.

Barrio Digital is based on customizable, open-source software that is maintained by the municipality and is compatible with the Barrios and Communities of Truth programs (PCVB), the Municipal Secretary of Public Infrastructure and the Autonomous Municipal Government of La Paz.

CHALLENGES

One of the ongoing challenges faced by the municipal government is engaging communities to provide feedback on the performance of Barrio Digital.

TAKEAWAYS

Public awareness - community consultation and training is essential. Barrio Digital carried out programs in more than 15 neighborhoods to help the local team design the system's online platform, geographic information system (GIS) components, and SMS submission and response workflow.

Engagement and participation - The end users of tools such as Barrio Digital should be involved in the development process. To ascertain how users think and what technologies they have access to the development team carried out both social and technology assessments of end users. The team also organized a series of workshops on technology literacy to help residents of PBCV neighborhoods, especially the elderly, simulate feedback submissions and follow up.

Leadership - The development of Barrio Digital required strong support from the mayor and the municipal government and a commitment to invest in new approaches to citizen engagement.

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MASTERPLAN INTEGRATED CLIMATE ADAPTATION DORTMUND

BACKGROUND AND KEY CONCERNS:

The transformation of urban infrastructure is nothing new to the City of Dortmund. The decline of the coal and steel industries and a number of major breweries meant that Dortmund was affected by structural change early on – from the 1970s onward. The last coal mine closed in 1987 and the last steel factory in 2001. At that time the unemployment rate was over 15%. In response to these developments a new land-use plan was approved in 2004, which has since been implemented. The plan aims to re-purpose brownfield land (which accounts for some 10% of the city's land) for housing, work and land restoration, as well as to protect public spaces. Ultimately this is designed to promote the city's development in a way that is socially, environmentally and economically sound.

The percentage of green infrastructure has been increased from 47% (1985) to 63% (2019). Dortmund has also succeeded in persuading companies in tate-of-the-art sectors – micro-electro-mechanical systems (MEMS), IT, biotechnology and logistics – to locate their operations in the city. The unemployment rate has been almost halved, and the economy is now multisectoral. With over 50,000 students, Dortmund has also emerged as a science hub, and as the city rejuvenates it is attracting new citizens. The restored land is helping to mitigate climate change and forms reservoirs and flood areas in case of torrential rainfall.

RELEVANCE (IMPACTS):

As Dortmund follows a smart and healthy development strategy, the main target of the Master Plan for the Integration of Climate Change (MiKaDo) is to get a common understanding for the challenges of climate change through:

- Continuous participation process within the city administration to elaborate recommendations for climate proof action for each department
- Elaborate a map of action for climate change
- Participation of stakeholder and citizens

IMPLEMENTATION:

The MiKaDo plan (Master Plan for the Integration of Climate Change in Dortmund) focuses on the development of a smart and healthy city, reducing the danger of extreme weather manifestations such as heat waves and heavy rains. The plan establishes a roadmap, with the participation of different parties and citizens, and recommendations for each of the city's departments. In order to develop the plan, an assessment and analysis of present and future climate scenarios was made, evaluating the vulnerability and challenges presented by each one. From there, climate adaptation strategies and measures were identified, and a plan for their communication, institutionalization, and monitoring was created. MiKaDo is being developed through the following steps:

- Step 1: Status quo analysis
- Step 2: Vulnerability analysis
- Step 3: Integrated climate change adaptation strategy
- Step 4: Climate adaptation measures
- Step 5: Communication and perpetuation
- Step 6: Controlling

TAKEAWAYS

One of the main lessons of this project is the importance of identifying key actors to convince and mobilize other relevant actors inside and outside the administration. Similarly, the importance of conveying the consequences of inactivity and the status quo in terms that are related to each of these actors has also been highlighted by the city.

Other important lessons are:

- A political decision for climate change adaptation is required.
- To motivate and activate stakeholders for action, the relevance of climate change adaptation must be conveyed by presenting the consequences of inactivity and the chances of no-regret measures
- Networking within the city administration and identifying key actors to convince other key actors is the main challenge but also the biggest chance to implement climate change adaptation.

CHALLENGES

The project is still ongoing, which means that some challenges will arise overtime. Coordination amongst different city departments within the administration has proven to be an important challenge. The city appointed a focal point to help coordinate climate actions and mobilize all the needed departments internally.
Effective communication was also identified as a mayor challenge at this stage. The impact of climate change should be communicated in relatable manners to each specific audience or department.

