CITY WATER RESILIENCE ASSESSMENT

WATER RESILIENCE PROFILE
JOHANNESBURG

ACKNOWLEDGEMENTS

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The City of Johannesburg Water Security Strategy Steering Committee members who have been providing strategic guidance to the Urban Water Resilience Team includes Nomvula Mofokeng, Freddie Letsoko, Jane Eagle, Tendamudzimu Mathagu, Mzukisi Gwata, Reabetswe Masombuka, Niël Rooi, André Nel, Zakhele Khuzwayo, Mashudu Rafundisani, Monde Ngwane and Ondela Tywakadi.

The analysis for the City Water Resilience Assessment also builds on the work done by the ICLEI Africa Team in assisting the CoJ in developing the Water Security Strategy.

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FOREWORD

Johannesburg, home to approximately 5.8 million people, is South Africa's largest urban area. It is both the economic hub of South Africa and a significant economic player in the southern African region. The economic development opportunities of Johannesburg, however, continue to place the city under tremendous growth pressure as a result of high population growth, urbanization, and regional migration.

At one point Johannesburg was considered the world's largest urban forest and was listed as one of the top ten greenest cities in the world. However, due to population growth, economic development, and poor urban planning, this asset stands degraded and reduced.

The City now faces an uncertain future with climate change threatening water security, resilience, and liveability of the City. Significant growth pressures, informal development, high inequality, pollution and environmental degradation, flash flooding, dilapidated infrastructure, delays in the development of new water infrastructure, fragmented governance, and limited financial capacity in the sector are all contributing to poor water resilience.

There is an urgent need for the City to identify areas of opportunity for taking strategic actions, to improve project development and collaboration and to establish a baseline against which progress can be measured and to identify priority actions to be implemented.

Since the beginning of 2022, the World Resources Institute (WRI), together with the City of Johannesburg's Environment and Infrastructure Services Department, and supported by the South African Cities Network, Zutari, Arup, The Resilience Shift, Resilient Cities Network

(R-Cities), and the Department of Cooperative Governance and Traditional Affairs are working together to develop a better understanding of vulnerabilities in Johannesburg's urban water system and to address them in a holistic manner.

This work is part of a multi-year Urban Water Resilience (UWR) Initiative, led by WRI along with partners in six African cities. In each city, the initiative undertakes baseline research and facilitates a structured, multi-stakeholder planning process to identify actions that address water-related shocks and stresses.

This report presents the summary of the results of the process for developing a water resilience plan for the City of Johannesburg and it includes a summary of challenges, opportunities and recommendations for priority actions to help improve water resilience for the City of Johannesburg.

On behalf of the project partners, we would like to thank the Addis Ababa Resilience Project Office, the Addis Ababa Water & Sewerage Authority and all the city stakeholders who have engaged in the planning process to develop this Water Resilience Profile and Action Plan.

ARUP

RESILIENT CITIES NETWORK

THE RESILIENCE SHIFT

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cooperative governance
Department:
Cooperative Governance
REPUBLIC OF SOUTH AFRICA

A LETTER FROM ENVIRONMENT AND INFRASTRUCTURE SERVICES DEPARTMENT, CITY OF JOHANNESBURG

Our city, Johannesburg, which is the largest municipality in South Africa, is in a water scarce part of the country, making water resilience a key requirement to keep the city functioning. Currently the city's water utility provides water services to approximately 5.6 million people and businesses within the city. The population of the city continues to grow and is expected to reach approximately 8.1 million people by 2050. While we pride ourselves in our ability to provide basic services such as access to piped water (98.8%), and sanitation (96.4%), we do face increasing challenges. Amongst other challenges, the municipality currently grapples with keeping water demand within the City's bulk water allocation, meeting all basic water and sanitation service needs, reducing water losses, maintaining infrastructure, improving the management of the overall water balance, ensuring coordination and effective governance between key actors, and investing in new water innovations. Furthermore, like many of our sister cities in the continent, we are yet to implement adequate and comprehensive data collection tools which could enhance our water management effectiveness.

Considering our growing population, the on-going water challenges highlighted above, and climate change related water risks, it becomes clear that we can no longer continue with business as usual. In 2020, we started working on the city's Water Security Strategy which was completed in June 2022. The Water Security Strategy describes the challenges that Johannesburg faces as well as the interventions required toward a water secure Johannesburg by 2040. The strategy priorities are linked to existing strategies and policies providing an aligned approach towards our water challenges. It is a strategic document that guides the City of Johannesburg and its stakeholders to better manage this finite resource and the water system as a whole towards achieving the vision of a sustainable urban environment that will contribute towards improving the quality of life for all in line with the Johannesburg 2040 Growth and Development Strategy.

While the Water Security Strategy will help the City of Johannesburg with long-term planning for water availability, the city also needed to take cognisance of the broader risks and shocks that may arise in relation to water, particularly climate related risks. As such, it was important to understand the threats and risks that Johannesburg faces through the lens of a resilience approach. We were not only interested in achieving water security but also building resilience in our water system to sustain socio-economic development, support economic growth, ensure protection of infrastructure as well as the sustainability of ecological systems. One of the major risks facing Johannesburg is the changing climate and weather patterns, which are anticipated to result in increased periods of drought and flooding. This requires that the City implements adaptive measures to ensure that it is better able to withstand these extreme weather events. In addition, remedial actions are necessary to promote more integrated management of water resources. Achieving this, and ensuring the sustainable delivery of water services, requires purposeful action, innovation and collaboration across different sectors.

It is in this context that the City of Johannesburg partnered with the World Resources Institute through the Urban Water Resilience Initiative to identify water risks and vulnerabilities through research, technical assistance, knowledge sharing, and partnerships for collective action. The Urban Water Resilience Initiative offered an opportunity for collaboration with the City of Johannesburg with a key objective being to ensure that the implementation of the Water Security Strategy, and the mainstreaming of the priority actions identified, as well as the integration of the City's Water Resilience Approach (CWRA), to enable the City to better plan for and manage related stresses and shocks to the water system.

On behalf of the City of Johannesburg, the Environmental and Infrastructure Services Department expresses its gratitude and appreciation to the Water Resilience Institute for its support and encouragement, and the invaluable technical assistance it has provided towards ensuring that the Water Security Strategy has real impact as we move forward. We are and is proud to have been part of the Urban Water Resilience Initiative and look forward to mainstreaming and implementing water resilience interventions that have been prioritised in the Johannesburg Water Resilience Profile.

Mr. Tiaan Ehlers

Executive Director: Environment & Infrastructure Services Department

City of Johannesburg

Joburg

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EXECUTIVE SUMMARY

URBAN WATER RESILIENCE IN AFRICA

The World Resources Institute (WRI) partnered with Arup and Global Resilient Cities Network (R-Cities) to deliver support towards building resilience in African cities through the Urban Water Resilience Initiative. One of the six cities identified under the Urban Water Resilience initiative is Johannesburg in South Africa.

In South Africa, the WRI has also partnered with Zutari and the SA Cities Network to assist in the assessment and development of water resilience plans for the City of Johannesburg and Gqeberha, both cities facing significant water-related stress.

The objective of this work is to help city stakeholders better design specific interventions to address their water risks and vulnerabilities in the context of climate change and the urgent need to support sustainable development in African cities.

Climate risks manifested as too much water, too little water and poor-quality water are already affecting people's health and wellbeing, constricting economies, and threatening lives and livelihoods in many countries around the world. As climate risks continue to increase, access to water has become a defining challenge of our times. A recent UN-endorsed projection estimates that the global demand for fresh water will exceed supply by 40% in 2030 due to the combined impact of climate change, urbanization, and population growth. Many cities—including Beijing, China; Buenos Aires, Argentina; Kabul, Afghanistan; and Mexico City, Mexico—may find themselves in situations like "Day Zero" in Cape Town, South Africa. Concurrently, flooding has caused nearly half of all weather-related disasters worldwide since 1995, affecting some 2.3 billion people. By 2050, 800 million people in 570 cities are predicted to be at risk from the impacts of rising seas and storm surges with damage costs of US$1 trillion each year.

Africa is urbanizing rapidly; most cities that will exist in 2050 are yet to be built. Africa's 1.1 billion citizens will likely double in number by 2050, and more than 80% of that increase will occur in cities, especially slums. City leaders in Africa face the converging challenges: extending water and sanitation services for growing populations, managing watershed risks largely outside city jurisdictions and designing for climate resilience.

The COVID-19 crisis has highlighted the urgent need to close the urban services divide more than ever, given that the lack of access to essential services, including water, has exacerbated the challenge of responding effectively to the pandemic.

In order to support sustainable growth for this expanding urban population, it is imperative that African leaders get water management right, adopt good water governance models, balance urban water policy to address socio-economic needs and climate risks, leverage technological innovations, advance water sensitive design strategies and implement integrated water planning to leapfrog and ensure long term urban water resilience.

The World Resources Institute's (WRI) Urban Water Resilience (UWR) initiative works to help cities overcome water challenges through research to illuminate urban water resilience challenges and pathways, create partnerships with cities to enhance capacity and demonstrate solutions, and facilitate collective action to improve enabling environments. This initiative is being led by WRI Africa, WRI Ross Center for Sustainable Cities, the WRI Water Program and partners. Together, these programs and offices provide experience in creating accessible, equitable, healthy, and resilient urban areas for

people, businesses and the environment as well as working with businesses, governments and civil society to ensure a water-secure future by addressing water quantity, quality and governance challenges.

THE CITY OF JOHANNESBURG

Johannesburg is the 'engine room' of South Africa and the most advanced commercial city in Southern Africa with an estimated population of 5.8 million. Johannesburg has grown into a global cosmopolitan city with key connections to Southern Africa, Africa, and the world. It is, however, facing increasing water security and resilience challenges as a result of growing demand, informal development and impacts of climate change.

CITY WATER RESILIENCE PROFILE

This report, Johannesburg Water Profile, provides an assessment of the Johannesburg water resilience. The assessment looked at the city's practices at the time using the City Water Resilience Framework to identify areas of existing strength and weaknesses and establish a baseline against which progress is measured. Subsequently, the report serves as a strategic action plan to build water resilience through the implementation of co-developed actions.

ACRONYMS

AMD	Acid Mine Drainage
CCR	City Characterization Report
CMA	Catchment Management Agency
CoJ	City of Johannesburg
CSIR	Council for Scientific and Industrial Research
CWRA	City Water Resilience Approach
CWRF	City Water Resilience Framework
DRM	Disaster Risk Management
DWS	Department of Water and Sanitation
EISD	Environment and Infrastructure Services Department
GCRO	Gauteng City-Region Observatory
GIS	Geographic Information System
ICT	Information and Communication Technology
JRA	Johannesburg Road Agency
JW	Johannesburg Water
KPI	Key Performance Indicators
NBI	National Business Initiative
NEPAD	New Partnership for Africa's Development
NRW	Non-Revenue Water
O&M	Operation and Maintenance
SACN	South African Cities Network
SALGA	South African Local Government Association
SANS	South African National Standards
SIWI	Stockholm International Water Institute
SWM	Smart Water Management
SWPN	Strategic Water Partners Network
UJ	University of Johannesburg
UWR	Urban Water Resilience
WASH	Water, Sanitation and Hygiene
WRC	Water Research Commission
WRI	World Resources Institute
WSCI	Water Sensitive Cities Index
WSD	Water Sensitive Design
WSS	Water Security Strategy
WSUD	Water Sensitive Urban Design

1

INTRODUCTION

Explaining the focus of this report and providing some context on water resilience drivers at catchment and city scale. Providing an overview of the City Water Resilience Approach and Johannesburg's part in its development and application . Unpacking the steps taken to prepare the water resilience profile for Johannesburg.

CONTEXT

URBAN WATER RESILIENCE

The concept of resilience widely encompasses the ability to "return to a new normal" by effectively coping with negative impacts or rapid-onsets disasters, the ability to adapt to new circumstances effectively, and the ability to accommodate radical shifts. In this context the demand for new concepts, approaches, and guidance on resilience has increased dramatically over the last few years focusing particularly on disaster risk reduction closely linked to infrastructure resilience and climate adaptation. Though the topic has been covered extensively in theoretical studies, outstanding examples on resilience practice in the water sector are rare.

WATER RESILIENT CITIES

In the context of this study, a water resilient city is defined as a city or metropolitan area that: (1) exhibits the capacity to provide access to high quality water and wastewater services for all residents, businesses and industries, (2) protects its inhabitants from water-related hazards while protecting the natural water cycle, and (3) can survive and thrive in the face of water-related shocks and stresses ranging from drought to flooding, storm surges, and sea level rise—and the potential impact of a range of shocks and stresses, not limited to water-related hazards. For example, the recent efforts by the City of Cape Town to improve water resilience through the development of a water resilience plan have also helped in responding to the COVID 19 pandemic.

Integrated urban water management will require alignment between and across many actors, and multiple nested, overlapping, and interconnected urban systems. Therefore, water resilience demands action at a large scale through interventions that meaningfully influence the myriad systems that impact water resource management and service delivery.

Additionally, the natural water cycle does not neatly align with administrative or political boundaries of cities or metropolitan areas, which means that any work conducted in this space requires the engagement of all actors working throughout the larger urban area and the catchment. Because overall city water resilience, water resilience and catchment level resilience are mutually inter-dependent, an assessment of urban water resilience cannot be thought of in isolation from its hydrological context, including the basins, the built infrastructure, and the socio-political and economic 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 context where the city lies. One fundamental challenge for most cities is that water governance functions are often siloed, and there is limited coordination, collaboration and knowledge sharing between actors working in the water system. In planning interventions to build resilience, it is therefore important to identify all stakeholders responsible for making the system resilient and making decisions about what should be made resilient and for whom. New initiatives that build resilience must strengthen existing infrastructure assets and systems, but also address the duplications, overlaps and gaps in the roles and responsibilities of the stakeholders across multiple levels and sectors, in responding to different shocks and stresses.

In addition, any response on the urban scale (though not confined to city limits) must be biased 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.

URBAN WATER RESILIENCE IN AFRICA

The World Resources Institute (WRI) together with the City of Johannesburg, Zutari, South African Cities Network, Arup, and the Global Resilient Cities Network (R-Cities) are working to develop an understanding of water risks and needs to help advance Johannesburg's urban water resilience.

THE CITY OF JOHANNESBURG

As part of the UWR partnership with CoJ, the project team conducting research, Johannesburg City Characterisation Report, and mapped Johannesburg's water systems though the OurWater Tool. The aim of these initial exercises was to provide an appraisal of the water context of Johannesburg. The appraisal includes its natural basin(s), maps key man-made and natural assets, governance processes of the urban water system, and interdependencies with other systems. The report assesses key water and urban policies, programs, plans underway and in development; and identifies development shocks and stresses to develop an analysis of existing urban water resilience challenges facing the city. In doing so, the report provides factors contributing to the resilience of the city water system and those increasing its vulnerability. The following points provide a summary of the appraisal for Johannesburg water systems.

Johannesburg is the "engine room of South Africa" and the most advanced commercial city in Southern Africa with an estimated population of 5.8 million. Johannesburg has grown into a global cosmopolitan city with key connections to Southern Africa, Africa, and the world.

Johannesburg, however, is the only city to be located on a continental divide and is facing significant water stresses due to increasing demands, growth pressure, climate change, lack of basic maintenance and limited financial and technical resources amongst several other challenges.

The CWRA, at its core, helps assess the resilience of the water system in a city and includes upstream and downstream catchment issues. In Johannesburg, it allowed stakeholders to better understand the interlinkages of climate-induced water risk on the water system they depend on, as well as provide guidance on adapting to water-related climate risks.

The outputs from the resilience assessment will allow Johannesburg to alter its development trajectory to adapt to current and future water risks. Together with the pilot cities and other potential cities that choose to implement the CWRA or have implemented the CWRA (e.g. Cape Town, Addis Abba, etc.) the cities will build an initial network of actors to increase ambition to build water resilience in Africa and globally.

KEY SHOCKS AND STRESSES

Urban water resilience is an important prerequisite to creating, not only a resilient city, but also a thriving city. In addition, a water resilient city recognizes that the urban water system it depends on is only one part of several complex, overlapping, and interdependent urban systems. The use and availability of water is impacted by energy supply and transportation networks, and directly affected by land use and waste management practices. Water is essential to economic growth and public health.

Johannesburg faces various several shocks and stresses that could hinder it from achieving its development goals and objectives.

- Key Shocks include increased flooding, failing infrastructure, energy disruption, and theft and vandalism.
- Key Stresses include population growth, environmental degradation, water scarcity, and poverty and inequality.

Johannesburg is a major city not located near a strategic water source and is significantly reliant on surface water from the Integrated Vaal River System that is supported by neighbouring country of Lesotho through the Lesotho Highlands Water Project.

Water demand within the CoJ is rising, while the availability and supply of water is decreasing due to high per capita usage, poor management of infrastructure, and climate change.

Johannesburg's topography, challenges with storm water management, and poor solid waste management leads to severe flooding during rainy seasons, further aggravated by informal housing located in flood-prone areas, increase in impermeable surfaces, and inadequate drainage systems. The combination of climate change and further construction pressures are expected to exacerbate the situation in the years to come. Unable to practice proper hygiene, residents in informal and low-income areas face greater risk of waterborne and infectious diseases.

Above all, there are major governance limitations that hinder participation, cross scale and cross sectoral governance learning and feedbacks, which are important ingredients of building water resilience. The bureaucratic system and the culture of top-down decision-making undermine the local perspective, complex realities of households' livelihood issues, and local adaptation and coping mechanisms, which negatively impacts the local community's and households' resilience capacity and ability to adapt to the future.

CHALLENGES AND OPPORTUNITIES

Based on results from the Assessment Workshops, participants identified nine critical challenge areas confronting water resilience for the City of Johannesburg. From these nine critical challenges, corresponding opportunities were identified that respond directly to these challenges. Under each Opportunity a set of possible actions were identified and one or two of these were priority actions. It is the objective of this study that these priority actions will be taken forward with support from the various partners to assist the CoJ in improved resilience.

Challenge

The following critical challenges were identified:

- Limited urban water asset maintenance
- Inefficient internal governance
- Inadequate external stakeholder engagement
- Slow uptake of digital water solutions
- Lack of resilience planning
- Systemic inequality: Formal vs Informal
- Slow uptake of Water Sensitive Design
- Low utilization of alternative water sources
- Unsustainable funding & finance

Priority Actions

For each priority actions potential resources were identified as well as recommended next steps and key stakeholders and responsibility for implementation.


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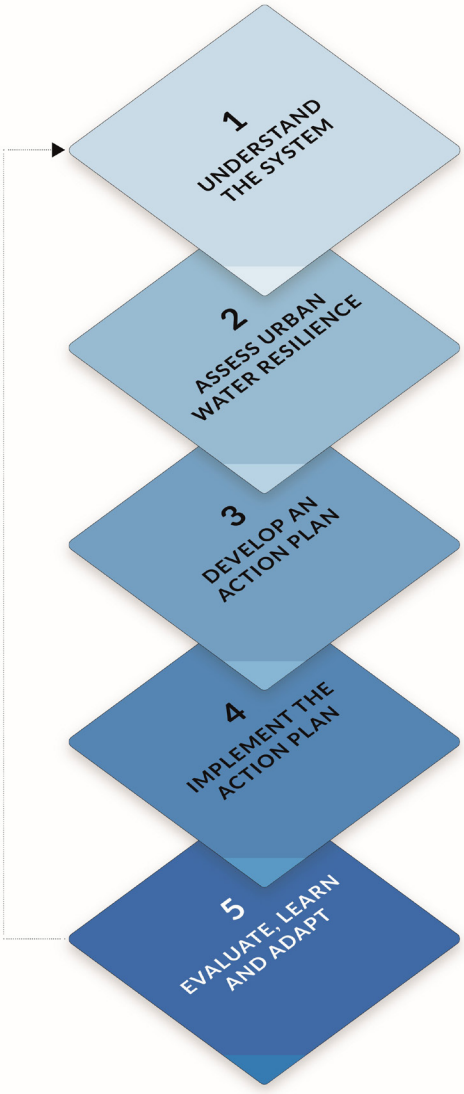
CWRA BACKGROUND

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), Global Resilient Cities Network (R-Cities), the Organization for Economic Cooperation 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 suffer chronic water-related stresses and are committed to co-creating water resilience approaches. The cities represent diverse geographies and face a range of shocks and stresses in a variety of socio-political contexts.



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:

1

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.

2

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.

3

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.

4

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.

5

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.

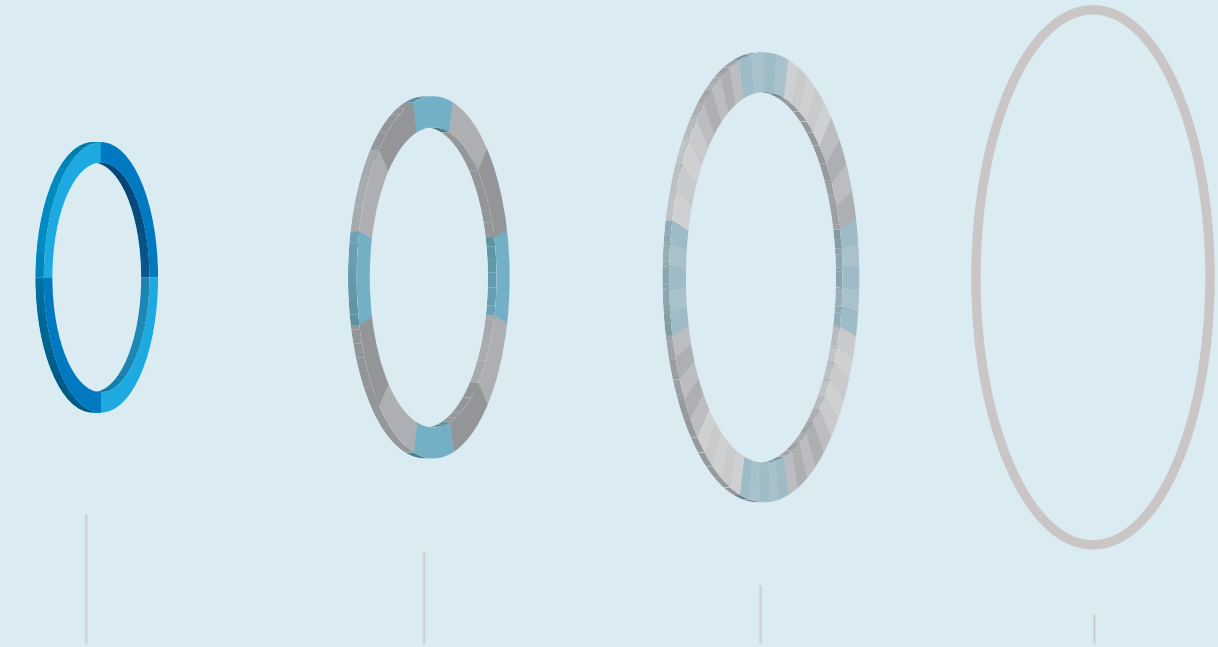
To guide cities through this process, the CWRA offers a suite of resources that target specific challenges identified by cities in their efforts to build water resilience:

- 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 is the primary tool used in Step 2 to assess urban water resilience, and the focal point for workshops conducted in the city.