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CITY OF MEXICO RESILIENT STRATEGY

BACKGROUND AND KEY CONCERNS:

The vision of the Mexico City government (CDMX) is to create an equitable society based on an all-embracing process in which various stakeholders, sectors, and vulnerable groups work together to combat the major challenges of the 21st century.

The city faces resilience challenges on environmental, social, and economic issues, given its geographic situation, the history of great social-environmental transformation, and social context. Having once been a lake, the city has become a megacity, one of the most populous on Earth. Rapid urban expansion and soaring population growth in the last few decades have added to the problems resulting from insufficient long-term planning and weak metropolitan coordination, making it difficult to monitor and track important regional issues such as water management based on a long-term sustainability perspective.

CDMX is faced with multiple risks, both natural and man-made, impacts (hydro-meteorological and geological) and tensions (inequity, poverty, climate change) that put the population, the territory and its ecosystems at constant risk. The CDMX Resilience Strategy is being developed to address the challenges facing the city through five pillars, or guiding principles.

The pillars will drive the implementation of actions to improve the adaptive capacity, disaster response, and infrastructure development of CDMX are:

- 01. Foster regional coordination
- 02. Promote Water Resilience as a New Paradigm to Manage Water in the Mexico Basin
- 03. Plan for Urban and Regional Resilience
- 04. Improve Mobility through an Integrated, Safe and Sustainable System
- 05. Develop Innovation and Adaptive Capacity

RELEVANCE (IMPACTS):

The Resilience Strategy is a document that requires ongoing assessment that incorporates a learning process that allows for responses to a dynamic context. Due to the scope of a Resilience Strategy, this document could not include all the issues that might be relevant to building resilience.

Therefore, regular reviews must be conducted to ensure that goals and actions are evaluated and updated. An MRV(measurement, reporting and verification) system will be implemented to support regular evaluations, continuous learning, and reflection on building resilience, specifically for communities and vulnerable groups.

IMPLEMENTATION:

The goal of the Resilience Strategy for CDMX is to identify opportunities and define priorities for building city resilience. The strategy's vision must be broad and ambitious to respond to the city's existing challenges. The Resilience Agency, a decentralized agency of the Ministry of the Environment of the CDMX government is in charge of the implementation and financing of the Resilience Strategy.

However, before the creation of the Agency, the Resilience Office was supported by the 100 RC (100 resilient cities) initiative, who provided financing and technical assistance, access to the services of global organizations, opportunities to exchange experiences and best practices among member cities, and access to tools for building resilience

To address the main challenges, the Resilience Strategy incorporated five pillars, each of which has distinct goals, actions, and activities. To define the goals and actions for each pillar, certain overarching concepts were established.

Pillar 01: Foster regional coordination

Vision: The Metropolitan Area of the Valley of Mexico (ZMVM) and the wider megalopolis operate under a regional institutional framework on key topics to maintain a common agenda and ensure shared responsibility in building resilience.

- 1.1: Create resilience through institutional coordination and regional strategic communication.
- 1.2. Guide and support regional projects that contribute to resilience.

Pillar 02. Promote Water Resilience as a New Paradigm to Manage Water in the Mexico Basin

Vision: To respond to the risks and shocks associated with climate change and social and environmental pressures, and to ensure equity in water access and water security for all who live and work in CDMX, the city manages water resources in the Mexico Basin based on the principles of the Comprehensive Management of City Water Resources (GIRHU) process.

- 2.1. Reduce water scarcity and inequality access.
- 2.2. Promote sustainable use of the aquifer and contribute to water security planning.
- 2.3. Foster a civic culture on the sustainability of water resources.
- 2.4. Integrate a water sensitive approach to urban design through blue and green infrastructure.

Pillar 03. Plan for Urban and Regional Resilience

Vision: All CDMX citizens have equal access to urban amenities, housing, green areas and public spaces; the environment is improved, and risks are mitigated through sustainable management of natural resources.

- 3.1: Increase spatial social equality in CDMX through programs and projects.
- 3.2. Protect Conservation Areas.
- 3.3. Reduce risk through urban and regional planning.