The CWRF is the primary tool used in evaluating the strengths and weaknesses of an urban water system, and the city's overall resilience to water-related shocks and stresses. Workshops held in GM&B assessed the metropolitan area against a model of water resilience—comprising dimensions, goals, sub-goals, and indicators—that are described in the CWRF.

The innermost ring of the CWRF consists of four **dimensions**, critical areas for building resilience. Within each dimension are the resilience **goals** that cities should work towards to build resilience in that area. Hybrid goals, which are marked in a different colour, refer to goals that can be placed in more than one dimension. Resilience **sub-goals** identify the critical elements for realizing each goal. They provide additional detail and help guide the concrete actions that help realize each goal. Finally, the outermost layer of the CWRF wheel consists of **indicators**, which measure how the city performs according to each area.

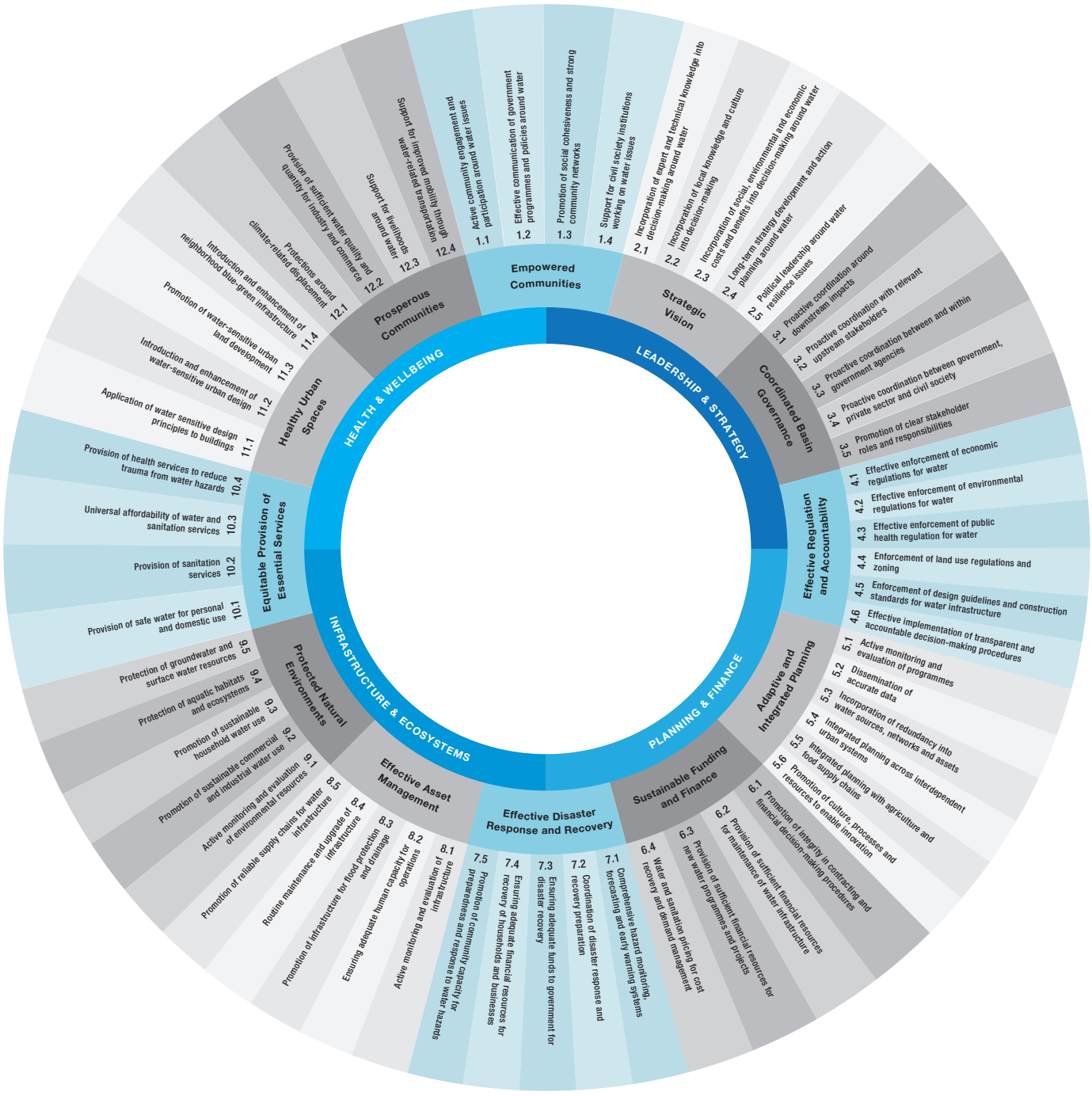
The CWRF can be broken down into dimensions, goals, sub-goals and indicators.



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

(Qualitative and Quantitative)

The City Water Resilience Framework 2021



WORKSHOP METHODOLOGY

This section describes the approach taken to assess water resilience in Johannesburg. Two workshops, one focus group discussion with city stakeholders and several engagements with the Steering Committee assessed urban water resilience in the city and helped identify actions that will promote resilience-building activities.

WATER RESILIENCE ASSESSMENT WORKSHOP

The objective of the assessment workshop was to evaluate the resilience of the city's water system using the City Water Resilience Framework (CWRF). The results informed strategy development and action planning in the Visioning Workshop several weeks later.

STAKEHOLDERS

The Resilience Assessment workshop gathered subject matter experts from all spheres of government, CoJ officials, academia, civil society, and the private sector to participate in round-table discussions focusing on Johannesburg's resilience to water challenges. A detailed stakeholder analysis exercise was undertaken between Zutari, WRI, SACN R-Cities and Arup to ensure that all relevant sectors were engaged in the process.

WORKSHOPS

Two assessment workshops were held virtually in May 2022. The group of stakeholders were divided into six groups each covering two different resilience goals from the CWRF. Each group had a virtual facilitator and a notetaker. Over the course of the two workshops, all the resilience goals and indicators were covered at least once while some were covered twice.

Johannesburg was previously benchmarked against the Cooperative Research Council's Water Sensitive Cities Index (CRC WSCI) and after an in-depth comparison between the two frameworks (WSCI vs CWRF), some of the scores from the previous study were used to inform the discussion of the CWRF indicators where there were significant overlaps.

SESSION OUTLINE

The Assessment Workshop consisted of two sessions:

1. **Introduction to the CWRF** - The session began with a welcome address by Nomvula Mofokeng, Deputy Director: ESID, followed by an introduction by Ondela Tywakadi on the alignment with the City of Johannesburg's Water Security Strategy, an introduction to WRI and the Urban Water Resilience Initiative by Amanda Gcanga and Aklilu Fikresilassie, a summary of the City Characterization Report by Dr. James Cullis from Zutari and a short presentation of the CWRA and the day's agenda by Louise Kennedy from Arup.
2. **Indicator Assessment** – During the second session, participants assessed and cored each of the indicators of the urban water resilience framework.

- Attendees were split into six groups based on their area of expertise and to reflect a range of perspectives in each group.
- The facilitator introduced each new indicator by reading the name of the indicator out loud, then allowing time for participants to read guiding criteria and take notes.

- The facilitator asked each participant to provide an initial score with minimal explanation for why they assigned that score.
- Once all participants had reported, the facilitator encouraged them to explain their scores.
- The facilitator then asked participants to provide a final score and, if the first and second score differed, to reflect on the reason for the updated score.
- Discussion of each indicator lasted approximately 15 minutes. After the last indicator session, facilitators asked participants to provide feedback on the
- workshop process and summarize strengths and weaknesses of the water system based on discussions from the day.

Following the **Assessment Workshops,** facilitators and notetakers convened to reflect on the workshop and compile scores for preliminary analysis. **The scores captured represented the views of all key stakeholders engaged during the workshop and not necessarily the view of the CoJ or of the members of the Project Team.** Through analysis of these results, the project team then developed nine (9) challenge statements that reflected the critical challenges.

These challenge statements formed the basis for the development of a vision and specific actions for improving urban water resilience during the Visioning Workshop.

MEASURING RESILIENCE

Indicators help measure complexity when direct measurement is difficult (or impossible). Responses to indicator questions help identify strengths and weaknesses and measure progress over time.

The CWRA takes a pioneering approach to measuring resilience through collaborative workshops dedicated to discussing qualitative indicators supplemented by quantitative information that provide additional detail and help validate qualitative results. This mixed approach has been adopted because elements of resilience especially those related to water governance, can be difficult to measure quantitatively. For example, a quantitative indicator might suggest whether a long-term strategy exists, but not whether the strategy is a good one or if it has been properly implemented.

The workshop approach adopted under the CWRA allows for a diversity of views on the same subject, gauges general qualitative assessment of system performance and creates an opportunity for stakeholder participation including capacity building and dialogue. This approach also reveals if consensus exists between different city stakeholders on any given topic. The assessment can be conducted over a single week (with additional quantitative indicators gathered later or beforehand) reducing the time and cost associated with the assessment.

VISIONING WORKSHOP

A Visioning Workshop was held virtually on the 22 June 2022, hosted by the UWR Team (WRI, R-Cities, Arup, SACN & Zutari) in collaboration with the City of Johannesburg.

During the Visioning Workshop, participants from the previous two workshops reconvened to develop a vision for water resilience and to identify actions that can be incorporated into future strategies to improve resilience in Johannesburg.

The objective of the **Visioning Workshop** was to define and prioritize actions to improve the resilience of the city's water systems based on initial findings of the resilience assessment. During the Visioning Workshop, the project team presented preliminary results from the Resilience Assessment Workshops back to participants, highlighting key challenges facing Johannesburg.

Responding to these challenges, participants identified areas of opportunity (or **Visions**) for building resilience and then outlined **specific actions** that will help advance these visions.

Eight **challenge statements** were addressed in the Visioning Workshop, however the ninth challenge statement related to **Unsustainable Funding** was addressed in a focus group discussion with specific expert stakeholders.

The eight **challenge statements** that were addressed in the workshop were the following:

1. Urban Water Asset Maintenance
2. Internal Governance
3. External Stakeholder Engagement
4. Slow Uptake of Digital Water
5. Resilience Planning
6. Systemic Inequality
7. Slow Update of Water Sensitive Design
8. Alternative Water Sources

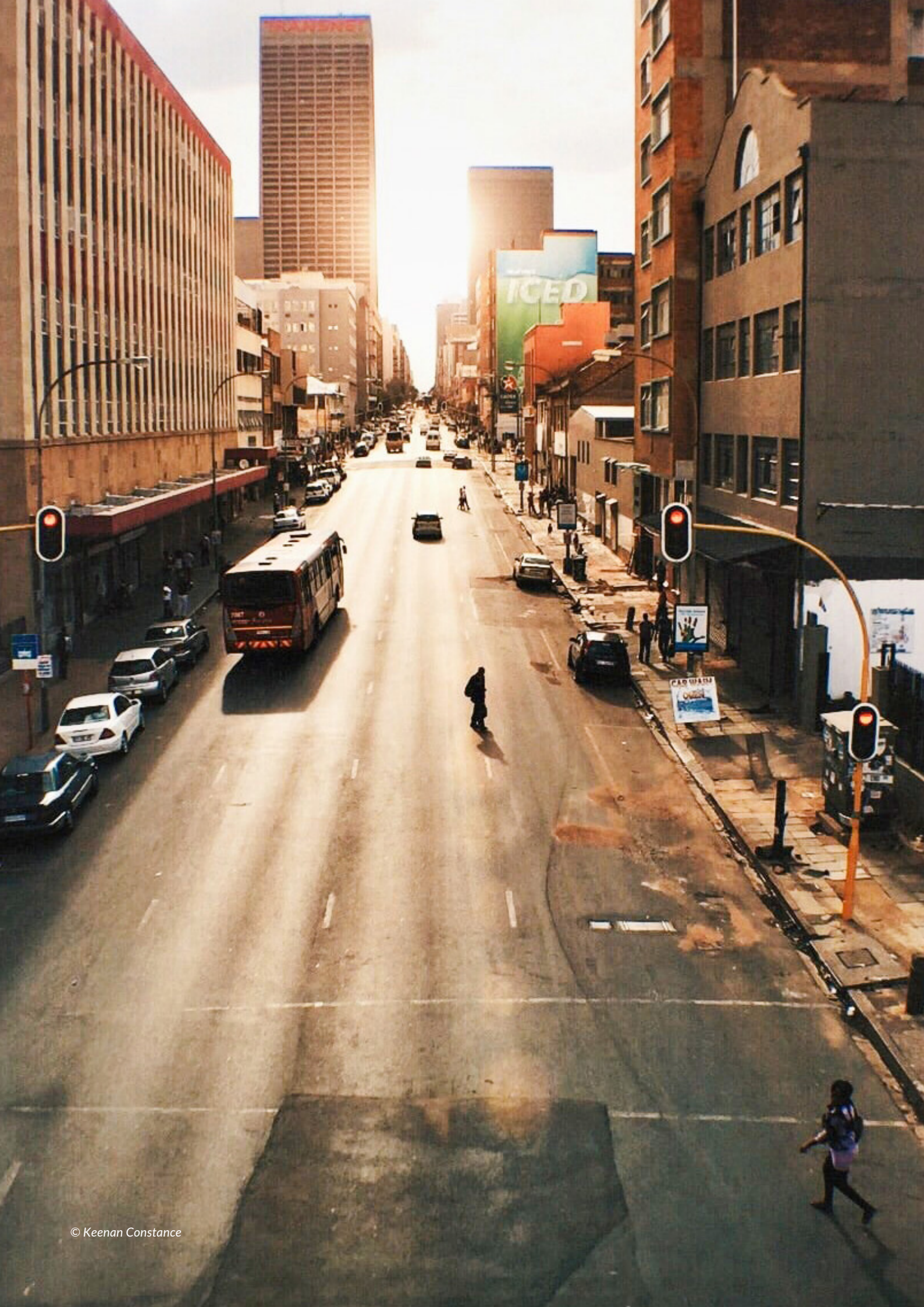
STAKEHOLDERS

Having attended previous sessions, participants were familiar with the project objectives and use of the CWRF "wheel" to identify strengths and resilience vulnerabilities in Johannesburg.

SESSION OUTLINE

The Visioning Workshop consisted of three sessions:

9. **Introduction –** The project team presented conclusions from the Resilience Assessment Workshops, including an overview of strengths and resilience vulnerabilities identified through the assessment. During the introductory presentations, participants were reminded of the diverse shocks and stresses confronting Johannesburg, and they were asked to consider the full range of these shocks and stresses when developing actions to build resilience for the CoJ.
10. **Root Cause Analysis –** Participants were asked to identify critical challenges facing the region. They were presented as Problem Statements developed by facilitators based on the two Assessment Workshops through analysis of CWRF scores and comments provided by workshop participants. Problem statements were also infirmed by the research conducted under the City Characterization Report. From eleven Problem Statements, participants selected nine to deepen root cause analysis.
11. **Solutioning -** Participants were then asked to identify potential actions based on the problems and visions identified in the previous step. The "solutioning" phase was broken down into two stages. In the first stage, participants developed a Design Brief that identified beneficiaries, needs, challenges, assets, and resources available to realize the resilience "vision." In the second stage, participants were asked to identify a specific Proposed Intervention that could help advance the vision. In this, participants were asked to identify the next steps in the short-to-long term, key decision-makers, and the shocks and stresses the action might respond to. Facilitators then presented the Proposed Interventions back to the full group and identified the actions they believed were most important for Johannesburg to pursue. The workshop concluded with a short reflections session that identified ways to improve the workshop and to provide any additional comments that might guide the development of the City of Johannesburg Water Resilience Profile. The proposed interventions were then further



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RESILIENCE ASSESSMENT

This section describes the approach taken to assess water resilience in Johannesburg using the CWRF and summarizes the results. During two interactive online workshops, stakeholders assessed each sub-goal within the CWRF, generating an initial resilience profile along with valuable insights to inform identifying challenges and opportunities.

OVERVIEW OF THE CWRA PROCESS

The Johannesburg Water Resilience Profile and Action Plan builds upon several years of research related to urban water resilience, shocks, and stresses.

Preliminary research was undertaken by the WRI and Zutari teams in consultation with the SACN, Arup and R-Cities to form the basis of the City Characterisation Report. The report can be accessed via this link. Prior to the Johannesburg City Characterisation Report, the team mapped the Johannesburg water systems. The map can be accessed via this link.

The CWRA team (WRI and Zutari) then worked closely with the CoJ to develop the urban water resilience profile for the CoJ based on the results of the assessment workshop and inputs from stakeholders.

The approach used to develop the Water Resilience Profile for the City of Johannesburg is outlined below and is constant with the City Water Resilience Assessment Framework.

An important additional consideration for applying the CWRA to the CoJ was to recognize a previous study that had applied the Water Sensitive Cities Index (WSCI) developed by the CRC for Water Sensitive Cities in Australia and was adapted by Zutari for application in African Cities. The WSCI was applied to the City of Johannesburg in support of the development of the draft Water Security Strategy (WSS) for the City of Johannesburg facilitated by ICLEI Africa. An important first step in applying the CWRA to Johannesburg was to undertake a comparison of the indicators used in the WSCI and the CWRA to identify areas of overlap and where similar scores could be applied. The additional engagements undertaken in support of the development of the WSS helped in providing inputs on key challenges and identification of priority actions for water resilience.

ALIGNMENT WITH EXISTING DRAFT COJ WATER SECURITY STRATEGY (WSS) AND CAP.

The City of Johannesburg has recently developed both a Climate Action Plan (CAP) as well a draft Water Security Strategy (WSS). Both documents contain a list of priority themes and actions that include actions that would contribute to improved water resilience. As part of the identification of actions for building water resilience, similar actions already identified under these existing strategies were reinforced in order to strengthen and support existing policies with additional actions to support improved water resilience for the CoJ. The further alignment with the WSS is needed for implementation.

Figure 1
Goals and Strategic Responses identified in the CoJ Water Security Strategy (WSS)

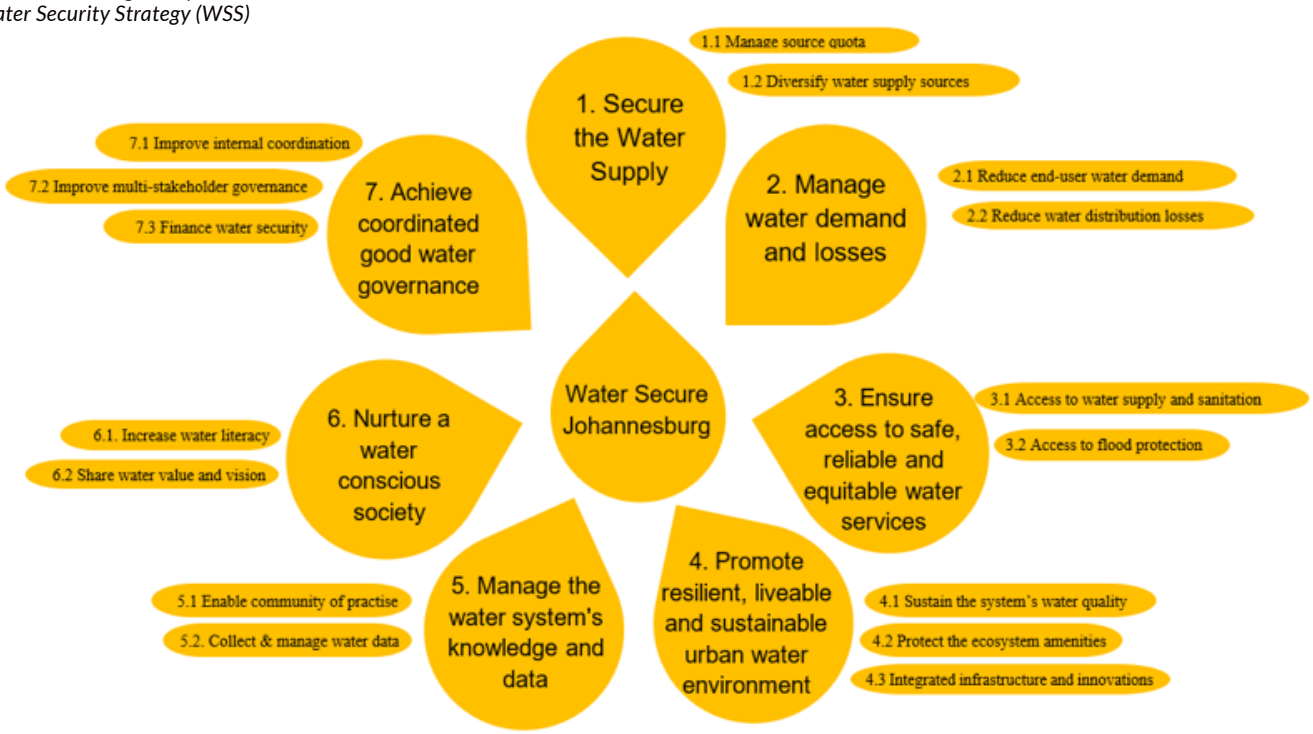
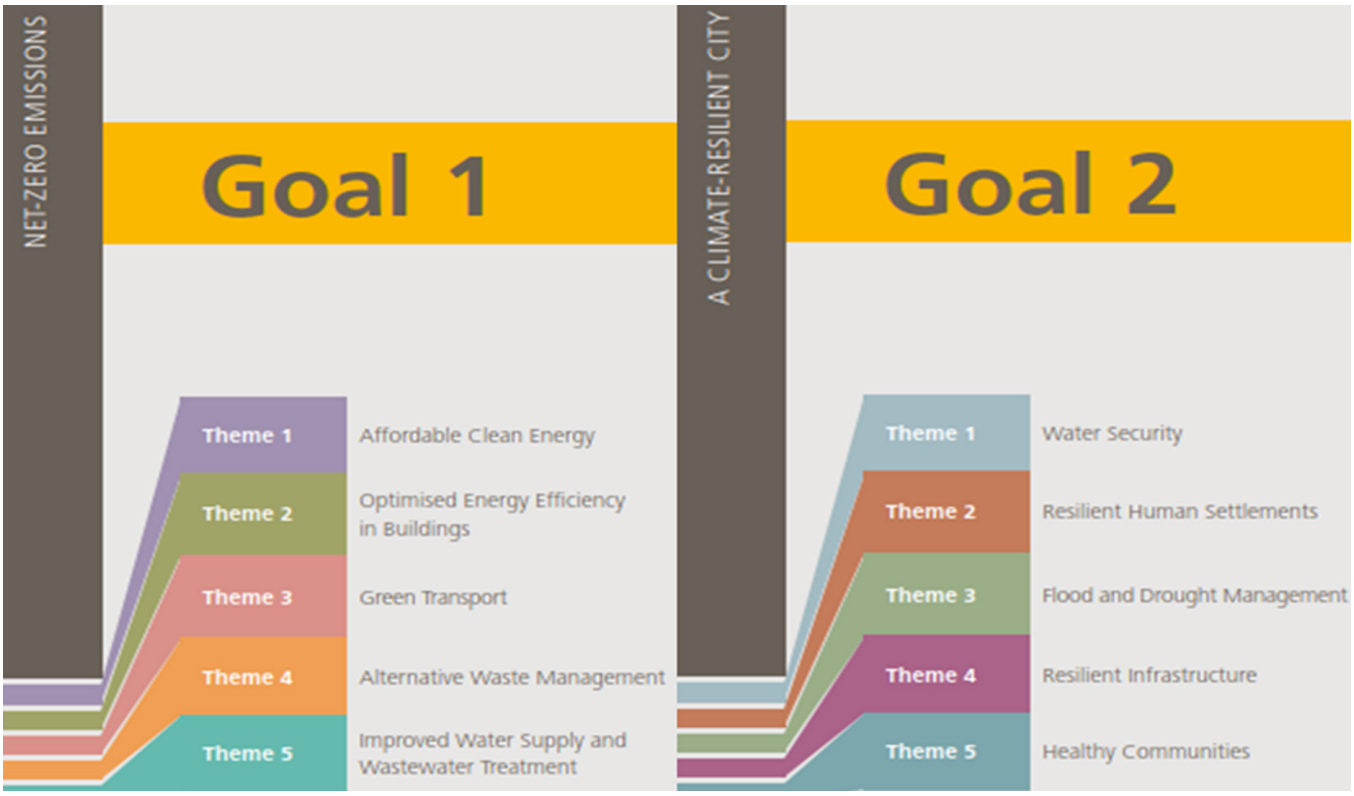


Figure 2

Goals and Key Themes Identified in the CoJ Climate Action Plan (CAP)



CWRA INDICATOR SCORES

Indicators describe the ideal or best-case scenario, and the score provided for each indicator reflects how well a city is perceived by stakeholders to currently perform when compared to the best-case scenario. For example, workshop participants were asked to reflect on whether the statement "a long-term strategy is in place to guide projects and programs that build water resilience over time" accurately describes current practice in Johannesburg.

To help guide discussions, a series of "guiding criteria" were provided to participants at each table. Guiding criteria have been developed for each indicator based on research and expert inputs during the development of the CWRA. The guiding criteria identify important considerations for each indicator and help to establish a common language and frame of reference for workshop participants, who often bring different perspectives, interests, and expertise to the conversation.

Where multiple indicators were required to assess a resilience sub-goal, each indicator was discussed by the group separately. All indicator questions are provided in the following section, organized according to sub-goal.

The color-coded CWRF wheel provides a snapshot of the strengths and weaknesses of Johannesburg's water system and the city's resilience to water-related shocks and stresses. It describes how the system performs against a best-case scenario for each of the 62 sub-goals. The scores for the 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 of the indicators reflect the opinions of individual participants. A strong effort was made to bring together participants with diverse and 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.

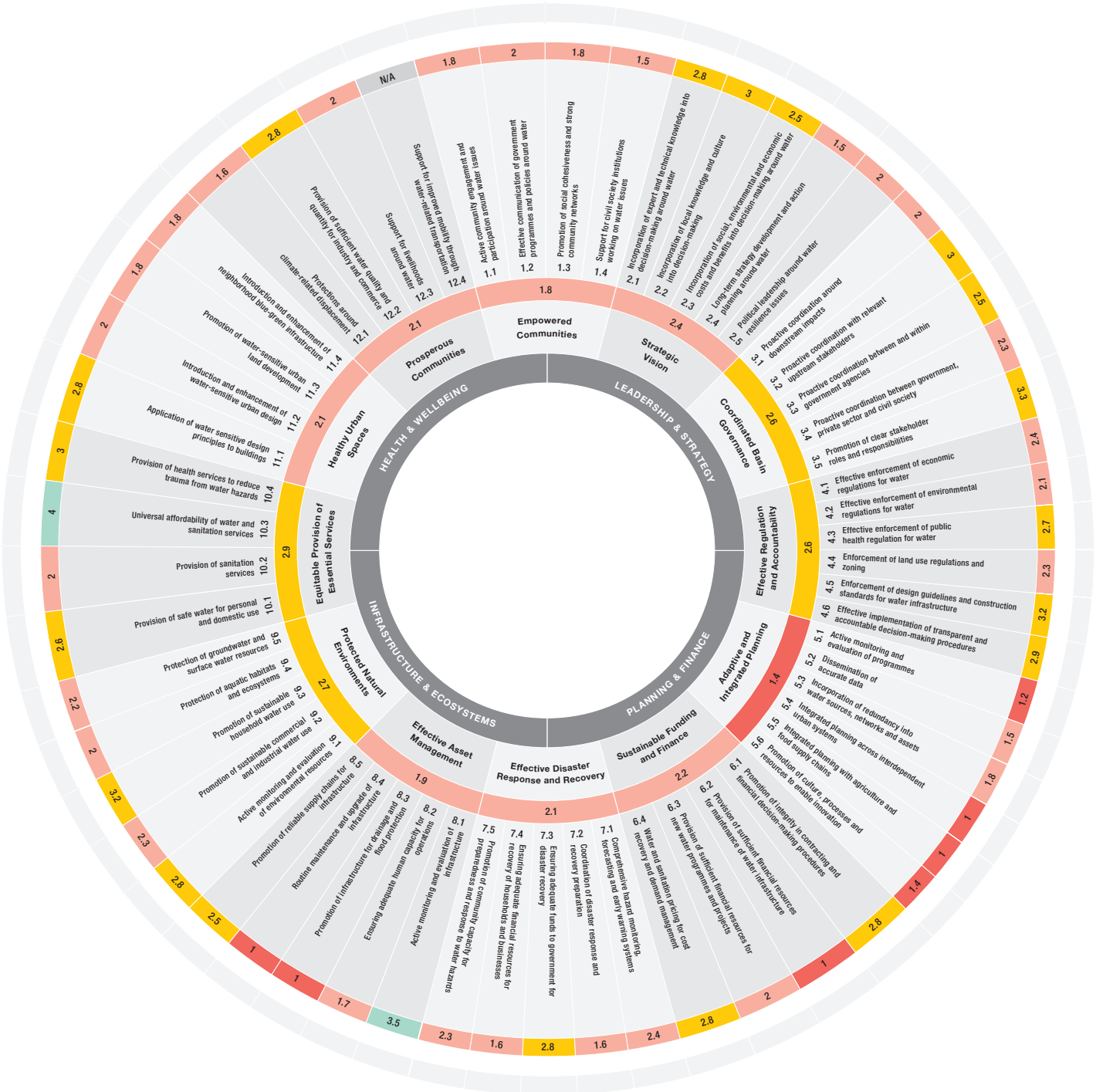
N/A

The indicator is not relevant to the city.

RESULTS OF THE CWRA FOR JOHANNESBURG

The resulting indicator scores for the City of Johannesburg are shown below in the urban water resilience wheel. The results and motivation for each indicator under the four themes of the CWRA are described in the following sections.

The scores and the comments represent the views of all key water stakeholders as captured during the workshop and not necessarily the view of the CoJ or of the members of the Project Team. Where external stakeholders did not have sufficient information on a specific topic for scoring and commenting, relevant CoJ officials were engaged during follow-up sessions.



The City Water Resilience Framework qualitative scoring for Johannesburg, 2022

LEADERSHIP & STRATEGY

COMMENTS AND OBSERVATIONS

Leadership around water resilience is generally fragmented and siloed between and within different government organizations and key stakeholders.

Improved urban water resilience is a critical part of the Joburg 2040 Growth and Development Strategy, as well as the Climate Action Plan (CAP). Recently the CoJ has also develop a draft Water Security Strategy with several actions already identified for improving water security. While these documents are all related to helping to improve urban water resilience, they do not cover all the necessary aspects and there is also a need to further strengthen them for implementation.

The CoJ is subject to a complicated governance structure with National Government, Provincial Government, Local Government, and its state-owned entities all having different and potentially overlapping mandates. This has a negative impact on coordination between stakeholders necessary to achieve resilience. The CoJ also covers to different Water Management Areas (WMAs).

This is further complicated by Johannesburg's growing water demands due to rapid population growth and urbanization, informal developments, inequality, and the impacts of climate change.

Political instability at local government level is also a major challenge for improving water resilience.

While the roles and responsibilities for different entities along the water cycle are clearly defined, there is a lack of collective responsibility across the full water cycle, including responsibility to both upstream and downstream stakeholders.

There is some recognition for the role of civil society groups, but there is little proactive community engagement or communication with representatives or residents of the CoJ.

Forums exist for addressing critical aspects of resilience, such as the Integrated Vaal River System steering committee, facilitated by the national Department for Water and Sanitation. However, they are usually not attended by all the relevant stakeholders and do not appear to be effective in supporting decision making and implementation of projects that will improve water resilience for the CoJ.

Hence it is necessary for the CoJ to become a more active and informed member of these forums in order to be able to help inform and to hold the other government agencies accountable for helping to improve urban water resilience.

Within Johannesburg, while some data is being collected, there are challenges around the sharing and dissemination of information within and between government agencies as well as with external stakeholders. There is also a need to improve data collection and develop appropriate digital decision support systems (DSS) for CoJ.

The City also needs to build a better framework for sharing information with the wider community to improve engagement, to build trust, and to foster collaboration and support for resilience.

While there is an acknowledgement of the need to incorporate a holistic view of resilience into planning and implementation across the whole of CoJ, there is a lack of universal agreement, action, and effective application of resilience principles.

For example, there is no official City Resilience Officer, dedicated resilience office, or mandate within the City of Johannesburg to drive the mandate across all departments. While individual departments, such as EISD, are emerging as the champions for resilience across the CoJ, they often lack the support from high levels necessary for successful implementation and coordination across multiple departments as well as with national government and other stakeholders.

EMPOWERED COMMUNITIES

1.1 Active community engagement and participation around water issues

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

Various legal frameworks exist to support community engagement and participation, but they do not work within the existing infrastructure. There is an overall poor effort in terms of legal and institutional frameworks within the water sector to support marginalised communities. There is also a general lack of willpower amongst current stakeholder organisations (public and private), and financial incentive hinders this further. While there may be a few stakeholders interested in engaging the City, institutional processes do not allow efficient processes. To achieve the appropriate amount of community engagement and participation will initially require high investments and time to plan how best to be inclusive for the current system.

1.2 Effective communication of government programmes and policies around water

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The government shares information which is necessary during operation and maintenance of infrastructure as well as during natural disasters (i.e., intermittent supply warnings, infrastructure upgrades). However, the City has not been able to sufficiently consider involving wider communities in the decision-making processes to better understand existing issue. There is no clear definition of what a sufficient mechanism looks like to ensure that information is disseminated. Furthermore, there is no clear definition as to whom the receiver of such information should be.

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-organise and act collectively in times of need

QUALITATIVE SCORE:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

The challenges of water are generally symptoms of another problem. Community participation requires a certain level of knowledge, awareness and understanding to provide constructive and relevant feedback; this relates back to the issue of power dynamics. Varying levels of empowerment influence different platforms of dissemination where active speakers, or more knowledgeable speakers, may overshadow others and result in a lack of cohesive inclusion. There is a degree of public participation, but this is often politically aligned and thus not all voices are heard. There are a number of active programmes in place that educate low-income communities on how to conserve water, which highlights a big disconnect when in fact stakeholders should be learning from communities. A top-down and bottom-up approach is critical for building resilience in the water system.

1.4 Support for civil society institutions working on water issues

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

1.5

SUMMARY OF ROUNDTABLE DISCUSSION:

A paradigm shift in the water sector is needed where the role of community participation should be clearly defined. 'Civil society groups' is too broad a term in this context, as it includes academia, charities and vulnerable communities in the same bracket. Currently, the power dynamics place the private sector as leaders in providing support to civil society institutions. There is a need for reframing the public/private dynamics in such a way that promotes inclusivity and participation of various community groups in an effort to empower them. With little to no intention for meaningful engagement, hard infrastructure only services 'well structured' societies, which represent less than half of the inhabitants of Johannesburg. 'Less structured' groups are defined as poor, black communities who lack funding and resources and generally are not given the platform to input and engage in working on water-related issues. This further creates a behavioural issue and lack of care towards interactions with water.

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:

2.8

SUMMARY OF ROUNDTABLE DISCUSSION:

The CoJ has very good technical expertise in the traditional engineering field and is seen as one of the best in comparison to other cities in Africa. However, this is for conventional engineering expertise and even in terms of traditional engineer capacity there is a shortage. There is also limited technical knowledge on planning for resilience and around holistic water resilience. Water-sensitive urban design principles have not been adopted or implemented even though they have been discussed for years. The SmartCity program does not consider water in their planning process, and it is just assumed that water will be made available. The CoJ still does not have an online system for water-related information capturing. There is a need to improve technical knowledge on a strategic, operational and management level.

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:

There is a willingness and regulated process for local knowledge to be integrated into decision making. However, engagement with local communities is largely done as a tick-box exercise that has little impact on planning. Local actors often do not have agency to impact change, and few people understand the nature of the water supply and sanitation systems of Johannesburg. If people cannot link their actions to the impacts that high water use and pollution have on the environment and socioeconomic fabric, they are less likely to manage their water effectively.

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 issue

QUALITATIVE SCORE:

2.5

SUMMARY OF ROUNDTABLE DISCUSSION:

In decision making, there is an understanding of the importance to incorporate social, environmental, and eco- nomic costs and benefits into decision-making around water. However, the indicators should distinguish between incorporation and implementation (for example, the water conservation guidelines and standards were drafted 20 years ago however, they are yet to be implemented). Local communities are not being sensitised on the business of water and why it is important to take care of water sources. The city has particularly been struggling to keep up with educating citizens on water in the mushrooming informal settlements where pollution is having social, environmental, and economic impacts downstream.

2.4 Long-term strategy development and action planning around water

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

1.5

SUMMARY OF ROUNDTABLE DISCUSSION:

In Johannesburg, conventional engineering solutions dominate the decision making for water supply, with limited consideration for alternative approaches that could provide long-term resilience solutions follows a very consumptive model where short-term engineering solutions are used to manage risk. The only long-term supply options for the CoJ are expensive alternative water sources or behaviour change (CoJ has a much higher water demand than similar cities), but these are typically not included in long-term planning. Long-term plans quickly become outdated as they are drafted with the current view in mind, and changing dynamics make it difficult for the municipality to implement them effectively.

2.5 Political leadership around water resilience issues

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The CoJ's political situation is constantly changing, and over the past few years CoJ has had five different mayors in power. Every time political leadership changes, the goals change and long-term plans change. The city is very close to running out of water, there is no resilience in the water system, and its catchment depends on water transfers from neighbouring countries and catchments. Yet the current premier of Gauteng Province makes promises about developing Gauteng without first ensuring that there is adequate water supply. Additionally, there is no political leadership to advocate for alternative water sources.

3 COORDINATED BASIN GOVERNANCE

3.1 Proactive coordination around downstream impacts

› QUALITATIVE INDICATOR:

Coordination between city stakeholders and relevant downstream stakeholders minimizes downstream impacts

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Entities like Catchment Management Agencies facilitate stakeholder engagement, however communication and coordination between the city and downstream stakeholders are currently poor. There is very little management for outcome or joint action planning to motivate for improved water quality results, as well as a lack of policies and support to follow through with the necessary solutions. A major area of concern is coordination around addressing downstream water quality and flooding impacts with each municipality only taking account of the direct impacts within their jurisdiction. The specific mandates for the different stakeholders are not conducive to developing holistic solutions that build resilience in the basin.

3.2 Proactive coordination with relevant upstream stakeholders

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Coordination between upstream water users is facilitated by the Department of Water and Sanitation (DWS) and Rand Water, however, there is a lack of coordinating functions and assistance for municipalities. Downstream water users are particularly reliant on wastewater flows from the northern wastewater treatment works impacting the CoJ's ability to re-use its own effluent. This is regulated by the DWS who is required to provide approval of quantities before the CoJ can reuse treated effluent within its jurisdiction.

3.3 Proactive coordination between and within government agencies

› QUALITATIVE INDICATOR (3.3A):

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

QUALITATIVE SCORE:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

There are mechanisms in place to encourage coordination between and within government agencies, but the different government agencies/department still tend to work in silos. There is a lack of cooperative governance and incentives to ensure joint planning and priority setting. This may be due to the void of appropriate KPIs within government agencies. Another significant factor is the role of political influence on the coordination mechanisms between government agencies. A critical forum for engagement between government departments is the Integrated Vaal River System (IVRS) co-ordination meeting.

3.4 Proactive coordination between and within government agencies

› QUALITATIVE INDICATOR:

Framework and mechanisms promote dialogue and deliberation around water and resilience issue between government and non-government actor

QUALITATIVE SCORE:

2.3

SUMMARY OF ROUNDTABLE DISCUSSION:

The CoJ's political situation is constantly changing, and over the past few years CoJ has had five different mayors in power. Every time political leadership changes, the goals change and long-term plans change. The city is very close to running out of water, there is no resilience in the water system, and its catchment depends on water transfers from neighbouring countries and catchments. Yet the current premier of Gauteng Province makes promises about developing Gauteng without first ensuring that there is adequate water supply. Additionally, there is no political leadership to advocate for alternative water sources.

3.5 Promotion of clear stakeholder roles and responsibilities

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

3.3

SUMMARY OF ROUNDTABLE DISCUSSION:

Each government entity has defined roles and responsibilities in terms of providing water and sanitation services, but it is not clear if these roles include planning for and building towards resilience outcomes. Roles and responsibilities are defined related to provision of water supply and sanitation services through traditional supply concepts and based on a clear distinction between water supply, sanitation, and stormwater management. Responsibilities are defined and allocated to different stakeholders, each with their own performance requirements which results in a siloed approach causing issues to address challenges through a holistic and integrated approach. Laws and policies need to be better aligned with the water resilience approach to improve the allocation of roles among stakeholders. In addition, there needs to be improved accountability for delivering on the responsibilities, particularly for government agencies.

PLANNING & FINANCE

COMMENTS AND OBSERVATIONS

The City of Johannesburg faces numerous planning, development, organizational, and financial challenges, impacting the provision of basic services and the infrastructure's ability to deal with shocks and stresses. Despite various institutional reforms that have been initiated over the two decades since the end of apartheid to better define roles and responsibilities in the water sector, more needs to be done to improve integrated planning and to avoid conflicting mandates.

Although the city has a disaster risk management (DRM) and strategic planning framework that can serve as a guiding document for decision-making regarding the design and implementation of DRM related plans and programs, it is not effectively implemented. In addition, there are currently few regulatory tools that can be used to establish responsibilities, plans, and priorities in a coordinated manner with the participation of all actors. Decision-making is generally top-down, without a robust human-centric approach and driven by political agendas.

Water resource management is not considered a priority for the city because the city receives bulk water from Rand Water, a regional water utility. Industries are subject to pollution regulations; however, the city suffers from acid mine drainage (AMD), a by-product of past mining exploits that continue to pollute the environment and contaminate groundwater.

Land use regulations exist, and officially high-risk areas are excluded from development however this is under consistent pressure as a result of population growth and urbanization with many communities continuing to live in unsafe areas.

A critical component of adaptive and integrated planning is the availability and use of accurate, up-to-date data and information. Existing spatial planning data is limited and is rarely cross-referenced, leading to differing figures and statistics. Where there are pockets of data, data analysis, monitoring systems and using data to better inform decision making is largely absent.

The city is highly reliant on utility revenues to cover its expenditure. The city has continually had issues with funding due to poor debt collection and an inability to structure and introduce a cost-recovering (ring-fenced) tariff model as a result of political agendas. The city needs to further enhance its capacity to increase municipal revenues to meet the growing demand for urban infrastructure and services fuelled by rapid urbanization. Foreign loans and grants take a long time to come into effect and are usually channelled to new infrastructure rather than maintenance or upgrading of existing assets.

Current tariffs for water are generally low and highly subsidized and do not cover the full O&M, let alone capital costs creating a funding backlog.

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:

2.4

SUMMARY OF ROUNDTABLE DISCUSSION:

Rules, norms, and standards for water allocation and regulations are in place but are not consistently enforced nor put into practice and there is limited accountability. Although there are guidelines available from DWS, they are not legislated or enforced, regulation is weak and there is a need for an economic regulator.

4.2 Effective enforcement of environmental regulations for water

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

2.1

SUMMARY OF ROUNDTABLE DISCUSSION:

It is unclear in many respects who is responsible for ensuring water quality standards are met, but it is suggested that there should be a shift towards more integrated management of water and environmental systems. This will make enforcement of environmental regulation easier. Water and environmental management are considered less important than social and economic development issues and are therefore lower on the priority list. There is a lack of monitoring and evaluation which prevents effective enforcement. Catchment responsibilities are fragmented and not managed in an integrated manner where different levels of government have different responsibilities related to different types of infrastructure.

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:

2.7

SUMMARY OF ROUNDTABLE DISCUSSION:

This indicator incorporates both water and wastewater, which participants would want to score separately, with water supply being scored much higher than wastewater. There are no significant health-related issues with Joburg Water and there is a good integration between the water and health department. The poor Green Drop score s, however, shows that there are challenges associated with wastewater management and the failure of wastewater treatment plants and sewerage systems in general is a major concern and a significant contributor to poor water quality in downstream environments.

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:

2.3

SUMMARY OF ROUNDTABLE DISCUSSION:

Johannesburg is prone to significant urban growth and expansion due to population growth as well as internal and external migration which impacts infrastructure planning and service provision in general. There are services available for those in formal areas and who can afford to pay for water, but not for those who cannot afford to pay, and underserviced areas are synonymous with impoverished communities.