Pillar 04. Improve Mobility through an Integrated, Safe, and Sustainable System

Vision: CDMX and the metropolitan area have an integrated mobility system that prioritizes public transportation over private vehicles and provides a safe urban environment for pedestrians and cyclists.

- 4.1: Promote an integrated mobility system that connects and revitalizes CDMX and ZMVM.
- 4.2: Discourage the use of private vehicles.
- 4.3: Create a safe and accessible city for pedestrians and cyclists.
- 4.4: Prepare the mobility system for the potential risks and effects of climate change.
- 4.5: Promote the use of data to improve decision making on mobility.

Pillar 05. Develop Innovation and Adaptive Capacity

Vision: CDMX adapts to the impacts of climate change and responds proactively and innovatively to dynamic risks of natural and social origin.

- 5.1: Integrate the principles of resilience in public facilities, investments, and new strategic projects, and promote private sector participation in building resilience.
- 5.2: Promote community resilience through citizen participation, strategic communication, and education.
- 5.3: Review and adjust the regulatory framework to promote the implementation of adaptive measures

TAKEAWAYS

The 2017 Central Mexico (Puebla) earthquake struck on September 19, with an estimated magnitude of Mw 7.1 and strong shaking lasting for about 20 seconds. Its epicenter was approximately 55 kilometers south of the city of Puebla. The earthquake caused damage in the Mexican states of Puebla and Morelos and in the Mexico City (CDMX) area, including the collapse of 44 buildings and damage to more than 3,000 buildings in CDMX alone. Nearly 400 people were killed, including 228 in CDMX, and more than 6,000 people were injured. It's well known that Mexico City is highly vulnerable to earthquakes. In 1985, also on September 19, an Mw 8.0 earthquake left between 9,500 and 35,000 dead in Mexico City, with 412 building collapses and more than 3,100 buildings badly damaged. In the aftermath of the 1985 tragedy, building codes were updated, an early warning system for CDMX was installed, and building evacuation drills were implemented.

In mid-March 2018, 100 Resilient Cities, pioneered by the Rockefeller Foundation, collaborated with the CDMX Resilience Office on a 3-day Network Exchange entitled "Building Seismic Resilience: Preparedness, Response, Recovery." Chief Resilience Officers (CROs), municipal leaders, private sector partners, academics, and subject matter experts from around the globe were invited to participate and share their experiences and strategies for building resilient communities in seismically active regions. Cities and countries represented by their CROs and other high ranking officials included Vancouver, Canada; Cali, Colombia; Quito, Ecuador; Kyoto, Japan; Colima and CDMX from Mexico; Christchurch and Wellington from New Zealand; and Los Angeles and San Francisco from the United States.

CHALLENGES

Over time Mexico City has experienced a great social and environmental transformation, becoming the center of economic, political, and social-cultural activities in Mexico. A strong trend of population growth and expansion of its territory have given rise to pressing issues, such as intense demand for natural resources, inequality and social marginalization, informal settlements, waste generation, degradation of natural resources, and pollution.

To build resiliency, the past must be considered so that risks related to the city's history are better understood. For example, while the fact that most of the City is located on top of what used to be a lake must be considered, future scenarios must take into account the fact that social and environmental transformation continues to take place. Knowledge of both the past and the present is the foundation for a better understanding of the potential risks and unforeseen events that the City and its citizens may face.

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WESTERN CAPE INDUSTRIAL SYMBIOSIS PROGRAMME

BACKGROUND AND KEY CONCERNS:

WISP was initiated by the Western Cape Department of Economic Development and Tourism (DEDAT) in April 2013. It is currently funded by the City of Cape Town through the Mayor's Office and is part of the Mayor's Portfolio of Sustainability Initiatives. WISP is one of the City's vehicles to drive its Zero Waste to Landfill Strategy. The programme is delivered by GreenCape, a not-for-profit company that works in Africa to grow the green economy.

Initially the initiative was created to address landfill airspace and unemployment issues the economy was experiencing. The intention was to divert waste away from landfills and stimulate the economy through the various value add interventions implemented through industrial symbiosis1. The initiative aids with transforming the largely consumptive and wasteful linear economy model into a more circular economy model where secondary materials can be integrated back into the economy.