In terms of development, there is a gap between development plans and availability of water which has already been over-allocated in most catchments in South Africa including the Vaal Catchment. The Spatial Planning and Land Use Management Act (SPLUMA) should be aligned with water resilient by identifying and prioritising natural resources such as rives and wetlands that can help in reducing flood and water security risks. The growth and persistence of informal settlements in flood prone areas is a critical area of concern.

4.5 Enforcement of design guidelines and construction standards for water infrastructure

› QUALITATIVE INDICATOR:

Technical standards and design guidelines define best practices for critical infrastructure

QUALITATIVE SCORE:

3.2

SUMMARY OF ROUNDTABLE DISCUSSION:

Johannesburg Water reviews and enforces design guidelines and best practices for water supply infrastructure. The City has a concern with ageing infrastructure that may no longer meet the required design standards. New infrastructure typically meets the required design criteria.

4.6 Effective implementation of transparent and accountable decision-making

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

2.9

SUMMARY OF ROUNDTABLE DISCUSSION:

A lack of dissemination of knowledge relating to water security, resilience and sustainability is an area of concern. While the information related to water resources does exist, it is not always accessible and easy to understand, and people are generally not interested in water source related information. The array of stakeholders with access to information is narrow, and it is difficult to provide information specifically targeted to reach indigent consumers which are persons who have no visible means of income, or whose income is insufficient for family subsistence, as identified by the Department of Social Welfare and Development (DSWD), based on specific criteria. A bottom-up approach is required to engage, reach and involve indigent consumers to make them part of the decision-making process.

5 ADAPTIVE AND INTEGRATED PLANNING

5.1 Active monitoring and evaluation of programmes

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

1.2

SUMMARY OF ROUNDTABLE DISCUSSION:

Overall, monitoring programs for water resources are not clearly defined and thus monitoring programmes are seldom existent or not executed. Monitoring programmes are included in a project's scope, however they are the last 'task' and are not always followed through. In terms of policies, to ensure frequent monitoring, these do exist but are poorly implemented and not prioritized due to a lack of resources.

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:

1.5

SUMMARY OF ROUNDTABLE DISCUSSION:

Data often exists across a number of systems, although little to no data analysis is done to better use and optimise this data to improve maintenance and/or upgrade infrastructure and services. There are limited mechanisms in place to collect, update and process data, meaning the data and information are often out of date and unreflective of the current state of infrastructure systems. Collected data also does not reach relevant stakeholders allowing them to make informed decisions. Decision-makers and key stakeholders infrequently receive data, due to it being retained within a specific institution (i.e., Joburg Water). This is amplified by a lack of definition of the roles and responsibilities across the water system, with stakeholders currently operating in silos. Furthermore, many organisations lack capacity and resources to collect, process, and analyse data on the current infrastructure.

5.3 Incorporation of redundancy into water networks and assets

› QUALITATIVE INDICATOR (5.3A):

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

QUALITATIVE SCORE:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

Water and sanitation infrastructure across Johannesburg is in need of rehabilitation and upgrading primarily as a result of aging infrastructure and growth exceeding the current capacity. This results in no capacity to deal with shocks on the current infrastructure such as pipe bursts and sewage spills. Additionally, there is a lack of technical resources and funds to accommodate such shocks because programmes are not built to respond to crisis.

Rapid urbanisation has caused city planning to focus on densification while infrastructure upgrading has not kept pace with the existing system failing to meet the needs of the current population. The lack of coordination between organisations intensifies the effect of misaligned city planning and budgeting for the water sector. Funding is available within Rand Water, however it is unclear where the funds are directed.

› QUALITATIVE INDICATOR (5.3B):

Redundancy exists in the sources that supply water to the city

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The current water supply system is under strain with a moderate to high failure rate and extreme reliance on Rand Water's infrastructure for bulk water supply. Current water demand exceeds water availability and Joburg's water supply system is dependent on augmentation from the Lesotho Highlands Water Project Phase II which aims to transfer water to Gauteng province and improved water conservation & demand management to reduce water consumption and demand. Water supply is highly dependent on surface water. The current water supply system was designed without redundancies which poses a high risk if failures or breakdowns occur. There is a need to diversify supply options and to reduce the city's dependency on surface water supply. However, the City faces challenges with contaminated groundwater due to acid mine drainage and wastewater reuse is also limited as downstream users are dependent on effluent return flows.

5.4 Integrated planning with across interdependent urban systems

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

1.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There is a general lack of coordination amongst stakeholders involved in the water sector. This is amplified by lack of co- ordination within organisations themselves, with many individuals working independently within their organisations. Such individuals have been specialists in their fields for many years, applying sound theoretical practises to individual programme areas with little considerations of system interdependencies.

The current infrastructure system was implemented before and during apartheid. It was designed to mirror western systems. These systems have not been significantly upgraded since and do not accommodate for the South African context. There is a need for more context specific guiding criteria to meet the needs of water users. Consideration of soft infrastructure defined as services required to maintain the economic, health and social needs of the population plays a critical role to ensure long-term sustainability, but is often overlooked. The national spatial framework legislation was written in an effort to better coordinate stakeholders across city planning and was finalised in 2019. Unfortunately, it has still not been signed off.

5.5 Integrated planning with agriculture and food supply chains

› QUALITATIVE INDICATOR:

Coordination exists between water agencies and organisations involved in food supply and production

QUALITATIVE SCORE:

1.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Across the food and agriculture sectors, specifically food supply and production, stakeholders interact independently from stakeholders in the water sector. Rand Water's involvement in food and agriculture is limited, with little to no communication and coordination between relevant stakeholders and institutions.

Currently, food consumption is higher than food production in the region and areas around the city Stakeholders agree that the city should focus on policy and urban planning that allows for better and enhanced urban agriculture opportunities within the City of Johannesburg and Guateng. Smart food production and distribution can improve food security which is directly linked to water security taking vulnerable groups, rising temperatures, diseases, food availability and affordability into account

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:

1.4

SUMMARY OF ROUNDTABLE DISCUSSION:

Overall, there are both funds and skills needed to enable a culture of innovation within the water sector, however a lack of policies and favourable conditions hinder partnerships and creativity. With no real incentives or encouragement to enhance coordination, a culture of innovation is difficult to encourage or implement. To build urban water resilience, the City of Johannesburg requires as much investment in human resources and soft skills as it does in engineering and hard infrastructure, specifically changes in human behaviour and lifestyle towards more interactions with water. This also applies to the water users in the city.

The public sector currently does not appear to value coordination and integration of different disciplines to encourage and develop a culture of innovation in the sector but rather sees it as a threat and disturbance to current programs that are being implemented. Increased integration between stakeholders and support for innovation (including NGOs, the private sectors, and accademia) could support the exploration and testing of new creative solutions and promote innovation in the water sector.

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:

2.8

SUMMARY OF ROUNDTABLE DISCUSSION:

The CoJ has financial procedures in place that promote transparency, minimise risk and ensure that procurement processes are implemented fairly and efficiently. However, there is room for improvement particularly around timely access to information for all, quality of service provided by the city in responding to queries, and a better coordinated approach for dealing with contractual processes.

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

› QUALITATIVE INDICATOR:

Adequate funding exists to maintain water and sanitation infrastructure and to support existing programmes

QUALITATIVE SCORE:

1.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The City of Johannesburg has currently reflected poorly on the provision of sufficient financial resources for the maintenance and upkeep of water infrastructure, with the available budgets often significantly lower than what is required to address the current maintenance backlog let along for new infrastructure. Key contributors are the limited available financial resources as well as limited availability of funding. The city needs to explore alternative funding sources as means to build sustainable finances. There is also a need for greater transparency on how water and sanitation funds are allocated to the different programs. Lastly, the city's regulation environment needs to be more flexible to allow for diversity in financing options.

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

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There is limited funding to finance new capital projects and programmes that support water resilience for the City of Johannesburg. As such, significant improvement is required. Opportunities exist in terms of alternative funding sources and mechanisms, particularly in collaboration with the private sector that could be explored. Water conservation and demand management also offers great opportunity to lower demand and reduce the demand for large capital investments in new infrastructure and alternative water sources . The grey-green infrastructure options need to be carefully and equally considered by the city. However, there is bias towards grey infrastructure in the name of efficiency which leads to missed opportunities for building water resilience by investing in green infrastructure as well as new technologies, innovation and solutions.

6.4 Water and sanitation pricing for cost recovery and demand management

› QUALITATIVE INDICATOR:

Water tariff systems are sustainable and equitable

QUALITATIVE SCORE:

2.8

SUMMARY OF ROUNDTABLE DISCUSSION:

The tariff system for water and sanitation requires some improvement to become more sustainable and equitable. This could be done in several ways. Mainly, improving transparency in the tariff calculation model, improving the tariff collection system to ensure that all users pay (access to information), and ensuring equitable costing of water from different water users. Rethinking and being more innovative when considering sustainable revenue collection models as well as its cost recovery approach for water is key, particularly for low-income and indigent households. There is an opportunity for the city to give greater focus to water conservation and demand management, particularly NRW, to reduce input costs. Lastly, while the tariff system is a regulatory one, the city has an opportunity to also develop a culture that promotes behavior change through information and awareness raising that results in reduced water use.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INFRASTRUCTURE & ECOSYSTEMS

At present many key water infrastructure assets are at risk of failure due to challenges with rehabilitation and maintenance. To address these risks, asset maps need to incorporate lifecycle information and donors and national governments need to integrate O&M costs while funding new infrastructure projects.

While water supply and sanitation networks are mapped, drainage assets are not adequately mapped, challenging proactive management and planning for water resilience. A stormwater manual has been developed recently but is yet to be implemented. Further coordinated action is required between agencies to mitigate cascading impacts such as a lack of solid waste management that contributes to the blocking of drainage channels resulting in flooding which also contaminates the water supply.

Resources are often wasted due to poor coordination between different agencies. In addition, supply chain related risks need to be mapped and communicated to national governments for support in addressing fluctuations, volatility and restrictions associated with international purchases. The city also faces a shortage of staff skilled in operations.

Although there is a department responsible for coordinating disaster risk management, the city relies on a national Early Warning System that is not very accurate or reliable. Due to lack of technical capacity and funding to proactively model and assess level of risk and exposure to water hazards, the city is unable to take proactive measures to adapt to future risks. There is a provision for funding post-disaster recovery, but it is not easily accessible. The city has a poor relationship with and does not engage with vulnerable communities to have efficient mechanisms to disburse recovery funds directly to such communities. The private sector is more active in this respect.

Appointment in management and leadership positions at agencies need to consider minimum levels of technical and management qualifications to help improve technical capacity and delivery.

At present environmental resources are not well protected due to development pressure and growth. Efforts to protect aquatic life are considered second to protecting human health though these issues are linked. In recent years, riverbank protection and restoration have garnered new interest but attention needs to be put in order to create community buy-in and strong implementation and monitoring pathways for these projects to be successful. Further, standards for water use and disposal need to be created and widely communicated to users.

Investing in Nature Based Solutions is becoming better supported in cities across the world and the CoJ could benefit from these investments. There are already several examples of the application of NbS as part of Water Sensitive Design case studies and there is a growing community of practice led by the Future Water Institute from the University of Cape Town. The CoJ already invests in the clearing of invasive alien plants from some of its catchment areas, but these requires additional funding and support.

Investing in protecting the catchments of the Integrated Vaal River System (IVRS), including in the Lesotho Highlands, is essential in reducing the risk to water security, but traditionally this is considered outside of the area of interest for the CoJ. Examples such as the Greater Cape Town Water Fund, in Kenya and in the Mgeni Catchment show how cities in Africa should be investing in the catchment areas outside of the traditional city borders.

Universities partnership can help create long-term mechanisms for collecting quality data to support monitoring of environmental resources.

EFFECTIVE DISASTER RESPONSE AND RECOVERY

7.1 Comprehensive hazard monitoring, forecasting and early warning systems

› QUALITATIVE INDICATOR:

Monitoring, modelling and early warning systems mitigate hazard risks

QUALITATIVE SCORE:

2.4

SUMMARY OF ROUNDTABLE DISCUSSION:

Hazard assessments are conducted every financial year but not communicated to vulnerable areas neither is there any forewarning when it comes to flood events. Infrastructure is not adequately monitored and although there are planning systems in place, very little is done in terms of action. Instead of having a city-scale Early Warning System, the CoJ relies on a national one that is not well operated.

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:

1.6

SUMMARY OF ROUNDTABLE DISCUSSION:

Disaster response and recovery is well coordinated; however, Joburg Water lacks the funding to ensure business continuity post disasters. Procedures are current and collaborative, however implementation is not well coordinated and delivered.

7.3 Ensuring adequate funds to government for disaster recovery

› QUALITATIVE INDICATOR:

Public authorities have access to funds for disaster recovery

QUALITATIVE SCORE:

2.8

SUMMARY OF ROUNDTABLE DISCUSSION:

There is a Disaster Management Plan which includes provision for funding; however, it was reported that implementation is not responsive and fragmentated. When it comes to significant disasters such as pollution of the water supply or sewer line, there is sufficient response and action, however smaller incidents involving infrastructural failures see a lack of urgency and capacity to resolve. The private sector is proactive in the case of emergencies such as flooding and arrive with support before the government entities get involved.

7.4 Ensuring adequate financial resources for recovery of households and businesses

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

1.6

SUMMARY OF ROUNDTABLE DISCUSSION:

Johannesburg's households and businesses are diverse in terms of make-up with informal settlements and businesses being significantly more vulnerable and exposed to shocks and stresses than formal areas. The City has attempted to make allowances for rebates on rates and taxes for indigent households due to the COVID-19 pandemic however this is not a common occurrence for other shocks such as floods. Funds are generally difficult to access when the system experiences any shock or stresses, and there is no evidence of programmes available for citizens to access funds in these events. Bureaucratic requirements and processes and technological disparities where people have limited access further hamper access to assistance.

7.5 Promotion of community capacity for preparedness response to water hazards

› QUALITATIVE INDICATOR:

Mechanisms promote community preparedness for water-related shocks and stresses

QUALITATIVE SCORE:

2.3

SUMMARY OF ROUNDTABLE DISCUSSION:

Vulnerable communities are not well provisioned for dealing with a disaster. In addition, they are typically more exposed as they are often located on the flood plain which is the only available cheap land and these areas are often not enforced. The identification of 'at risk' communities is not systematically undertaken and there is a lack of education around shocks and stresses and how to prepare for these events. Disaster alerts are communicated and targeted communication is improving but it is not yet well coordinated or effective.

8 EFFECTIVE ASSET MANAGEMENT

8.1 Active monitoring and evaluation of water infrastructure

› QUALITATIVE INDICATOR:

Monitoring and evaluation of water infrastructure and networks ensure data is current and accurate

QUALITATIVE SCORE:

3.5

SUMMARY OF ROUNDTABLE DISCUSSION:

Joburg Water has a spatial data management system in place, but the continual monitoring and evaluation of these systems can improve as well as the use and communication of information. The annual water balance is done to give an indication of demand and supply and non-revenue water, but there is insufficient granularity in the data to be able to target specific areas of concern. The city has data on the condition of their infrastructure systems and have detailed plans for addressing the backlog, but there is not enough budget to act on these plans and the backlog just grows. There is limited monitoring of green infrastructure and water quality within the CoJ. Water quality monitoring is improving in the Vaal System, undertaken by DWS and supported by the private sector, and through the River Health program, but much more is needed.

8.2 Ensuring adequate human capacity for operation 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:

1.7

SUMMARY OF ROUNDTABLE DISCUSSION:

In terms of planning for what is required, this is happening at the city of Johannesburg, and the condition of infrastructure is well known, along with the infrastructure upgrade backlog, and there are adequate records of the water infrastructure. But there is a serious shortage of technical human capacity at the municipality which has been lost over the years and the municipality is operating reactively in terms of maintenance (the municipality is running infrastructure to failure and only then is renewal/upgrading done). The main constraint is the availability of adequate finances and the annual budget cuts make it harder to provide sufficient training and recruitment of skilled personnel to address the human capacity shortage and make it harder for the municipality to be proactive in doing critical maintenance.

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:

1.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Flooding infrastructure in the city is largely 'grey' however it is aged and not well maintained due to a lack of capacity and financial resources as well as theft and vandalism. Johannesburg is prone to flash floods and intense storms which often bring the city to a standstill as roads become flooded. There has been recent advocacy for 'green infrastructure' and there has been support from the City in this respect. However, there is a significant expertise and capacity challenge which make rolling out of these types of technologies difficult.

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:

1.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The current budgeting allocation system within the CoJ is a challenge because it has a focus on capital expenditure for new infrastructure but not enough emphasis on the operational requirement for maintenance and upgrading. For Joburg Water there is a known R61 billion backlog for the asset upgrade and rehabilitation of water supply and sanitation infrastructure (approximately 10 years backlog). But the funding received is approximately R1.2 billion per year. Other factors impacting negatively on maintenance in the city are vandalism, and the institutional arrangement of the entities.

8.5 Promotion of reliable supply chains for water infrastructure

› QUALITATIVE INDICATOR:

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

QUALITATIVE SCORE:

2.5

SUMMARY OF ROUNDTABLE DISCUSSION:

The supply chain is strictly regulated creating unnecessary red tape for procurement especially in emergency situations, which in turn hinders service delivery and material delivery. The only time the regulations are relaxed is when a situation is declared a disaster. Each agency has their own emergency response plan (e.g., JRA have an emergency response plan for critical infrastructure), but it is un- clear if the whole city has a disaster management plan.

PROTECTED NATURAL ENVIRONMENTS

9.1 Active monitoring and evaluation of environmental resources

› QUALITATIVE INDICATOR (9.1A):

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

QUALITATIVE SCORE:

4.0

SUMMARY OF ROUNDTABLE DISCUSSION:

For Joburg Water, there are adequate and comprehensive monitoring systems in place for human water consumption. The city has done well in terms of the blue drop report, with 99% compliance for potable water quality, and daily testing is done to ensure that any issue is immediately addressed. Results are captured on a central data system and the monitoring systems are compliant with SANS and CSIR standards. There could be more real time monitoring of data.

› QUALITATIVE INDICATOR (9.1B):

Environmental monitoring is conducted to assess the health of environmental systems

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

More can be done to improve river health by broadening the coverage of this type of monitoring across the city, as well as more consistent and detailed monitoring of ecological indicators. Data sharing is done in the catchment forums to help with coordination. The city of Johannesburg and other government entities could do more to demonstrate their commitment to environmental resource monitoring and evaluation and to display innovation in this area

9.2 Promotion of sustainable commercial and industrial water use

› QUALITATIVE INDICATOR:

Mechanisms encourage sustainable water use for commercial and industrial users

QUALITATIVE SCORE:

2.3

SUMMARY OF ROUNDTABLE DISCUSSION:

There is a need for the promotion of sustainable commercial and industrial water use at a city level. There are policies in place and awareness related to alternative water use but there is no uptake from commercial customers. If businesses go off grid, there will be revenue loss for the City of Johannesburg so there is a hesitancy regarding alternative water use by commercial and industrial customers.

9.3 Promotion of sustainable household water use

› QUALITATIVE INDICATOR:

Mechanisms promote sustainable water use for households

QUALITATIVE SCORE:

3.2

SUMMARY OF ROUNDTABLE DISCUSSION:

Joburg Water has all the traditional policies and plans in place, as well as extensive social media awareness and community programmes to promote sustainable household water use. However, more can be done to raise awareness and to embrace traditional views and practices such as rainwater harvesting as practised in the rural areas. The City should consider new approaches and regulations to align with international best practices, especially in the context of rainwater harvesting in the broader systems.

9.4 Protection of aquatic habitats and ecosystems

› QUALITATIVE INDICATOR:

Policies and programs protect aquatic habitats and ecosystems

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Although there are many policies and programmes in place with good intentions, enforcement is weak and lacking, particularly in terms of systems to enable enforcement and institutional capacity to enforce and regulate. As a result, these policies and programmes are implemented in an ineffective manner. The city rivers are in a bad state with the main factorsin Johannesburg being stormwater, poor solid waste management, and sewage spills into the rivers. Instead of focusing solely on the aquatic systems, urban management as a whole must be considered to better maintain the aquatic habitats and ecosystems in the city.

9.5 Protection of groundwater and surface water resources

› QUALITATIVE INDICATOR (9.5A):

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

QUALITATIVE SCORE:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

The protection of surface water abstraction is something over which the City of Johannesburg has no control. This is DWS's responsibility. There is a lack of communication between the city and DWS, as well as little or no support from DWS in terms of surface water abstraction monitoring and regulation.

› QUALITATIVE INDICATOR (9.5B):

Protections exist to prevent over-abstraction/over-withdrawal and elimination pollution of groundwater sources

QUALITATIVE SCORE:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The protection of groundwater is not the City of Johannesburg's mandate, therefore there is not much being done in this regard. This is the responsibility of DWS. However, the city is trying to put in place systems to regulate the household/domestic level abstraction of groundwater across the city through the town application schemes. DWS regulates the commercial abstraction of groundwater. More can be done to regulate groundwater use across the city especially in the dolomitic areas and also to protect groundwater from acid mine drainage pollution.

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HEALTH & WELLBEING

Access to safely managed water services is high in the CoJ but access to adequate sanitation services is low, especially in informal settlements and low-income areas. Demand for water has long exceeded availability and the city exceeds its allocation as a result of intense growth, high per capita usage and high non-revenue water percentages from illegal connections, poorly functioning aged infrastructure and vandalism.

In general, drinking water quality is very good and continuously maintained. The water tariff is considered low and unreflective of the true operating costs and the value of water. It is highly subsidized, burdening the financial sustainability and investment capacity.

Following the potable water demand allocation exceedance, treated effluent is made available for industries and commercial businesses. But this can only be done to the extent permitted by the Department of Water Sanitation who manages the catchment whereby downstream users are dependent on treated effluent out of Johannesburg. Additionally, groundwater is largely unexplored due to the perceived contamination by Acid Mine Drainage (AMD).

Access to safely managed sanitation services is dependent on the household income, with high income groups having excellent services because they live in a house that is connected to the public sewerage system. Sanitation access is worst in low-income communities where sewer charges for individual connections cannot be afforded, and temporary shared facilities provided are not deemed adequate or dignified and often become unusable due to lack of proper operation and maintenance.

The affordability of sewer charges is a challenge in low-income communities with individual connections. This poses multiple health risks such as outbreaks of waterborne diseases and the prevention of viruses.

While a wide variety of health services are provided, quality is generally considered poor especially outside of private clinics.

Water is rarely considered an element of urban placemaking. Restoration of rivers and watercourses is beginning to emerge in city plans, but there is little consistent support across all agencies and sectors. Riverfronts are not a desired places to live given the pollution and risk of flooding, resulting in the poorest settlements being located near rivers.

While land use regulations exist and high-risk areas are identified at the planning stage, settlements still develop in these areas due to a shortage of available and affordable land.

Comprehensive policies and regulations exist that protect people from being displaced or re-settled, however, enforcement is lacking and decisions around resettlement are often taken with little consultation of the affected communities.

Small components of blue and green infrastructure can be found in some larger hotels and private developments but are not widely accessible across neighbourhoods.

Developers have two approaches to blue green infrastructure. Some implement it to increase amenity and property values whilst others view it as a maintenance hassle and leave it out of the development entirely. Although the city tries to enforce it, there are instances where these regulations are not adhered to.

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:

3.3

SUMMARY OF ROUNDTABLE DISCUSSION:

Overall, the residents of the CoJ have good access to water and there is minimal improvement required in the provision of safe water for personal and domestic water use. A greater majority of the population (98%) has access to sufficient, safe, accessible, and affordable water for personal and domestic use. However, there are challenges with securing continuous supply due to the demand far exceeding the supply from the Integrated Vaal River System and the rising backlog as a result of growing informal settlements. Challenges with water supply are largely concentrated in informal settlements or low-income suburbs.

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:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Sanitation service access is vastly different between formal and informal areas. While formal households have good access to safe, hygienic, and affordable sanitation (90%), informal households have low access (43%) to shared services that often fall into disrepair due to a lack of maintenance or theft and vandalism. Informal settlements are often subject to temporary sanitation services and are not formally serviced by the city-wide water-borne sanitation system due to being located on land that is illegal for service provision. The latest quality of life survey had 20% (1 in 5) households in Johannesburg dissatisfied with sanitation service (and declining).

10.3 Universal affordability of water and sanitation services

› QUALITATIVE INDICATOR (10.3A):

Safe water for consumption is made affordable for all users

QUALITATIVE SCORE:

3.5

QUALITATIVE SCORE:

Water quality is excellent and generally affordable, however there is a culture of non-payment among citizens and it is unclear whether this is due to affordability issues. Even though there is a stepped tariff system in place, water tariffs are considered too high for those located in social housing. There is a concern of affordability for the future considering the state of infrastructure and supply issues.

› QUALITATIVE INDICATOR (10.3B):

Safely managed sanitation services are made affordable to all users

QUALITATIVE SCORE:

3.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Sanitation services vary between formal and informal areas. The areas that are able to afford services are provided with water-borne sewerage systems and those that cannot have poor, temporary sanitation solutions that are not considered to be adequate or dignified and since these services are not paid for, they are not maintained. The issue of whether sanitation is safely managed is of concern in the CoJ and there are often instances where wastewater treatment works do not function optimally or infrastructure fails and there are sewage spills into stormwater systems. Sewage is particularly mismanaged and poorly disposed of in informal settlements and often results in river pollution causing significant health risks.

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 diseases

QUALITATIVE SCORE:

2.4

SUMMARY OF ROUNDTABLE DISCUSSION:

The health services are generally of a good standard and most communities have access to healthcare services. However, services related to water-borne diseases could be better. The disease burden associated with water-borne diseases and risks are increasing because of poor treatment of sewage and flow of sewage water into rivers and streams that people still use for recreation. The city takes a reactive approach and there are few preventative measures to act against water-related shocks and stresses.

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:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

Stormwater guidelines, manuals and by-laws exist which ensure the management of stormwater on new sites. But there are various factors which impede the effective implementation of water sensitive design principles in buildings, including: the entity responsible for ensuring the guidelines are adhered to is unclear; lack of standardised applications for an array of specific site conditions; lack of incentives and enforcement; and lack of pilot projects to create an applicable narrative around green 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:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

There has been increased recognition and implementation of the value-add of Water Sensitive Urban Design (WSUD) within the CoJ. However, various challenges remain including: the socio-economic spatial disparity in implementation, effective operations and maintenance planning, and limited stakeholder/community engagement and support. Public awareness on how to maintain and value green spaces is lacking.

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:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

There are land-use regulations in which water is a key consideration in planning and development, however there is a lack of enforcement of these regulations with respect to developers and illegal development (e.g., informal settlements) adjacent to water courses. The effective planning of maintenance of water-sensitive urban land development is also lacking.

11.4 Introduction and enhancement of neighbourhood blue-green infrastructure

› QUALITATIVE INDICATOR:

Blue and green infrastructure is adopted in neighbourhoods

QUALITATIVE SCORE:

1.8

SUMMARY OF ROUNDTABLE DISCUSSION:

The city has done significant research on BGI specially for the CoJ context. However there has been little implementation thereof, and there is no cross-cutting city-wide plan within CoJ. An avenue for improvement includes engagement with stakeholders during the initial phases of policy formulation to encourage future adoption and implementation of relevant policies.

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:

1.6

SUMMARY OF ROUNDTABLE DISCUSSION:

Only temporary accommodation is available for displaced communities rather than permanent housing. The control of informal settlement in flood risk zones is often lacking despite policies being in place. As a result, it the most vulnerable communities that are at greatest risks from water-related shocks and stresses.

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:

2.8

SUMMARY OF ROUNDTABLE DISCUSSION:

Generally, water supply to industries is good. There is a growing understanding that supply is limited and there is an anticipated shortfall until the completion of the Lesotho Highland Phase II. There are also regular failures in the ability to supply water of sufficient reliability and quality due to the failure of water infrastructure such as treatment plants, pumpstations and reservoirs. The private sector is putting in place measures to reduce their exposure to any shortfall and there are agreements in place between Joburg Water and some industrial and commercial users to supply treated effluent instead of potable water. This is, however, limited to the allowances dictated by DWS as downstream users are reliant on treated effluent coming out of the CoJ.

12.3 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:

2.0

SUMMARY OF ROUNDTABLE DISCUSSION:

The shortfall in water supply could provide the stimulus for new opportunities to deliver demand management solutions and these emerging enterprises should be encouraged. Before the pandemic, there were training courses provided for improved water management but they need to be brought back.

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

3

OPPORTUNITIES

Following the Assessment Workshop, a set of cross-cutting challenges were identified as common themes emerged from the breakout room discussions with key stakeholders. These were analysed by the UWR team to establish a set of nine problem statements to be addressed in the Visioning Workshop to identify resilience actions.

The project team, in consultation with the CoJ Steering Committee, developed nine challenge statements informed by the City Characterization Report (CCR) and based on an analysis of qualitative indicators from the Assessment Workshops. These were then transformed into a series of "Challenge Questions" that served as a starting point for stakeholder consultation during the visioning workshop which addressed eight challenge questions and a focus group discussion that discussed the ninth challenge question. The following section presents an overview of the nine challenges, a brief contextualization of each, the related indicators to each challenge from the CWRF, as well as, the result of the root causes analysis that was carried out by participants during the visioning workshop.

	CHALLENGE AREA	CHALLENGE QUESTION
1	Urban water asset maintenance	What are the opportunities for CoJ to address its maintenance backlog and create enabling structures that result in a robust system by overcoming the challenges that result in maintenance failure?
2	Internal water governance	How can CoJ reimagine its regulatory environment, roles and responsibilities of the various entities to support collaborative planning and streamlining implementation in support of improved water resilience?
3	External stakeholder engagement	How can CoJ create an enabling environment for long-term collaborative relationships with city and catchment stakeholders in a manner that allows for resilience planning, co-production of data and evidence, access to reliable information, joint establishment and maintenance of collaborative platforms, and regular social surveys to better understand the needs and perceptions of citizens?
4	Slow uptake of digital water	What are the opportunities for CoJ to develop a resilience mandate that can support mainstreaming of a resilience agenda in support of urban infrastructure planning, governance, and implementation processes for water?
5	Lack of holistic resilience planning	How can the Structure Plan better integrate local knowledge, cultural values and the regional context to gain citizen and stakeholder support for implementation?
6	Systematic inequality in access to basic services: Formal vs Informal	How can CoJ ensure an equitable and just transition towards achieving a water resilient that will also address historical inequalities in access to reliable and affordable water supply and sanitation services and safety from floods?
7	Slow uptake of Water Sensitive Design	How can CoJ strengthen the integration of WSD into urban planning and implementation to improve the water resilience of the city?
8	Lack of diversification, uptake, and usage of alternative water sources	How can CoJ incorporate alternative water sources, including water re-use, groundwater and acid mine drainage, into long-term water security planning while maintaining water-related revenue options, and overcoming the associated negative perceptions and the lack of capacity and resources to ensure an urban water supply that is resilient with adequate redundancies?
9	Unsustainable funding & finance	What are the opportunities for CoJ to develop a more sustainable and equitable pricing strategies that includes alternative sources of funding, such private sector funding/ finance equity, commercial debt, climate finance, development fees, taxes etc., in order to overcome the current finance and technical capacity challenges that result in an under-performing cost recovery model, disabling bureaucracy, and limited fund availability to enable a resilient water system?

1. Urban Water Asset Maintenance

CHALLENGE QUESTION

What are the opportunities for the City of Johannesburg to address the maintenance backlog and create enabling structures that result in a robust and proactive asset maintenance system?

CHALLENGE DESCRIPTION

At the time of writing this report, the City of Johannesburg Metropolitan Municipality (CoJ) had a maintenance backlog of about R19.2 billion and had reported water interventions to be below average. Moreover, the City is currently underfunded for new infrastructure sitting with a backlog of R20.4 billion (Johannesburg Water, 2021). Recently, Johannesburg Water was allocated at R3.3 billion multi-year capital budget for water and sewer pipe replacements, upgrades to the water storage infrastructure and the wastewater treatment works programme. While significant, this is still only a fraction of the funding required to address the challenge of aging infrastructure.

A general lack of maintenance is common across South African municipalities as a result of budget constraints and limited institutional capacity. Inadequate maintenance of assets and irregular replacement of aging infrastructure will over the long run lead to failing and dilapidated infrastructure, high non-revenue water, and poor service delivery.

Due to aging infrastructure and inadequate maintenance, water pipe bursts remain high at a rate of 368.23 per 100 km of network length for 2020/2021 which was down from the previous year at 453.83 (Johannesburg Water, 2021).

The lack of financial resources, technical capacity, and political support for operating expenses vs capital expenses are some of the barriers to effective water asset maintenance suggested by various stakeholders.

Furthermore, low tariffs, inadequate income from other sources of revenue, and lack of up-to-date data over the long run have led to a vicious circle of poor maintenance and deterioration of services that affect users' willingness to pay and induced decrease in collection efficiency.

Currently, CoJ is quite reactive in its approach for addressing maintenance backlog and creating enabling structures that can improve maintenance. A better understanding of the root causes, data, political will, and capacity to design and implement strategies that can allow the City to proactively fund water asset maintenance through a mixture of tariffs, taxes, and transfers will help improve the efficiency of dealing with asset maintenance backlogs as well as water conservation incentives and ensuring equity and affordability of water.

Consideration should also be given to partnerships with the private sector that can assist in improved asset maintenance as part of a broader program of addressing current non-revenue water challenges.

RELATED INDICATORS

- **6.2 Provision of sufficient financial resources for maintenance and upkeep of water infrastructure**
  - Active monitoring and evaluation of water infrastructure
  - Ensuring adequate human capacity for operations and implementation
- **8.4 Routine maintenance and upgrade of water infrastructure**
  - Provision of safe water for personal and domestic use
  - Provision of sanitation services

1. Urban Water Asset Maintenance

ROOT CAUSES

Social Causes

Lack of empathy and connection between the "haves" and "have nots" and the aspect of cross-subsidization where high income areas subsidize low-income areas creates resentment within the former and a culture of entitlement within the latter. This culture of entitlement, particularly in low-income areas, contributes to a lack of willingness to pay for services because citizens believe that they are "owed" services and should not have to pay for them due to having been previously disadvantaged. The city struggles with enabling structures for adequately addressing this issue due to thin relationships with external stakeholders.

Some past engagements with communities have resulted in angry mob mobilization that vandalize and steal infrastructure causing a further backlog.

Lack of care on behalf of citizens for city infrastructure and willingness to report infrastructure failure to the City was seen as also contributing to poor maintenance. In general, the city lacks a collaborative environment with communities that could empower citizens to look after assets within their communities.

The lack of clear and easy communication avenues for citizens to directly engage the City is a major contributor to this behaviour. As a results, cases of vandalism and theft are often not reported to the city. This is key as the City does not have the human and technical resources to monitor all of its assets.

CoJ suffers from a lack of willingness to pay by water users for water tariffs. This affects revenue generated for maintenance and investments in improved water resilience. Research previously conducted on customer's willingness to pay for water identified several reasons for this behaviour including: a lack of affordability, lack of educational programmes for developing water conscious citizens, poor tracking and billing systems, poor service delivery in certain areas even though the City has a high water access percentage, infrastructure breakdown, a sense of unfair treatment by high-earning citizens and large water users, and political campaigns that promote access to free water as a fundamental human right.

Environmental Causes

Lack of maintenance of sanitation infrastructure resulting from funding gaps and lack of prioritization has over the years resulted in an increase of pipe bursts and leakage which directly contributes to the current poor state of green infrastructure, degraded and polluted wetlands, and river corridors.

Technological Causes

The city has an extensive water and sanitation infrastructure. The water and sanitation system alone includes a water distribution network of 12,000 km which delivers 1.6 billion litres of water per day, 127 reservoirs and water towers, 37 water pump station, 11,000 km wastewater network, 38 sewer pump stations, and six wastewater treatment plants. This extensive and complex water and sanitation system requires modern tools and technologies for effective management of the entire system, conditions assessment, and monitoring of the infrastructure.

CoJ currently lacks innovation and exploration of best practice technologies. Other priorities taking precedence and technical expertise contribute to the lack of modern technological and innovation practices that could better inform CoJ's management system of existing infrastructure.

As Johannesburg continues to grow (formally and informally) at a faster pace than the city can adequately plan for, there is limited human and financial resources to design fit-for-purpose infrastructure. Particularly within informal settlements where piloting of decentralised water and sanitation infrastructures have been implemented. This has resulted in a lack of fit-for-purpose infrastructure causing a "one size fits all" application of infrastructure and therefore a backlog in maintenance and operation.

Political & Governance Causes

CoJ has limited expert knowledge and suffers from high staff turn-over which has eroded institutional knowledge. For retiring senior and incoming junior officials, there is no process in place to transfer institutional knowledge and mentor new personnel. As a result, a lot of knowledge is lost when staff movement occurs. In the absence of a modern maintenance programme and eroded institutional

1. Urban Water Asset Maintenance

knowledge, maintenance of existed infrastructure tends to be negatively affected.

Various roles and responsibilities for water and sanitation management in Johannesburg are mandated to several actors at the international, national, regional, and city levels. The key actors include National Department of Water and Sanitation, Rand Water which is a regional water board of the Gauteng Province, Johannesburg Water, which is a water utility fully owned by CoJ, Johannesburg Roads Agency also an agency also fully owned by CoJ, and the CoJ Environment & Infrastructure Services Department (EISD). These key actors play crucial roles in water and sanitation management and service delivery. Constitutionally, there are clear roles and responsibilities delegated to the various actors. However, numerous studies show that this governance structure has resulted in siloed and uncoordinated planning culture within and between the different departments and agencies that are entrusted with water and sanitation management mandates. In addition, a lack of a modern asset management systems which limits transparency and willingness to share information between the actors, poor coordination and planning between these actors contributes to the overall state of inadequate asset maintenance.

The fragmented nature of water governance also encourages a lack of accountability within and between different government agencies because the roles and responsibilities regarding asset ownership and operation are not clearly defined.
National and city laws and policies dictate that citizens must pay for water and sanitation services rendered by Johannesburg Water irrespective of the level and quality of service provided or the affordability. Because political channels such as local councillors championing citizen issues within the municipality while traditional communication channels for queries and complaints are managed by the Johannesburg Water Utility (Joburg Water), this makes it very difficult for citizens to hold the relevant service providers accountable.

Financial Causes

The lack of financial resources has contributed to high debt and inadequate water and sanitation asset maintenance that ultimately leads to failing infrastructure.

The lack of adequate funding is thought to be due to a combination of a lack of funding opportunities, poor financial models, low water tariffs, limited human capacity to explore additional funding such as green finance, lack of a budget allocation prioritisation model within CoJ, outdated and poor billing systems, and a lack of awareness and willingness to pay by citizens for water and sanitation services delivery. All of these factors have contributed to limited financial resources for maintenance of water and sanitation infrastructure which results in a reactive approach to dealing with the most critical issues first and never having the opportunity to be proactive with asset maintenance.

The sale of utility services, mainly water and electricity, generates the largest revenue streams for the CoJ. As with most municipalities in South Africa, CoJ lacks a budget prioritisation system which helps to allocate funds to key service delivery programmes such as water and sanitation and in line with the city's long-term development strategy. In the absence of such a budget prioritisation system aligned with long-term strategy development, CoJ makes adhoc budget allocation across the different departments, including those that do not generate revenue. These are not always determined based on the best use of resources and are often subject to political rather than technical considerations. As such, funds generated through urban water service provision are shared between a variety of service operations. Leaving the water utility with limited funds for maintenance.

Other Causes

South Africa is known to be the most unequal society in the world (COGTA, 2020), initially associated with apartheid stemming from white supremacy but still continues to be a major issue almost three decades later. Historical service provision inequalities resulting from apartheid persist where not only does the City have to grapple with closing the service gap but also servicing aged infrastructure. As such, CoJ as a main economic hub of South Africa, has high inequality with 19.1% of the population living in informal settlement with limited to no access to basic services such as water supply, sanitation, electricity and refuse removal.

2. Inefficient Internal Governance

CHALLENGE QUESTION

How can the City of Johannesburg re-imagine its current regulatory environment and roles and responsibilities to unlock collaborative planning and streamlining implementation processes?

CHALLENGE DESCRIPTION

Water governance for the City of Johannesburg's water supply and wastewater management system is distributed to actors at the international, national, provincial, and local (i.e., city) administrative level. At the city administrative level, the water board responsible for the Gauteng Province, Rand Water, supplies water to the water and sanitation utility responsible for the City of Johannesburg, Johannesburg Water, an enterprise of the CoJ, which is responsible for water supply and sanitation provision to the residents of Johannesburg. Johannesburg Water is also responsible for water quality and ensuring that water supply maintains potable water standards as well as wastewater treatment. Anything related to groundwater is also managed by Johannesburg Water. Johannesburg Water falls under the directorate of the City of Johannesburg Environment & Infrastructure Services Department's (EISD) Water Services Regulation & Policy Unit. The Johannesburg Roads Agency (JRA) is responsible for stormwater management within the City of Johannesburg and serves as the custodian of stormwater infrastructure. In addition to the specific departments and agencies with water and sanitation mandates, several other departments in the city, such as planning, finance, and disaster management, also indirectly influence the water and sanitation business of the City.

A set of acts define clear roles and responsibilities which are mandated to different departments and agencies managing the City of Johannesburg's urban water system. The roles and responsibilities are executed within the context of a highly regulated environment. On paper, such a highly regulated environment is well suited to a well-run urban water management system. However, this highly regulated environment can also contribute to a lack of innovation, coordination and collaboration between departments and agencies with overlapping mandates.

The procurement system for water and sanitation is considered to be the most affected. Over the years, the National Treasury and the Department of Public Services and Administration have hardened procurement rules for the public sector with the aim to improve efficiency and curve wasteful expenditure. Municipal Supply Chain Management Regulations specify minimum procurement processes for the city and are allowed to apply stricter standards. Nevertheless, Auditor General Reports continue to highlight that irregular expenditure continues to significantly increase year on year. This is considered necessary to address issues of corruption and transformation, but has, however, resulted in a highly regulated procurement system with a long and onerous procurement process that some believe results in inefficiencies, limited innovative decision-making and project implementation, financial mismanagement resulting in underinvestment and low asset maintenance, delays in the appointment of service providers, and limited collaboration capacity within and beyond the City

RELATED INDICATORS

- 1.2 Effective communication of government programmes and policies around water
- 2.1 Incorporation of expert and technical knowledge into decision-making around water issues
- 2.5 Political leadership around water resilience issues
- 3.3b Proactive coordination within government agencies
- 3.5 Promotion of clear stakeholder roles and responsibilities
- 4.2 Effective enforcement of environmental regulations for water
- 5.4 Integrated planning across interdependent urban systems

2. Inefficient Internal Governance

- 5.6 Promotion of culture, processes and resources to enable innovation
- 7.2 Coordination of disaster response and recovery preparation

ROOT CAUSES

Social Causes

Within the CoJ, there appears to be a lack of a common vision on the management and future planning for water and sanitation services. Water is not viewed as a key resource and service delivery that requires attention and effort for sustainable use and growth of the city. This is reinforced by the siloed mentality of departments which puts pressure on officials to focus on their individual mandates, the multi-actor water governance environment, particularly the City's dependent on Rand Water for water supply, which paints an impression that the overall responsibility of building resilience and sustainability in the urban system sits with external stakeholders. As such, there is a tendency to push the responsibility for water security to external actors at regional and national level and not be held accountable.
Population growth and urbanization has resulted in additional pressures put on the City to cope with growing demand compounded with a lack of financial and human resources. As a result, teams are inundated with their own pressures and lack the capacity to foster collaboration and better coordinate efforts with other teams.

Environmental Causes

Environmental issues are not seen as a priority within the City administration. As such, teams who deal with these aspects are marginalized and do not enjoy the same attention as those working on issues related to basic services.

Technological Causes

While various departments within the City of Johannesburg sit with a considerable amount of data and information, the city lacks an integrated data and information system that could enable greater transparency and collaboration across departments. Each department and unit has its own way of operating, storing data and information, decision making, and engaging with the rest of the administration. The lack of an integrated data and information system across departments has fostered wasteful expenditure of limited resources and the siloed culture that persists. This also tends to lead to limited opportunities for holistic planning and programme intervention informed by information and data.

Political & Governance Causes

The City of Johannesburg Metropolitan Municipality comprises of the legislative arm (the council made up of 270 councillors representing various political parties) whose primary role is to act as lawmakers, approve policies, budgets, and reports, and provide general oversight of the municipal law and policies), the executive arm (executive mayor and mayoral committee), and the administrative arm. Both the legislative arm and the executive arm compromise of elected political representatives. The purpose of the executive arm is to put into effect government laws and programs and oversee the functioning of each political portfolio.