RELEVANCE (IMPACTS):

The resource exchanges facilitated by WISP divert waste from landfill, generate financial benefits for members, reduce the carbon intensity of production processes and create jobs; ultimately making the manufacturing sector more competitive and resilient to climate change.

Application of industrial symbiosis and circular economy principles ensures the maximum utilization of available resources before virgin resources can be exploited which can lead to the decoupling of economic growth from resource use. The initiative bridges the communication gap between industrial sectors that do not traditionally associate with each other and increases collaboration to the mutual benefit of the businesses involved with regards to environmental social and economic performance. Business can explore various waste treatment technologies and select the most appropriate for their purposes.

Over 70% of the businesses in the network of over 1000 companies are practicing resource efficiency in one form or another through commitments to divert waste from going to landfill by utilizing more sustainable value add waste treatment options. This has led to an increased awareness to environmental issues and how our economy is vulnerable to shocks and stresses like droughts and lack of skills.

The biggest indicator used is the amount of waste diverted from going to landfill as this is easily quantifiable. From the data calculated, benefits accrued to businesses (additional revenue due to businesses selling some of their waste streams, cost reduction due to reduced waste generation, avoidance of transport and disposal costs) and use this data to demonstrate to funders and other businesses that the initiative is adding value. The data is aggregated for all the businesses and can be disaggregated per industrial sector.

Going into the future, more people will be impacted by the initiative as new waste value-add businesses are added to the areas creating new employment opportunities for low skilled labor in surrounding communities.

Through WISP 104.900 tons of waste have been diverted from landfill, 309.200 tones of carbon dioxide equivalent emissions saved (equivalent to the annual electricity usage of 83.340 households in South Africa).

WISP facilitators provide business members with dedicated time and technical expertise, connecting companies with unused or residual resources such as materials, energy, water, assets, logistics and expertise.
By sharing resources, WISP members:

- Cut costs and increase profit
- Improve their business processes
- Create new revenue streams
- Learn from each other
- Operate more sustainably

IMPLEMENTATION:

The initiative takes what some businesses have been practicing at an individual site level (node optimization) and scales it up to a network level involving multiple businesses to the benefit of the whole economy (system optimization). It is adaptive as it takes a dynamic and iterative approach to achieve results due to the ever-changing waste landscape. It has moved beyond landfill diversion

to conducting material flow analysis (MFA)2 on industrial areas to determine opportunities for interventions to increase resource efficiency. The inclusion of enterprise development allows for the establishment of new business initiatives that take advantage of the opportunities identified.

To get buy-in from the businesses, the initiative is pitched from an economic point of view, so that businesses can immediately see that their bottom line will not be impacted negatively. Facilitators directly engage businesses through site visits and meetings. There is a secure database for storing company information which is not shared with anyone, and a carbon calculator has been developed to measure CO2e (carbon dioxide equivalent) emission reduction potential of the exchanges.

The initiative targets businesses in the manufacturing sector and works closely with academia and relevant governmental departments to ensure the creation of an enabling environment for industrial symbiosis to thrive. The programme was initially guided by a steering committee from these three stakeholders. Academia is leveraged for research & development based on gaps and opportunities identified in industry and relevant governmental departments are consulted on various policies and legislation to ensure compliance with regulations. Information is relayed between the stakeholders to ensure decisions are made with a full understanding of the landscape.

The programme focuses on industrial areas, however, special attention is given to entrepreneurs and SMEs as they need the most assistance with regards to business development and understanding the green economy. Efforts are put into integrating informal businesses from neighbouring communities like waste pickers with established businesses for mutual benefit.

The initiative evolves with time making sure the work done is still relevant in the changing waste economy landscape. Each subsequent year a new layer is added to the traditional core activities of the initiative, the work has grown from making individual business resource efficient to optimizing whole new areas.

TAKEAWAYS

Other cities can learn about how industry, academia and government can work together for sustainable growth of the economy. There is usually an information gap between these three spheres, an industrial symbiosis initiative such as this helps to bridge this gap by increasing triple helix collaboration (Academia, industry and government). Through sharing of resources, economies can decouple economic growth from virgin material consumption putting less strain on the environment as the already depleting natural resources are preserved and businesses are able to reduce their carbon footprints. The businesses implementing the initiatives are always willing to share their learnings through case studies which are publicly available. The City is also willing to partner with other Cities to train and share insights on how the initiative can be implemented. The Non-Profit Organization that delivers the programme is also willing to conduct training workshops and collaborate with organizations in other Cities to deliver a similar initiative.