The legislative and executive arms are both political arms and are influenced by municipal elections which take place every five years. With each election cycle, a new legislative and executive arm is established. The administrative arm comprises of nine departments that drive formulation of policies and strategies and overall implementation for outcomes. Mandates and priorities of the administrative arm are, however, heavily influenced by political leadership. A change in political leadership often results in change in mandates and priorities for the City. This has, and continues to undermine the city's long-term strategic plans, Johannesburg 2040 Growth and Development Strategy (GDS), and the Integrated Development Plan (IDP), which provide a common goal and should promote coordinated planning and implementation. In addition, political influence on administrative mandates and priorities causes internal fragmentation, instability, and confusion as politicians tend to focus more short-term.

Constant shifts in the City's priorities as a result of changes in the political leadership make it difficult for City officials to see any real progress as well as being able to implement a consolidated long-term vision they can work towards.

The urban water and sanitation system is greatly affected by other urban systems such as solid waste, roads, development planning, crime, financing, and disaster

2. Inefficient Internal Governance

management. Planning and effective implementation of water and sanitation programmes requires water actors to collaborate with other departments that do not hold water and sanitation mandates. The City's rigid procurement rules aimed at controlling corruption and strict reporting requirements tend to limit the collaboration required to achieve resilience. The lack of an agile procurement and reporting process appear to be a limiting factor for internal coordination within the CoJ.

Social Causes

The Integrated Development Plan (IDP) and the 2040 Growth and Development Strategy (GDS) provides a long-term vision and mission for the CoJ. While the IDP provides integrated vision, each department and unit within the City is focused on their own mandates and can lose sight of the overall vision and aims. Issues are not viewed holistically or sustainably or driven from the top as an agenda and are instead based on what has been outlined in terms of mandates.

While the IDP identifies clear roles and responsibilities for each department and encourages cross-coordination between departments, the strong siloed culture limits internal effective water governance.

The urban water resilience approach is fairly new in the South African cities and for cities in Africa in general. Currently, the City's long-term policies have not prioritized water resilience as a key approach for planning for water as this is considered the responsibility of the national government via the Department of Water and Sanitation (DWS). In addition, the sector is dominated by engineers who come from a traditional engineering school. There has been some effort to introduce the concept of water resilience to water actors and City departments that influence water and sanitation services, mainly through external initiatives led by international development agencies and academic institutions.

Even so, there is still a limited understanding of water resilience as a broader issue than just water supply or water security. The water resilience approach brings together water departments along with other departments in the city that influence a city's water resilience. The lack of appreciation and understanding of the water resilience approach has limited wider participation from the broader City administration as government officials do not view water resilience as part of their mandate even if it might be.

Like all municipalities in South Africa, CoJ is highly structured with separate entities and departments operating with limited human, technological, and financial capacity. Given the rigid procurement and reporting processes that promoted siloed working culture, under such conditions, the teams have limited opportunity for innovative ways to work more collaboratively. The separation of these urban water services further prevents holistic planning, integration, collaboration and coordination.

Financial Causes

The City's funding and budget priorities change based on the political priorities for each political cycle. Long-term plans, which create a common goal for city officials and should encourage collaboration, are often overlooked as new agendas are prioritised.

As a result, there appears to be a lack of consistency when it comes to implementation of long-term plans, such as the Joburg 2040 Growth and Development Strategy, and how funding is allocated to see through implementation. Where there are overlaps or similarities in programmes and projects between different teams, there is a tendency to reduce or reallocate budget to other programs and not provide additional support for integration. This tendency can result in internal confusion around roles and responsibilities.

Other Causes

Historical service provision inequalities resulting from the apartheid governance regime persist. As such, not only does the City have to grapple with closing the service gap between different groups but also in servicing aged infrastructure.

3. External Stakeholder Engagement Engagement

CHALLENGE QUESTION

How can the City of Johannesburg create an enabling environment for building long-term collaborative relationships with city and catchment stakeholders to support water resilience?

CHALLENGE DESCRIPTION

The City of Johannesburg currently lacks coordinated and collaborative relationships with its stakeholders, both at the city and catchment level. In a rapidly changing city where climate change, population growth, urban development, growing inequality (including historic inequities), rising water needs, natural disasters, and water shortage are likely to damage societies and the environment, stakeholders must be engaged and empowered to act together to build resilience.
Effective and informed stakeholder engagement provides opportunities to share objectives, experiences, and responsibilities. Collaborative relationships further enable policy coherence and trade-off management and implementation.
Policy and institutional fragmentation, highly bureaucratic regulatory environment, distrust, dissatisfaction with the quality-of-service delivery, lack of proactive and effective communication, limited capacity, and irregular expenditures are some of the factors limiting good relationships with stakeholders.
Furthermore, stakeholders have over the years reported unwillingness to integrate stakeholder inputs into decision-making and project implementation. When city stakeholders are engaged, often it is a tick-box exercise that has a minor impact on planning and implementation. Stakeholders feel they do not have the agency to impact change, and only a limited number of stakeholders understand the nature of the water supply and sanitation systems of Johannesburg. As we see in other cities such as Cape Town if people cannot link their actions to the impacts that high water use and pollution have on the environment and socio-economic fabric, they are less likely to manage their own water usage in a sustainable way.

This lack of stakeholder engagement is a missed opportunity not only for future planning but also for the city to meaningfully engage its stakeholders over complex water and sanitation issues that it currently grapples with such as its billing system, effective use of data, water conservation and demand management, informality, procurement processes, and general communication.

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 institutions working on water issues
- 2.1 Incorporation of local knowledge and culture into decision-making
- 3.4 Proactive coordination between government, private sector and civil society
- 5.5 Integrated planning with agriculture and food supply chains
- 7.5 Promotion of community capacity for preparedness and response to water hazards

ROOT CAUSES

Social Causes

There is generally a lack of appreciation by water user groups and actors for water as a scarce resource. Lack of awareness and poor engagement of water users by the City is considered to be one of the key reasons for the lack of appreciation by water users. Over the years, this behaviour has resulted in under-valuation of water and placing all the responsibility for management on CoJ and its agencies. While this is the case policy-wise, the City has limited human, technological, and financial capacity to be able to manage the water and sanitation system effectively. Management of particular activities, such as leakages, is almost entirely depended on water

3. External Stakeholder Engagement Engagement

users and citizen reporting to the City. The high values of non-revenue water are one of the areas where greater engagement with citizens would make a significant difference and make them part of the solution.

Over the past several years, the South African Government, across all three spheres, has faced allegations of corruption. Audit reports have also shown high percentage of funds used inappropriately in majority of local municipalities.

The City of Johannesburg municipality has also had multiple cases of corruption implicating both politicians and municipal officials. Citizens generally perceive CoJ as an ineffective and inefficient municipality with high waste and corruption, disabling collaborative relationships.

The growing perception of a culture of corruption in government has led to a breakdown in the relationship with citizens resulting in a sense of mistrust in the City.

Technological Causes

External stakeholder relationships of CoJ are managed by the Group Communications and Marketing. This Group makes use of technological platforms including radio stations, newspapers, social media, CoJ's website, and telephone to engage with citizens and enable citizens to communicate directly with the City. While the city makes use of various technological platforms to engage with citizens on service delivery, policy formulation and any other key activities affecting cities, studies and statistics show that there is generally low use of technological platforms by citizens as well as the City to engage each other. Communication barriers include a lack of awareness and inability to use the technology. In addition, while the City has deployed the use of some technological communication platforms, there is still a lack of innovation and best-practice in how these are used to engage stakeholders and encourage support and participation.

Political & Governance Causes

As mapped out in the City Characterization Report, the water system for CoJ has a multi-level governance system and requires strong and effective vertical and horizontal coordination between levels of government and across sectors to manage and efficiently use the available water resources. The National government as represented by the Department of Water and Sanitation is responsible for national water resources planning and management. Rand Water, a regional water board, is responsible for bulk water supply to CoJ. Johannesburg Water, a CoJ owned water utility, is responsible for water supply and sanitation services for CoJ.

CoJ's Environment and Infrastructure Services Department is responsible for water resource and biodiversity. Johannesburg Roads Agency, owned by CoJ under the Department of Transport, oversees stormwater infrastructure. While there are clear roles and responsibilities between the different actors, a great level of coordination and collaboration is required for a resilient water system. Currently, there is a lack of coordinated catchment management between these various actors within the greater catchment. This phenomenon is fuelled by the absence of a common vision across the different water management institutions and a common engagement platform that could encourage greater coordination.

Within the CoJ, the limited coordination between the key departments and agencies with water and sanitation mandates makes it challenging for external stakeholders to engage holistically with the CoJ. As such, lack of coordinated efforts internally within the City have resulted in poor relationship building externally with key water institutions. Conflicting mandates and the absence of coordinated efforts internally continue to exacerbate the current situation.

Political divisions and interference in water and sanitation related programmes across the three spheres of government also influence poor coordination between the different water actors. Over the years, political division have resulted in weak relationships between key water actors as well as private-public partnerships that result in poor coordination of efforts and missed opportunities for improved urban water resilience.

Financial Causes

Departments often to not reserve a budget for ongoing stakeholder management. As a result, there is often limited human and financial resources to enable management of relationships and coordination with external stakeholders.

3. External Stakeholder Engagement Engagement

The lack of prioritization of external stakeholder engagement has not only affected coordination with water actors and citizens but has also contributed to the absence of private sector investment into the City's water crisis as its reputation of poor financial management persist in the absence of effective stakeholder engagement.

Other Causes

Another issue that has deteriorated the City's relationship with external stakeholders, particularly the citizens and business, has been the inability to effectively engage challenges related to scale-up and expansion of new and existing interventions. While noting that the City does attempt to engage stakeholders at the start of every major intervention, citizens have reported that this is often a tick-box exercise and that meaningful engagement does not happen often. With some interventions, the City often struggles to scale-up due to a lack of political support often experienced with a change in political leadership, limited financial resources and capacity limitations resulting in discontinued relationships previously built with external stakeholders.

4. Slow Uptake of Digital Water Solutions

CHALLENGE QUESTION

How can the City of Johannesburg create enabling structures, systems, and tools that allow an effective, efficient, and safe transition towards implementing innovative digital water solutions?

CHALLENGE DESCRIPTION

In the CoJ, data often exists across several systems and platforms in different departments, however little to no data is analyzed to better optimize systems and inform decision making. There is often no mechanism in place to update data resulting in it becoming outdated and unreflective of the current state of infrastructure systems. For example, the city has data on the condition of their infrastructure systems and have detailed plans for addressing the backlog, but there is limited budget to act on these plans.

Furthermore, the data is not coordinated and often does not reach the appropriate key stakeholders required to make informed and timely decisions. Specialist decision-makers and expert stakeholders infrequently receive the data that does exist due to it being retained within a specific sphere of government (national, provincial, municipal) and not publicly available.

In addition, many organisations lack the capacity and resources to implement a system of data analysis of current infrastructure in real time that would act as a decision support system.

There is a national Early Warning System in place for floods and droughts, but no such system exists on a city scale. As a result, preparation and planning for disasters and hazard assessments do not make use of the best digital tools available to enable efficient decision making at the local level within the CoJ.

There is a fear within the CoJ that sharing data and opening it to the public and other key stakeholders will result in the identification of ill-performance and be linked to poor performance ratings for the CoJ. The threat of cybersecurity breaches prevents quick transitions towards using digital tools that are available to create enabling structures and assist with monitoring and decision making.

RELATED INDICATORS

- 5.1 Active monitoring and evaluation of programmes
- 5.2 Dissemination of accurate data
- 7.1 Comprehensive hazard monitoring, forecasting and early warning systems
- 8.1 Active monitoring and evaluation of water infrastructure
- 9.1 a Active monitoring and evaluation of water quality for human consumption
- 9.1 b Active monitoring and evaluation of health of environmental resources

ROOT CAUSES

Social Causes

Various water and sanitation activities could be better managed by CoJ through the implementation of new technological systems or upgrading of existing systems. Non-revenue water (NRW) is one of the potential areas that has been long identified as an area of opportunity for improved digitization. NRW includes all water supplied that is not paid for, including physical water losses through leaks in the distribution system, illegal connections, unbilled consumption, and billed but unpaid for water use. Limited leak detection and inefficient billing systems continue to drive high NRW in Johannesburg. While there is a strong case to digitizing the leakage detection and upgrading the billing system, the existing culture of doing things the old way persists.

There is an urgent need to take stock of existing data platforms and identify opportunities for improved use of digital information, raising awareness amongst staff, and

4. Slow Uptake of Digital Water Solutions

encouraging a new way of doing things without leaving officials and citizens behind.

Environmental Causes

Johannesburg depends on catchment management for its water supply, mainly in the regional Integrated Vaal River System (IVRS).

The IVRS, managed by the National Department of Water and Sanitation, is a series of dams supplemented by the Lesotho Highlands Water Project. IVRS supplies Rand Water, irrigation boards, industry, and environmental use with water. The IVRS supplies a total water demand of approximately 3919 million m3 per annum of which 780 million m3 per annum is allocated to Rand Water. In turn, Rand Water is responsible for urban water use and sells water to thirteen municipalities in the Gauteng, including CoJ. Within the CoJ, various departments and agencies play different roles to ensure service delivery. Due to the highly intricate nature of the IVRS and the various inter-basin transfers that exist in the system, a complex set of operating rules has been developed that regulates when and how much water is transferred. The complexity of the IVRS in terms of the infrastructure, flows of water, and governance between different institutions makes it challenging to model crucial water data in real time across the entire system. Models and data do exist, but there could be better coordination across the different departments to make better use of the digital information available to run scenarios in real-time that will not only assist in providing improved water use efficiency but is also critical in managing the increasing water quality and pollution risks and maintain minimum environmental flow requirements (EFRs).

Technological Causes

At the catchment and city level, there is a lack of modern digital data management and information systems in place to process existing data and to provide continuous monitoring to better manage efficient water use. Moreover, water governance actors use different data systems and platforms which add a barrier to sharing, understanding, and analysing the data for better use. Limited internal and external coordination between water governance actors further limits the digital innovation required to bring efficiency in the water system. The different water governance actors lack approaches and a mandate to share with each other data which could in turn be used to improve the management of the water system. Moreover, the infrastructure, both at the catchment and city level, is aging and is incompatible with new digital systems.

Political & Governance Causes

Government agencies and departments responsible for the management of water-related data are situated in different political and administrative structures, mainly National and municipal governments. Digitizing the complete water information management system requires a greater level of coordination between different agencies and departments as well as political support. The process of updating digital information systems is lengthy and bureaucratic both at the municipal and national level.

In the absence of political leadership across different departments, there has been limited data coordination and use of existing data. The lack of coordination between and within agencies results in more siloed decision making, uncoordinated planning and a lack of data and information sharing, and an inability to jointly analyze the data to inform decision making.

In addition, despite talk about the coming of the fourth industrial revolution it appears that digital needs and systems change have not been prioritized. The development of digital water solution is possibly viewed as a “nice to have” and not an essential.

Where there is an interest to explore upgrading of digital information systems or introduction of new systems, pathways for adoptions are unclear, uncoordinated and lack support.

Financial Causes

Limited political leadership will restrict the modernization and uptake of digital solutions as there is limited budget prioritization. Financial and human resources also limit progress where there is interest to explore the sharing of data, upgrading of current digital systems, and the introduction of new systems.

As elaborated in Challenge Nine, sustainable finance and funds for water and sanitation service delivery are a key challenge for CoJ.

4. Slow Uptake of Digital Water Solutions

The City generally suffers from low levels of revenue collection due to several issues including some water users being unwilling and unable to pay for water and sanitation services, low water tariffs, and poor revenue collection. Furthermore, revenue collected by CoJ from water and sanitation service delivery is not ringfenced for water infrastructure and tends to be used for financing of other aspects of the CoJ. The revenue from tariffs is distributed across different departments based on budget prioritization by the City's finance department. Ensuring sustainable water and sanitation services is heavily constrained under these circumstances. As it stands, Johannesburg Water is not able to sustain the maintenance and operation of infrastructure.

Investments into new areas, such as the introduction and upgrading of digital water solutions, is limited. Nevertheless, the City does have the ambition of transforming into a smart city. As such, funds should be prioritized to identify and develop innovative digital water solutions that integrated across the whole water cycle.

Other Causes

CoJ's Disaster Management Centre plays an integral role in the management of large-scale data for the City. Given their role in terms of the development and implementation of the City of Johannesburg Disaster Management Plan, the Disaster Management Centre has access to data from the different departments within the city.

There are opportunities to utilize this data in a meaningful way that could provide information for better decision-making. An example of what is possible is the eThekwini Municipality Dashboard which hosts a series of dashboards that provide insight on various operations on the municipality, improve citizen engagement, promote co-governance, and improve the ability to make decisions. Similarly, both the City of Cape Town and more recently Nelson Mandela Bay have initiated the publishing of relevant information, such as overall water consumption and dam levels, on a weekly water resources dashboard that helping to avert a water crisis in Cape Town and is currently assisting the NMBM with the management of water demand during the current water supply crisis. In the case of the City of Cape Town, this dashboard is now supported by a high complex digital bulk water management and information system that provides real time information on dam levels, production levels, and water consumption. A critical component of this system is that it also links to the DWS model of the Western Cape Water Supply System which enables the City to run its own scenarios in terms of bulk water availability and to keep track of dam levels across the whole systems which enables it to more proactively manage the City's demand and also usage of its own sources. This system has been extended to include quasi-real time information on water quality and stocks of critical resources such as chemicals at treatment plans. The CoCT is currently exploring the potential to extend this system to include wastewater treatment plants.

Outside the municipality, external organisations such as the Water Research Commission (WRC), academic institutions, and the private sector have also conducted research and piloted digital information systems. At times, this is done in partnership with CoJ but at other times it is purely a research exercise. In both cases, it has been difficult to roll out the pilot studies to large scale implementation without support. Finances, systems integration, partnership between relevant stakeholders, policy environment, and human capacity are some of the leading factors that have limited the full-scale development and roll-out of innovative digital water solutions.

5. Lack of Holistic Urban Resilience Planning

CHALLENGE QUESTION

What are the opportunities for institutionalizing and championing a more holistic resilience agenda in the City of Johannesburg's planning and implementation processes for improved water resilience?

CHALLENGE DESCRIPTION

The City of Johannesburg lacks integration of climate adaptation and resilience into its general planning and implementation processes. In addition, conventional engineering or "business as usual" solutions tend to dominate decision-making for water supply. There are elements of this "traditional approach" that should be maintained and improved, but consideration of resilience thinking could also introduce alternative options with the potential for multiple co-benefits.

At present, long-term water security issues are addressed both at the national and municipal level. At the national level, the Department of Water and Sanitation addresses water securing through long-term planning and investment into bulk infrastructure and conservation management. For CoJ, the Integrated Vaal River System Reconciliation Study and steering committee aims to address the region's water security. At the municipal level, the City of Johannesburg recently developed its Water Security Strategy. While there are efforts to address long-term water security planning, it is often not conducted in a holistic way. Long-term planning is often driven by the lowest cost options and is bias towards traditional "hard" engineering solutions.

The existing planning and decision-making process for future water security does not necessarily consider other co-benefits or ways of monetizing co-benefits into revenue streams. In addition, the implementation of these plans has always been slow. Long-term plans quickly become outdated and overlooked with change of political leadership, and moving targets make it difficult for municipalities to stick to long-term plans.

The lack of consistent political will and financial resources to champion climate resilience is also a key driving factor. Over the past three years, CoJ has had five different mayors. With each change of leadership, growth, and service delivery goals are changed and long-term plans become redundant as new priorities are identified to support the political agenda. Additionally, there has been limited political will and championing of climate change issues by the previous and current political leadership within the City of Johannesburg.

This is, however, set to change with the CoJ recently developing a Climate Action Plan (CAP) with clear targets and priority projects for implementation. One of the key focus areas identified in the CAP is for improved water security and also improved access to basic services, early warning systems and disaster risk management systems. As a result, there is a strong level of support for these principals now within the CoJ that need to be implemented into individual plans and will also help in strengthening the case for more integrated planning.

The institutional setup of the city's water system also tends to limit climate resilience thinking. The Johannesburg water system has a multi-level institutional governance system and requires strong and effective vertical and horizontal coordination between levels of government and across sectors to manage and efficiently use water resources. Although overarching principles and roles allocation are duly stated in the legislation and coordination mechanisms are in place, institutional fragmentation, capacity gaps, and a prevailing regulatory culture limit opportunities for taking forward a resilience agenda. We have seen in cities that have embedded a resilience agenda that a greater level of institutional coherence is key.

5. Lack of Holistic Urban Resilience Planning

RELATED INDICATORS

- 2.1 Incorporation of expert and technical knowledge into decision-making around water issues
- 2.4 Long-term strategy development and action planning around water
- 2.5 Political leadership around water resilience issues
- 5.5 Integrated planning with agriculture and food supply chains
- 7.2 Coordination of disaster response and recovery preparation
- 9.1 Promotion of sustainable commercial and industrial water use
- 9.1 Promotion of sustainable household water use
- 10.4 Provision of health services to reduce trauma from water hazards

ROOT CAUSES

Social Causes

Johannesburg is one of the fast-growing cities in South Africa. The rapid expansion in the city and a lack of proactive urban planning makes it difficult for the city to cope with the level of growth. This is a particular concern for informal areas where service delivery remains a challenge. Resilience planning requires much more integrated planning and service delivery across the key City departments but also with external stakeholders such as developers and residents of informal settlement.

For services such as water, waste, and electricity, there is a general lack of societal awareness of the role of critical infrastructure which can result in underappreciation, vandalism, illegal connections, unwillingness to pay, and lack of willingness to help co-manage the infrastructure with the municipality.

There is potential for CoJ to explore innovative ways for building resilience for water in partnership with key stakeholders. The relationship, however, between the CoJ and the private sector has also not been fully explored. Other factors, such as the lack of by-laws, the reputation of CoJ around corruption and slow service delivery, as well as crime, tend to influence the relationship the private sector has with the city, making it difficult for the City to leverage these potential partnerships to build resilience.

Environmental Causes

Like most African countries, climate change impacts and El Niño have impacted urban water resilience. In South Africa, climate change is thought to have resulted in drier conditions impacting the availability of water resources. Johannesburg is expected to experience a moderate risk to drought tendency and heat stress and a high risk to wild-fires and urban flooding.

Wildfires is of particular concern because of the populated nature of the city and the lack of access to significant water sources. Urban flooding is already a major concern for Johannesburg and is expected to worsen due to the impacts of climate change. There is also a direct link between exposure to flooding and location of communities living within the floodplain creating a need to limit exposure through accelerated human settlement planning to protect vulnerable communities. The current growth pressures puts further strain on the environment and further pressure to turn currently pervious areas into impervious which will further exacerbate flooding impacts.

Johannesburg also has a challenge with environmental pollution caused by human activities such as mining. Acid Mine Drainage (AMD) has negative impacts on the environment and contaminates groundwater sources.

Technological Causes

Resilience planning requires use of up-to-date data from different sectors within the city. The City of Johannesburg has not yet developed a platform that could enable it to collect across its departments and use data to inform resilience planning and overall decision making.

Political & Governance Causes

Resilience planning is a fairly new approach within the municipalities in South Africa.

Across municipalities, there is a lack of a consistent definition of resilience and furthermore a general lack of understanding of the term and how to embed it. In the past few years, the National Treasury's Cities Support Programme (CSP) has been working with local

5. Lack of Holistic Urban Resilience Planning

municipalities to introduce the concept and support key areas of resilience.

Water is a critical resilience area. Because of the lack of enforcement, municipalities such as Johannesburg are yet to develop a strategy for implementing urban resilience planning. As a result, there is a lack of a strategic environment to govern the adoption of the approach across the City. Without a city-wide resilience strategy and capacity building, roles and responsibilities are unclear resulting in poor accountability and lack of initiative towards resilience planning.

Organizational structure prevents integrated working and decision-making despite a desire to collaborate. As one of the largest metropolitan municipalities in South Africa, institutionalization and acceleration of a resilience approach across departments would require a greater effort. Loss of institutional memory, limited knowledge transfer, and the lack of capacity and expertise has also left gaps that limit resilience thinking culture within officials.

As a new concept for planning, most politicians tend to be unaware of the approach as well as its benefits for a city. When new political leaders join the city, they often prioritize programmes that they are familiar with. Moreover, mandates and budgets are politicized preventing anything that is not the Mayor's top priority list being accounted for and constantly changing every time there is a change in leadership.

Within the water sector, there are efforts to building resilience. However, several challenges remain, including:

- The City's reliance on Rand Water. The City continues to be heavily reliant on surface water supply from Rand Water. Any disruptions within Rand Water's supply immediately puts the city at risks with no redundancies in place.
- Rules and regulations related to illegal water use are poorly enforced out of fear of backlash and further damage to infrastructure that ends up costing the City more.
- Lack of enforcement to tackle illegal water connection and unwillingness to pay for services from some sectors.
- Limited availability and use of data for resilience planning.
- Unsustainable funding models which promote short term investments and a focus on capital projects and not O&M.
- Limited resilience planning at catchment level although there is an established steering committee for the Integrated Vaal River System which could be strengthened.

Financial Causes

Adoption of resilience planning at a city-wide scale will require the prioritization of financial resources. A lack of budget prioritization for capacity building, developing of a resilience strategy and embedding resilience across key departments continues to be a challenge. There are, however, several opportunities for funding to support urban resilience planning available particularly from international sources such as the Green Climate Fund and others that should be explored.

6. Systematic Inequality: Formal vs Informal

CHALLENGE QUESTION

How can the City of Johannesburg ensure an equitable and just transition towards achieving a more water resilient city in the face of unprecedented challenges resulting from the historical inequalities in access to sufficient, reliable, and affordable water supply and sanitation services?

CHALLENGE DESCRIPTION

Despite the growing population and high rate of urbanisation, the provision of basic services in the CoJ is still comparatively higher than the national average. Although the average income of Johannesburg is nearly double the rest of the country, Johannesburg is the second most unequal city in the world . According to the Water Services Act, every citizen has a right of access to basic water supply and sanitation services and every municipality has the responsibility to plan in its water services development to realize these rights. Despite these basic rights, quality of service provision in the CoJ is starkly varied between formal and informal areas.

Growth creates opportunities to entrench principles of resilience into the design of South African cities, however without adequate planning and efficient management, growth will place enormous pressure on infrastructure and has critical implications for national and regional policies and inter-governmental prioritisation efforts. The issues with basic service provision in Johannesburg is largely concentrated in informal settlements that house the most economically and climate vulnerable people in the city. Compared to the rest of South Africa, the provision of access to piped water (98.8%), sanitation (96.4%) is high in Johannesburg. In the informal settlements, however less than half the households have access to basic sanitation and piped water is provided in the form of a standpipe. These issues are exacerbated by high population growth and urbanization due to international and rural migration. Of the total number of households in Johannesburg, 19.1% live in informal settlements.

Informal settlements occur on land which has not been surveyed or proclaimed as residential, and the structures are usually informal. They are usually found on the outskirts of towns or in pockets of 'infill' inside towns, or along railways and roads. Informal dwellings are typically makeshift structures not erected according to approved architectural plans. In parts of the central business district of Johannesburg informal communities have taken over several abandoned or hijacked buildings which are not maintained and this poses an additional challenge for urban water resilience.

Informal settlements often exist on illegally developed land on which the municipality is by law not able to provide permanent service provision. Citizens living in these areas often have poor levels of access to adequate and safe sanitation contributing to poor water quality and are the most vulnerable to the impacts of climate change such as increasing flood risk and temperatures. In some instances, this is also the case for informal settlements located on legally developed land which can be serviced. Where sanitation services have been provided, they are often shared or not maintained to the extent that they are unhygienic and longer considered as adequate or dignified. The issue of formality is made more complex between different income groups with back-yarding, the process of erecting informal structures in the backyard of formal housing. Back-yarding contributes to failing infrastructure due to overloaded systems as a result of unanticipated outcomes during initial urban planning.

In the post-apartheid era, the Constitution of South Africa states that "everyone has the right to have access to sufficient food and water… and the state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realization of each of these rights" (Republic of South Africa, 1996).

The Water Services Act of 1997 provides for the right of access to basic water supply and sanitation. Basic water supply service refers to the infrastructure necessary

6. Systematic Inequality: Formal vs Informal

to supply 25 litres of potable water per person per day from a source within 200m of a household and with a minimum flow of 10 litres per minute (in the case of communal water points) or 6 ,000 litres of potable water supplied per formal connection per month (in the case of house connections). Basic sanitation services refer to the provision of a basic sanitation facility which is easily accessible to a household and the sustainable operation of the facility. This includes the safe removal of human waste and wastewater from the premises where this is appropriate and necessary, and the communication of good sanitation, hygiene, and related practices.

It is under this act that access to basic water and sanitation services for residents in informal settlements where the government must ensure that water supply and sanitation services are provided in a manner that is efficient, equitable and sustainable.

The government of South Africa also made a concerted effort to resolve the housing crisis (informal settlements with lack of basic services) by constructing large-scale developments. However, these were located on the outskirts of towns far from economic and social opportunities resulting in high costs for the provision of bulk infrastructure and linking to town centres. Subsequently there has been a shift in the government policy with the introduction of the National Upgrading Support Program (NUSP) to support municipalities to implement in-situ upgrading of informal settlements to provide better living conditions and access to services in locations that have better access to economic opportunities.

Regardless of the progress of the NSUP since 2019 to conduct feasibility studies and develop plans, the implementation has been inconsistent and limited. Solving these issues will require multiple levels of government to work in a coordinated approach as different spheres of government play various roles in addressing inequality and informality. Furthermore, a level of high capital expenditure supported by sufficient resources for O&M, an inclusive and well-informed city plan with buy-in from key stakeholders, appropriate community engagement, and participation is needed.

While there might be interest to champion more innovative ways for addressing inequality and informality, these two topics tend to be politically driven. When politicians do champion inequality issues, it is often with a short-term political agenda or mistrust in the intentions. As such, there is a general lack of interest amongst current stakeholder organisations (public and private) and financial incentives.

RELATED INDICATORS

- 1.1 Active community engagement and participation around water issues
- 9.3 Promotion of sustainable household water use
- 10.1 Provision of safe water for personal and domestic use
- 10.2 Provision of sanitation services
- 10.3a Universal affordability of water services
- 10.3b Universal affordability of sanitation services
- 12.3 Support for livelihoods around water

ROOT CAUSES

Social Causes

As an economic hub, the rate of development of affordable housing in Johannesburg has not matched demand which is driven by inward migration, natural population growth, and the large influx of economic and political refugees resulting in numerous informal settlements becoming established without formal planning permissions or prior construction of essential infrastructure (Mubiwa and Annegarn, 2013).

By way of protesting poor service delivery and living conditions, affected citizens often damage public infrastructure and assets to demonstrate their dissatisfaction. In recent years, there has been an increase in the destruction of private property. The destruction of infrastructure and assets further adds to creating a backlog in service provision in low-income formal and informal areas. General lack of awareness, low water and sanitation literacy, and a lack of appreciation for the value of water has resulted in it being abused and wasted. A breakdown in communication and engagement between

6. Systematic Inequality: Formal vs Informal

the government and communities has contributed to social and service delivery protests. Where there have been efforts to come up with innovative solutions, within the CoJ or from external stakeholders, it is often met with resistance.

Environmental Causes

Informal settlements occur mostly on the periphery of formal areas including in floodplains where development is otherwise illegal due to the risk of flooding. In recent years, Johannesburg has also been experiencing more high intensity rainfall events, overloading the city's stormwater system causing more frequent flooding in the city. The flooding occurs in low-lying areas which often is occupied by informal housing and/or low-income households. Informal settlements located in floodplains cannot be permanently serviced for water, sanitation, roads, and electricity due to the threat of environmental disasters damaging infrastructure. This further widens the inequality of basic services.

Technological Causes

Because of land tenure challenges particularly in informal areas, limited space, and having the highest population density in the Johannesburg, municipalities are restricted in providing permanent water and sanitation infrastructure and technologies for service delivery in these areas.

Over the years, innovation around mobile and communal technologies have been introduced, especially for sanitation. Communal VIP latrines and chemical toilets are the most popular sanitation options provided by the CoJ to informal settlement residents. These types of technologies and infrastructure solutions, however, are viewed as "poor quality" or "inferior" compared to those provided in formal settlements. Striking a balance between an effective technology for water and sanitation services that is fully accepted by a community remains a challenge.

Political & Governance Causes

For political campaigning, it is common for politicians to champion equity issues for informal residents as well as low-income formal communities.

Such campaigns do raise expectations which often cannot be met through a municipality's budget. At times, politicians do influence the municipality's budgeting process resulting in long-term priorities becoming less of a priority. The lack of transparent engagement by politicians with citizens they represent once they are elected further exacerbates this tension. As such, there is often social and political protection for a lack of accountability on behalf of local councils to provide adequate services that have been promised to citizens.

Financial Causes

Even though Johannesburg Water provides water and sanitation services to informal areas to address inequalities, mostly in the form of communal taps and shared sanitation services, a backlog does still exist. Residents of informal settlements also do not typically pay for water and sanitation services adding to the service delivery burden and responsibility for the CoJ.

Addressing inequalities in informal settlements is a multi-level governance effort. The national government plays a role through the provision of the Municipal Infrastructure Grants which aim to eradicate municipal infrastructure backlogs in poor communities to ensure the provision of basic services such as water, sanitation, and roads. Free basic water and sanitation services are financed through the local government equitable share as part of the infrastructure grant. The Department of Cooperative Governance is responsible for managing and transferring the grant and provides support to provinces and municipalities with implementing the projects. There have been irregularities in the allocation of the grants to municipalities. Due to budget cuts, the CoJ reported irregularities in the receiving and use of the grant since 2008, resulting in the increase of backlogs and responsibility to municipalities to provide services at their own cost.

With a current maintenance backlog of about R 19.2 billion and infrastructure backlog of R 20.4 billion (Johannesburg Water, 2021), and reduced national grants, financial resources for addressing systematic inequalities remain a significant challenge to the City.

7. Slow Uptake of Water Sensitive Design

CHALLENGE QUESTION

How can the City of Johannesburg strengthen the integration of Water Sensitive Design (WSD) into urban planning and implementation to improve the overall water resilience of the city?

CHALLENGE DESCRIPTION

The City of Johannesburg recognizes the opportunities for water security and diversification of water sources through water sensitive design (WSD). Most of the water infrastructure in Johannesburg is for single use.

The CoJ, through its Water Resilience Strategy, also recognizes the need to promote and incorporate Water Sensitive Design (WSD) into urban planning for resilience, including the promotion of green infrastructure. Benefits to WSD include improved rates of water infiltration, flood management, groundwater recharge, limited asset and infrastructure damage, and stormwater management. In addition, implementing WSD and in particular more green infrastructure, helps in providing shade and reducing the impacts of increasing daily temperatures due to climate change.

There are various challenges facing the implementation of WSD for urban placemaking in the CoJ including a socio-economic driven spatial disparity in implementation, safety, ineffective operations and maintenance planning, pollution, and insufficient stakeholder engagement and public awareness on how to maintain and value open and green spaces.

One of the significant struggles for WSD is the pressure for densification to support growth and the placement of illegal settlements within the urban river corridors of the city even though the land is deemed unfit for occupation. This impacts the ability to protect and rehabilitate the blue-green river corridors and ecological infrastructure within the city.

The Spatial Planning and Land Use Management Act (SPLUMA) also has a weakness in terms of supporting water resilient frameworks as it does promote WSD principles. Water sensitive design principles are not incorporated in the current design standard and building codes, and current green building policies focus more on sustainable energy principles and less on climate adaptation.

In recent years, the municipality has been able to get some developers to implement WSD design guidelines for new developments. However, there is still a significant challenge with needing to retrofit existing infrastructure and the lack of funding and incentive to do so. There are developers who view blue-green infrastructure favourably and incorporate it into plans to increase the amenity and therefore real-estate value, however there are others who view it as too expensive and hard to maintain.

Showcasing examples where the application of WSD principals has improved profitability and liveability within the CoJ are critical in making the case for more widespread implementation of green infrastructure solutions.

There are existing pilot projects that have tested water sensitive design technologies and explored alternative sources of water supply, however there has been no large-scale roll-out or planned implementation across the City.

Johannesburg is prone to intense storms and flash flooding which is exacerbated by insufficient and aging drainage systems and a lack of green infrastructure in certain regions of the city. The stormwater by-laws and manual has been updated to incorporate WSD principals, but it is yet to be fully adopted and utilized by developers. There is also a lack of enforcement to ensure accountability.

The Water Sensitive Cities Index (WSCI) was used in the process of developing the CoJ Water Security Strategy (WSS) and therefore the strategy encourages the incorporation of WSD principles into the planning

7. Slow Uptake of Water Sensitive Design

and development of the city for the purpose of building adaptability, resilience, and sustainability into urban water management.

In addition to the WSS, legislation such as the stormwater by-laws, plans such as the Climate Action Plan (CAP), and design guidelines such as the updated CoJ Stormwater Manual and revised Neighbourhood Planning and Design Guide (the Red Book) all advocate for water sensitive urban design to be incorporated into urban planning at the citywide scale.

RELATED INDICATORS

- 4.4 Enforcement of land use regulations and zoning
- 4.5 Enforcement of design guidelines and construction standards for water infrastructure
- 8.2 Promotion of diverse infrastructure for flood protection
- 9.4 Protection of aquatic habitats and ecosystems
- 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 neighbourhood blue-green infrastructure

ROOT CAUSES

Social Causes

A deep societal issue affecting the progress of WSD is illegal dumping and littering by citizens and industrial actors. Pollution and environmental degradation in Johannesburg caused by illegal dumping is a major concern and continues to undermine developments towards waste sensitive designs. The culture of illegal waste dumping is fuelled by beliefs that someone else will do the "job". While the CoJ provides solid waste management services, there are certain parts of the city, particularly informal areas, marginalized areas, low-income areas, and neglected parts of the central business district where illegal dumping of waste is prominent. Several factors also influence this social behaviour. Firstly, there is generally a lack of environmental knowledge and concern for the well-being of ecosystem services within the citizens. Secondly, there is limited law enforcement preventing illegal dumping and littering.

Human activities, such as the development of informal settlements in floodplains, also threatens and undermines WDS in the city.

For multiple reasons related to limited access to basic services, safety, and hygiene, it is common for residents in informal settlements to discard waste directly into the environment. Where there is a lack of accessible and safe sanitation services, residents may use the environment as a substitute. While there are environmental policies prohibiting human activities in ecological hotspots, human settlement and human rights policies make it challenging to prevent these settlements.

In addition, prevention and removal of informal settlements is often meet with protests and political interference. In formal residential areas and business districts, there is also a developing culture where property owners and managers reduce their maintenance costs by installing pavement. This affects the hydrology of the area and can contributing to increased flash flooding.

Technological Causes

Johannesburg and areas around the city are historically gold-mining areas. This major economic activity, which is behind the establishment of the city, has left a legacy of acid mine drainage. Acid mine drainage (AMD) is a by-product of mining pollution. It is a process whereby water that has come into contact with exposed mine workings forms sulphuric acid and a highly saline mixture. Further, metals from the exposed underground/opencast workings or naturally occurring in the watercourse become dissolved thereby exert a toxic effect on the ecosystem. Younger (2001) describes AMC as the single most significant threat to Johannesburg.

Political & Governance Causes

The management and planning for WSD, takes place in multi-level governance environment with the following key stakeholders:

7. Slow Uptake of Water Sensitive Design

- National government: Department of Water and Sanitation, proto catchment management agencies, Department of Environment, Fisheries, and Forestry, South African National Biodiversity Institute
- Provincial government: Department of Environment, Fisheries, and Forestry
- Local municipality: (City of Johannesburg, Johannesburg City Parks and Zoo, Johannesburg Road Agency.
- Non-government organisations (NGOs) that partner with government for resource mobilization, research, planning, and implementation: private sector, development agencies, NGOs, CBOs, and academic institutions.

Responsibilities are also divided between the different government actors based on departmental policies. Even though there is a large community of stakeholders, impact is limited by the fragmented nature of governance. With limited coordination between stakeholders, there is also the potential for duplication of efforts, ineffective use of resources, and confusion in interpretation of the different mandates.

Financial Causes

While there are multiple government actors working in the water sensitive design environment and green infrastructure, there are limited funds from across all spheres of government. At a municipal level, green infrastructure is under-funded and is not identified as a priority compares to other services such as water and sanitation. The fragmented governance nature also limits opportunities for a consolidated approach.

8. Lack of Alternative Water Source Implementation

CHALLENGE QUESTION

How can the City of Johannesburg incorporate alternative water sources into long-term water security planning without impacting on future revenue streams and by overcoming the negative perceptions to ensure an urban water supply that is resilient with redundancies?

CHALLENGE DESCRIPTION

The City of Johannesburg Water Security Strategy (2022) recommends the diversification of water supply options for the purpose of building resilience and advocates for the support of feasibility studies and pilot projects for the implementation of alternative water supplies at the local and catchment level as part of the Integrated Vaal System.

Johannesburg Water (JW) currently supplies treated effluent to a range of commercial and industrial users and intends to expand their customer base. There are already incentives in the form of lower tariffs to encourage users to adopt the use of treated effluent. JW is also investigating the options for direct potable reuse (i.e., the treating of effluent to potable standards) and indirect potable re-use (i.e,. the mixing of treated effluent with surface water sources before treatment) to meet the growing urban water domestic and industrial demand.

There have also been research studies related to increasing groundwater use, rainwater and stormwater harvesting. The CoJ EISD recently investigated the potential for increasing regional attenuation of stormwater which would not only help to address some of the current and future flooding challenges but could also be considered as a future alternative water source.

The treating of Acid Mine Drainage (AMD) has also been investigated by the Department of Water and Sanitation (DWS) as it is necessary to treat AMD to minimize the impact that this is having on the natural environment. This would also be a potential alternative water use as the technology is available and is already being implemented in a few pilot studies. The challenge with using AMD as an alternative water source is the cost of treatment and the limited interest from industry to take up supply. Until the issue of cost is addressed, the use of AMD as a viable alternative water source will be limited.

Although the use of alternative water sources would increase the resiliency of the system over-ll, there is hesitancy on behalf of the City to promote it for a number of reasons, including loss of revenue.

Furthermore, the use of alternative sources would require the CoJ to consider changes in its mandate from being the supplier of water in collaboration with Johannesburg Water to having more of a regulatory responsibility for managing diversified sources.

While different agencies are exploring options for alternative sources, this is being conducted on an ad-hoc basis and lacks a coordinated effort to incorporate it into the long-term plan for water security.

There is also an issue of safety and a concern that decentralised infrastructure,such as individual boreholes or stormwater harvesting, would be subject to theft and vandalism for which there are additional costs to be considered. Although the perception of viewing stormwater as a resource as opposed to a hazard is changing, the infrastructure and governance structure is yet to support this shift. There is a lack of capacity and resources to support the transition from research on the use of alternative sources to feasibility stage and then to design and construction. While re-use of AMD has been investigated, the stigma that the water is too contaminated to even be considered as a source still persists.

There are also social and cultural perceptions around wastewater re-use which would have to be overcome in order for it to be considered as a feasible source.

8. Lack of Alternative Water Source Implementation

RELATED INDICATORS

- 5.3b Incorporation of redundancy into water sources
- 6.3 Provision of sufficient financial resources for new water programmes and projects
- 9.2 Promotion of sustainable commercial and industrial water use
- 9.2 Promotion of sustainable household water use
- 12.2 Provision of sufficient water quality and quantity for industry and commerce

ROOT CAUSES

Social Causes

Water pollution is a significant concern with the citizens of Johannesburg as well as the municipality. The majority of the rivers in the city are already heavily polluted, ranking between a D (large loss of habitat and basic ecosystems functions) to an F (near complete loss of habitat and destroyed ecosystem functions) and all of the wetlands in the City are threatened and endangered (CoJ, 2021).

Water pollution caused by poor quality effluent discharges, sewer spills due to aged infrastructure and limited maintenance, illegal dumping, acid mine drainage, and pollution of feeder stream and water bodies by mine residue areas subsequently limiting reuse potential and stigmatization of re-use of treated effluent (Schäffler et al., 2013).

In Johannesburg, and most cities in South Africa, the stigma is driven by cultural perceptions attached to viewing treated effluent as a hazard as opposed to a resource.

Downstream of Johannesburg, there are other water users depending on the same catchment through the Integrated Vaal River System. Water flowing from Johannesburg, including the significant volumes of treated effluent discharged into rivers becomes part of the source water for some downstream users. As with most catchments, water tensions related to allocation exist. Johannesburg is located at the source of two water basins: Crocodile River Catchment and Vaal River Catchment. Downstream water users reliant on upstream water coming of the Johannesburg therefore have concerns around the CoJ exploring alternative water sources that could potentially have negative consequences on the rest of the water users and the environment.