CHALLENGES

Initially, WISP had little local evidence of the benefits of implementing industrial symbiosis resulting in companies being reluctant to engage with WISP due to lack of trust and/or knowledge of IS. As resource exchanges were completed, and case studies created, WISP's credibility was established, and the programme was better able to recruit new members into the network.

Businesses' lack of capacity and technical expertise to implement non-core activities meant companies only focused efforts on core activities and sustainability was and continues to be seen as a non-core activity by some businesses, particularly within SMEs. WISP fills this gap by making facilitators available to companies.

REFERENCES

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ADAPTUR – MOBILIZING RESOURCES FROM THE PRIVATE SECTOR TO INCREASE RESILIENCE AND PROTECT ECOLOGICAL SERVICES.

BACKGROUND AND KEY CONCERNS:

In 2016, more than 35 million international tourists travelled to Mexico, spending in excess of 17 billion US dollars. This corresponds to 8.7 percent of gross domestic product. More than four million people work in the tourism sector.

However, tourism is also affected by the effects of climate change. With the rise in temperature, some regions risk losing their status as attractive destinations. Coastal regions in particular are at great risk from rising sea levels, the degradation of their beaches and the threat of hurricanes. The diving industry needs coral reefs with their diverse flora and fauna. Many inland destinations are suffering from the loss of their ecosystems, declining biodiversity and a dwindling natural water supply.

RELEVANCE (EXPECTED IMPACTS):

National level:

- Contributing that Mexico will achieve its international obligations in the adaptation of climate change (NDCs).
- Development of a National Plan for the tourism sector as part of the National Plan for Adaptation (NAP)

Federal level:
(Riviera Maya, Riviera Nayarit/Jalisco and San Miguel de Allende)

- Elaboration of an economic analysis about the impacts of climate change on the tourism sector.
- Assistance in the integration of criteria and adaptation measures in sectoral plans and processes (e.g. programms of investment)
- Intermediation of public-private dialogues

Local level:
Pilot projects at the Riviera Maya, Riviera Nayarit/Jalisco and in San Miguel de Allende

- 10 projects of adaptation in climate change together with touristic companies
- Sensibilization of the stakeholders about the outcome of climate change
- Intermediation of intersectoral dialogues

IMPLEMENTATION:

The ADAPTUR project works in three tourist destinations in Mexico: Riviera Nayarit-Jalisco (on the Mexican Pacific), San Miguel de Allende, Guanajuato (in the Bajío region of Central Mexico) and Riviera Maya (in the Mexican Caribbean). These pilot regions were selected on the basis of economic, social and environmental criteria and the expected results. Safety also played a decisive role.

A technical advisor to the project is on site in each of the three pilot regions. The advisors coordinate ADAPTUR's activities and support local stakeholders in technical matters. This includes information events, dialogues between the public and private sectors, technical training for a total of 300 people (e.g. economic assessment of climate risks), planning climate adaptation measures with the participation of all relevant stakeholders and support in developing project proposals. The project also promotes access to international expertise (studies, concepts or methodologies) and exchange with other projects in Latin America.

Implementation of the project is based on the principle of public-private cooperation. This includes ensuring that all stakeholders in the tourism sector (e.g. companies, entrepreneurs, associations or foundations) and wider society (including civil society organisations, communities, and academia) participate in the development of solutions and joint measures.

TAKEAWAYS

- The private sector is a key partner to mobilize resources and strengthen the resilience of cities and regions.
- Importance of understanding private sector language and processes, communicating the risks of climate change and benefits of adaptation efficiently in terms of their impact in profits and return of investment.
- Local governments have numerous mechanisms to collect funds from the private sector, which can be more efficient if they are accompanied by a consultation process, and transparent disclosure of investment and results.

REFERENCES

Link1
Link2
Link3
Link4


ALPINE WATER
WITH NATURAL MINERALS

CONTACT INFORMATION

Katrin Bruebach | Resilient Cities Network
kbruebach@resilientcitiesnetwork.org

Smita Rawoot | World Resources Institute
Smita.Rawoot@wri.org

Martin Shouler | Arup
Martin.Shouler@arup.com