Environmental Causes

With concerns over the health of rivers, environmental flows are required in South Africa and form part of the Ecological Reserve. Environmental flow is the amount of water left in, or released into, a river system for maintenance of a healthy riverine ecosystem and rehabilitating of threatened systems. Within the Integrated Vaal River System, all the water users, of which the environment is recognised as one, have water allocations licensed by the Department of Water and Sanitation. For the IVRS, approximately 8.4% of the 3 919 million m3 per annum of the available surface water yield is allocated to the environmental flows. According to the latest reconciliation strategy of the Integrated Vaal River System, ecological requirements are expected to grow faster than the agricultural and industrial sectors as they are implemented (Department of Water and Sanitation, 2021).

With Johannesburg exploring alternative water sources, there is a concern that this might have a negative impact on the environmental flows of which some of the contributions are from stormwater runoff and treated effluent collectively maintaining the river ecosystems. Therefore, altering the use and timing of these sources might negatively impact the environment in not planned holistically.

Technological Causes

The Water Research Commission, Department of Water and Sanitation, municipalities, and research institutions have led various feasibility research studies and piloting some of the innovation related to water re-use, rainwater harvesting, and other alternative water sources. However, there has been generally a lack of exploration of best practices and technologies that could specifically be appropriate for Johannesburg.

Very few municipalities in South Africa have adopted alternative water sources, venturing outside of the traditional surface water supply.

8. Lack of Alternative Water Source Implementation

The City of Cape Town, following the recent Day Zero crisis has piloted a potential direct potable re-use (DPR) plant and is currently undertaking detailed design studies for full scale development. Along with the design, the City of Cape Town has also initiated a comprehensive study to address other barriers to successful implementation including compliance with international standards, social and cultural norms as well as addressing any other misconception. The CoCT has also developed municipal guidelines that support alternative and diversified water sources.

It would be very useful to learn from this experience and apply some of the thinking currently being tested by the CoCT to CoJ.

The town of Beaufort West has successfully implemented a 15 ML/d direct potable re-use (DPR) plant and other cities such as eThekweni and Nelson Mandela Bay are also investigating DPR as an alternative resource.

With regards to stormwater harvesting, there are several international case studies to consider, and the City of Cape Town is also currently investigating this option as well.

Political & Governance Causes

The Department of Water and Sanitation regulates catchment flows and prevents the City of Johannesburg from using its treated effluent due to concerns around downstream users being dependent on the supply from upstream. To be able to explore re-use as an option, the CoJ would have to apply for a license for the Department of Water and Sanitation. The lack of capacity within the City department limits the progress that is required, including engaging with DWS, on this important matter.

The City is also dependent of Rand Water for bulk water supply. While the city has faced nearly zero experiences, there has not been great efforts and pressure for the city to explore with water resources within the city's boundaries. The dependence on Rand Water has therefore meant that diversification of water sources is not an immediate priority.

Financial Causes

For municipalities todiversify their water sources, a significant budget should be availed to its water and sanitation department. Cape Town Metropolitan Municipality is one of the few cities in South Africa that has allocated significant budgets for diversification of water sources. Driven by the 2015-2017 severe droughts, financial resources, human capacity, and leadership and the National Treasury supported investments in diversifying its water sources. For example, the City of Cape Town aims to have:

- 50 million litres per day from desalination to come online by 2026,
- 70 million litres per day from re-use to be effective by 2024, and
- 105 million litres per day to be effective in series by 2022.

The CoJ is yet to benefit from any political support that could enable financial resources to be made available for a large-scale water resources diversification programme. Given the water and sanitation infrastructure backlogs already facing the city and the limited efforts towards exploration of alternative water sources, this would require significant resources to cover feasibility assessments, design, and implementation.

Outside the municipality, there are interests from the large companies, particularly big water users, to explore alternative water sources such as groundwater and re-use. The use of alternative water resource would mean that the companies would be off Johannesburg Water's water grid.

The CoJ currently does not have a policy that informs the alternative water use by large scale water users in the city and in the process of developing one. Large-scale water users are a source of revenue for the CoJ. There is generally a fear within the CoJ that companies going off-grid would result in substantial revenue loss, worsening the financial challenges.

9. Stormwater Management

CHALLENGE QUESTION

What are the opportunities for the City of Johannesburg to introduce sustainable and equitable pricing strategies and exploring alternative sources of funding (private sector funding/finance equity, commercial debt, climate finance, development fees, taxes etc.) by overcoming finance and capacity challenges in the form of an under-performing cost recovery model, disabling bureaucracy and fund availability to enable a resilient water system?

CHALLENGE DESCRIPTION

Service provision is typically financed at the local level through tax revenues, tariff income, and higher-level government allocations.

In addition to other challenges, the lack of financial resources has contributed to increasing levels of debt and neglect of maintenance, rehabilitation and repair of infrastructure that contributes to more failing infrastructure.

Water and sanitation use tariffs are crucial for long-term financial sustainability of water and wastewater infrastructures and services.

Tariffs, along with other sources of finance are required to cover operation, maintenance and renewal costs of basic infrastructure.

Although some generic tariff setting principles are established in the Pricing Strategy for Raw Water Use Charges, apart from a yearly stakeholder consultative process on tariffs, the CoJ appears to lack the data, understanding and mechanisms to design and implement pricing strategies that allow them to fund water and sanitation services through mixture of revenues including tariffs, taxes, and transfers while enabling economic efficiency, providing water conservation incentives to ensure equity and affordability. Nevertheless, the sustainability of water and sanitation maintenance services continues to depend on revenues raised through tariffs, in addition to small subsidies.

Low tariffs, coupled with inadequate income from other sources of revenue, lack of up-to-date data, and capacity limitations over the long run have led to a vicious circle of poor maintenance and deterioration of services that affect users' willingness to pay and induced a decrease collection efficiency.

Tariffs are also a critical tool for managing consumption. There is an opportunity for the city to pay greater focus on water demand management, particularly non-revenue water (NRW), to reduce input unrecoverable costs particularly related to 'physical and commercial losses'. However, losses under 'unbilled authorised consumption' are more difficult to reduce, as this consumption includes water supplied to informal settlements, water used for emergency services and water used for the piped network maintenance, among other uses.

A steep tariff system is useful to encourage users to use water wisely, but the provision of Free Basic Water for those not able to pay places a strain on the system due to the base operation and maintenance costs involved regardless of the quantity provided. Finding a way to balance the right to access to basic services with the financial needs to maintain the system requires new and innovative thinking.

The current cost recovery model is based on cross-subsidisation where utilities subsidize those that have low revenue collection and high-income groups subsidize low-income groups. This model is prone to failure where low revenue generating utilities exceed the high revenue ones and low-income groups exceed high income groups to the extent that the system ends up generating an overall loss and cross-subsidization is insufficient.

9. Stormwater Management

A further challenge exists around promoting the use of alternative water services at a household level which would contribute to water supply resilience but results in a reduction of municipal revenue and ultimately reduced financial resilience. The fact that high-income groups are the ones who can afford the investment into alternative water sources would place a further stress on the revenue model because the water service provider is dependent upon them to subsidise low-income groups.

There is also a general lack of transparency regarding financial resources at local level and bureaucratic structures tend to hinder service providers from seeking their own financial resources to prevent corruption which in turn also prevents the exploration of other funding avenues to increase resources.

Rules norms and standards for effective economic regulation exist but there is a lack of enforcement, monitoring and evaluation.

The current system of allocating budgets to different services and departments does not have a formal allocation system based on social and economic impacts but tends to be based on previous allocations and short-term political objectives.

It is essential that the importance of providing sufficient resources for water and sanitation services and including the maintenance of infrastructure is recognised.

There is limited funding to finance new or expanded capital projects and programmes that support improved water resilience.

Exploring ways of including the private sector in helping to fund the provision of critical infrastructure and services is critical.

RELATED INDICATORS

- 4.1 Effective enforcement of economic regulations for water
- 6.2 Provision of sufficient financial resources for maintenance and upkeep of water infrastructure
- 6.3 Provision of sufficient financial resources for new water programmes and projects
- 6.4 Water and sanitation pricing for cost recovery and demand management
- 7.2 Ensuring adequate funds to government for disaster recovery
- 7.3 Ensuring adequate financial resources for recovery of households and businesses

ROOT CAUSES

Social Causes

There is a general culture of entitlement to basic services in South Africa and a lack of trust in service delivery that results in a culture of non-payment for basic services has resulted in poor revenue collection.

Growth due to population expansion and migration (internal & external) has resulted in a demand for basic services that exceeds the City's ability to cope due to restrained financial resources.

Environmental Causes

Climate change is having an impact through an increased frequency of storm events which causes damage to infrastructure and increases the cost for rehabilitation and maintenance. The need to reduce consumption as a result of increasing water scarcity also contributes to reduced revenue generation from water sales.

Political & Governance Causes

Political pressure to reduce tariffs without considering alternative financing systems will cause the system to fail because the tariff system is based on cross-subsidisation.

The consideration of Johannesburg Water (JW) being an independent entity to the City of Johannesburg has arisen, however it is not possible due to the City being reliant on the revenue generated by JW to function.

Lack of political stability results in poor decisions made around operating systems. It is also hard to make long term commitments to improve resilience and sustainability in the face of short-term political incentives and decision making.

To tackle corruption, the City has very strict regulations for procurement in place. However, this results in delays

9. Stormwater Management

in supply chain ineffective implementation of initiatives and constraints around operation.

Financial Causes

There is a lack of support for exploring alternative funding and financing options.

Despite its challenges, due to its economic situation, Johannesburg is not viewed as a desperate enough city to compete for grants and "free money." Oher African cities take preference in this regard.

Johannesburg Water's creditworthiness is dependent on the CoJ and even though JW has not exceeded their loan percentage limitations, the CoJ has and therefore JW is limited in borrowing money.

Equitable share issued by national treasury does not get awarded to Joburg Water.

The CoJ is responsible for allocating budgets and therefore JW is not privy to the entire of its own revenue generated. Increases in tariffs would not necessarily translate into an increased budget for JW if not viewed as a priority for the City.

The billing and collection system does not perform optimally and has resulted in poor revenue collection and lack of funds for operation, rehabilitation, and maintenance.

Other Causes

There is a lack of innovation to explore options of how best to leverage alternative funding options such as climate financing.

4

VISIONS

This section describes the process of analysing the interdependencies and alignments between emerging opportunities and prioritizing these into an initial high-level visions and priority actions. It looks at alignment with existing projects and programs and indicates some potential next steps.

Each of the identified nine Urban Water Resilience Challenge Areas are shown below along with the specific opportunity statement and the alignment with the action areas for the existing Water Security Strategy.

CHALLENGE AREA FOR URBAN WATER RESILIENCE	OPPORTUNITY STATEMENT	AREA OF ALIGNMENT WITH THE WATER SECURITY STRATEGY
1. Urban Water Asset Maintenance	**Promote a pro-active mindset that prioritizes maintenance of water assets that is holistic, and stakeholder driven.**	*Overlap with managing water demand and losses (SR2)*
2. Internal Governance	**Encourage behavioural changes to create a collaborative working environment within and between government organizations that promotes transparency, communication, integration and working towards common resilience goals.**	*Overlap with achieving coordinated good water governance (SR7)*
3. External Stakeholder Engagement	**Strengthen existing partnerships and build new ones by connecting and collaborating with external stakeholders.**	*Overlap with nurturing a water conscious society (SR6) and achieving coordinated good water governance (SR7)*
4. Slow Uptake of Digital Water	**Collate existing data within and between government departments and streamline the generating of infromation and access to real-time data to enable better decision making.**	*Overlap with managing water system's knowledge and data (SR5)*
5. Lack of Resilience Planning	**Obtain political understanding and support in order to encourage behavioral and mindset changes towards resilience championing and cooperation in planning, processes, procedures and decision-making.**	*Overlap with nurturing a water conscious society (SR6) and achieving coordinated good water governance (SR7)*
6. Systematic Inequality in Provision of Water Supply Services: Formal vs Informal	**Open lines of communication and encourage relationship building by collaborating with external stakeholders and the private sector to develop sustainable, equitable and holistic solutions that ensure quality and reliability of service provision to indigent and vulnerable communities.**	*Overlap with ensuring access to safe, reliable, and equitable water services (SR3)*
7. Slow Uptake of Water Sensitive Design	**Encourage the widespread promotion and appropriate us of blue-green infrastructure in the development planning process and leverage current initiatives with stakeholders to promote water sensitive design in education and training.**	*Overlap with promoting a resilient, liveable, and sustainable urban water environment (SR4)*
8. Lack of Alternative Water Sources	**Improve water security and resilience by introducing redundancies in the water supply system through the exploration and use of alternative sources of water, including re-use of treated effluent and acid mine drainage water.**	*Overlap with securing the water supply (SR1) and promoting a resilient, liveable, and sustainable urban water environment (SR4)*
9. Unsustainable Funding & Finance	**Develop a plan for diversifying revenue streams and better management of financial resources through stakeholder engagement with a particular focus on the private sector.**	*Overlap with achieving coordinated good water governance (SR7)*

CHALLENGE	VISION	ACTIONS
1. Urban Water Asset Maintenance	**Robust and well-operated infrastructure through consistent proactive maintenance**	*Action 1 – Consider alternative arrangements to improve urban water asset management and reduce non-revenue water including potential for PPPs.* *Action 2 – Improve the asset management information system to be based on real time data collection and proactive asset maintenance planning.*
2. Internal Governance	**Collaborative and well coordinated organizational culture between and within government agencies.**	*Action 1 – Improve strategic alignment of relevant departments within CoJ to build a collaborative approach to improved urban water resilience.* *Action 2 – Embed an understanding of the value of water in the City's long terms prosperity among relevant departments within the CoJ to get support for resilience actions.*
3. External Stakeholder Engagement	**Improved collaborative relationships between the City of Johannesburg and external stakeholders.**	*Action 1 - Strengthen existing external stakeholder engagement platforms and build new ones for inclusive water resilience planning and implementation.* *Action 2 - Develop and implement effective communication channels, e.g., robust early warning system, that can enable timely dissemination of information on water stresses and shocks among citizens.*
4. Slow Uptake of Digital Water	**Well-run secure digital systems operating in real time to inform decision making with reliable, well-maintained data collection and information systems.**	*Action 1 - Leverage existing data platforms to build a water resilience dashboard and decision support system (DSS) for the CoJ.* *Action 2 - Develop and pilot a digital project to test the feasibility of digital solutions to track water losses prior to large scale implementation.*
5. Lack of Resilience Planning	**A resilient, productive and liveable city, able to adapt and thrive to acute shocks and chronic stresses.**	*Action 1 - Establish a resilience office to embed the principle of resilience and to lead and champion priority initiatives across several departments.* *Action 2 – Align with the Climate Action Plan (CAP) to identify priority actions/projects that can then be packaged for adaptation funding.*
6. Systematic Inequality in Provision of Water Supply Services: Formal vs Informal	**Equitable and just service provision reflective of collaborative relationships between the City and its communities.**	*Action 1 - Acknowledge and celebrate community-led existing initiatives around access to basic service provision in existing stakeholder engagement and the City's planning platforms* *Action 2 - Develop mechanisms to document and monitor community-led concerns and initiatives to understand key focus areas of intervention and opportunities for supporting from the CoJ.*
7. Slow Uptake of Water Sensitive Design	**A city made more resilient, liveable and amenable by accessible and well-maintained blue-green infrastructure.**	*Action 1 - Develop guidelines and appropriate pricing for alternative water sources technologies by private commercial users and tackle the stigma (and other roadblocks) limiting their safe and sustainable implementation and use.* *Action 2 - Fastrack the development of city-wide alternative water source options by the City of Johannesburg including decentralized groundwater schemes, stormwater harvesting and effluent re-use.*
8. Lack of Alternative Water Sources	**Diversified water sources.**	*Action 1 - Develop guidelines and appropriate pricing for alternative water sources technologies by private commercial users and tackle the stigma (and other roadblocks) limiting their safe and sustainable implementation and use.* *Action 2 - Fastrack the development of city-wide alternative water source options by the City of Johannesburg including decentralized groundwater schemes, stormwater harvesting and effluent re-use.*
9. Unsustainable Funding & Finance	**Robust financial model supported by sustainable financial resources.**	*Action 1 – Investigate and establish appropriate public-private partnerships (PPP) by engaging large private sector water users to promote a culture of strong water stewardship values.* *Action 2 - Review and improve the operation of revenue collection and ring fencing for water infrastructure to improve debt collection and increase the availability of financial resources*

VISION 1

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Robust and well-operated water infrastructure through consistent, proactive maintenance	**Promote a proactive approach to asset information management and a stakeholder led, whole life cycle asset maintenance and management system.**	**#1 Limited Urban Water Asset Maintenance**

VISION DESCRIPTION

In order to efficiently operate infrastructure to deliver urban water services, it is necessary to prioritize operation and maintenance (O&M).

Maintaining infrastructure is just as important as initial installation and therefore operating expenditure is as essential as capital expenditure. However, as a result of a lack of resources and capacity, the City has built up a maintenance backlog that has been growing since 2008. Inefficiently performing infrastructure due to a lack of maintenance has resulted in increasing percentages of non-revenue water, wastage and pollution of the environment in the case of sanitation infrastructure failure.

This vision aims to create well-operated, maintained and managed infrastructure by changing the current approaches and practices of asset management from being primarily reactive to a being more proactive, encouraging stakeholder ownership and collaboration, developing better systems for asset management and ensuring the availability of resources to support operation and maintenance.

The following needs shall be addressed:

- Creation of a proactive approach to maintenance and operation of infrastructure and its prioritization
- Asset management systems that provide the location, characteristics, and condition of grey, and green infrastructure, improving the capacity to identify and track maintenance needs.
- Overlapping mandates and ensure that roles and responsibilities are clearly defined to cover all types of infrastructure operation and maintenance.
- Skills development and training of municipal staff to ensure technical competence for O&M.
- Financial strategy that ensures the securing of long-term sustainable funding required to maintain infrastructure over the entire lifecycle.

RELEVANT ASSETS AND RESOURCES

- CoJ Water Security Strategy
- CoJ Climate Action Plan
- National Water Resources Strategy
- Johannesburg Integrated Development Plan

SHOCKS AND STRESSES

- Water-related natural disasters
- Wastage of financial resources
- Wastage of natural resources
- Environmental degradation and contamination

OVERALL CHAMPIONS

Lead
City of Johannesburg EISD

Strategic Partners
Rand Water
Johannesburg Water
Johannesburg Road Agency
Strategic Water Partnership Network

Approval
Mayoral Committee

VISION 1

ACTION 1.

Consider alternative arrangements to improve urban water asset management and reducing non-revenue water including Public-Private Partnerships (PPP).

DESCRIPTION

This proposed action aims to establish a catalytic stakeholder partnership to mobilise resources and address asset maintenance challenges through the Strategic Water Partnership Network (SWPN).

The SWPN is a multi-stakeholder (public, private and civil society) partnership working collectively to close the gap between water supply and demand. The vision of SWPN is to contribute to efficient, equitable and sustainable water supply and access to water and sanitation for all South Africans through the identification and application of innovative and cost-effective solutions. The approach of the Water Partnership is to support government endorsed plans and projects by mobilising private sector resources, such asfinance, expertise and information.

The SWPN has established Water Partnerships in Polokwane Municipality where the partnership supported towards the reduction of non-revenue water. The support provided included flow assessment and carrying out best value for money infrastructure repairs identified through the assessment.

SWPN has recently launched a Water Partnership in Nelson Mandela Bay Municipality for reduction of non-revenue water. SWPN has shared interest to explore a City of Johannesburg Water Partnership with the aim to catalyse resources mobilization from multiple stakeholders and jointly address non-revenue water, wastewater treatment, and other pressing water challenges that CoJ grapples with. Since October 2022, SAWP, through the UWR work, has engaged the CoJ on the interest to establish a partnership. CoJ is interested in working with SWPN to address some of the challenges related to maintenance of assets, particularly on non-revenue water reduction. Formalisation of the partnership will be approved by the CoJ council. This is expected to take place in 2023.

Stakeholders

Lead

- City of Johannesburg- Jo'burg Water
- City of Johannesburg- EISD
- Strategic Water Partnership Network
- Development Bank of Southern Africa

Approval

- City of Johannesburg City Manager
- City of Johannesburg Council

Next steps

- Johannesburg Water and EISD to present the proposed CoJ Water Partnership to the city manager
- Once approved by the city manager, Johannesburg water and EISD to present the proposed Water Partnership to CoJ Council
- Upon approval of the CoJ Water Partnership by council, SWPN and Johannesburg Water to formalize the partnership through an MoU.
- Johannesburg Water and SWPN to formally launch the partnership
- On-going engagement of private sector by SWPN

Expected outcome

- Improved relationships between City of Johannesburg and private sector
- Reduction of non- through maintenance and infrastructure replacement
- Diversified revenue streams

VISION 1

ACTION 2.

Improve inclusiveness of asset management information and performance monitoring system based on real-time data collection, inclusive citizen engagment, and proactive asset maintenance and planning.

DESCRIPTION

Johannesburg's non-revenue water losses account for 34.5% of the total water supplied to the municipality. Water leakages contribute significantly to this figure. Johannesburg Water and EISD must oversee a reduction in non-revenue water both to conserve valuable water resources and recover potential revenue for the infrastructure.

One of the key measures for tracking and responding to water leakages has been the inclusion of citizens in monitoring and reporting through various platforms such associal media, call center, and email. While these measures have been effective, they tend to exclude the majority of the city's population, specifically the low-income demographic. As such, unreported leakages tend to be high in low-income areas, particularly in informal areas.

A collaborative pilot initiative is proposed between Johannesburg Water, World Resources Institute, and an identified low-income neighbourhood for a mobile water leakage detection project. The aim is to enable citizens in these areas to actively engage in water management through the capturing of data that allows effective response measures from Johannesburg Water.

The mobile water leakage detection pilot project would also improve water data analysis to better identify and mitigate potential infrastructure issues. Data analysis will also enable Johannesburg Water to plan and budget for improving and upgrading existing systems and implement new systems where data collection and monitoring systems are missing.

Stakeholders

Lead

- Johannesburg Water
- World Resources Institute (WRI)
- GSMA
- Identified local community
- Strategic Water Partnership Network

Approval

- City of Johannesburg City Manager
- City of Johannesburg Council

Next steps

- Johannesburg Water, WRI, and GSMA to refine the scope of the pilot project
- Johannesburg Water to initiate the pilot project approval through the city's processes
- Co-identify a partnering community

Expected outcome

- Strengthened water resilience city through the reduction of water losses and strides towards healthy urban spaces and prosperous communities
- Improved water data analysis
- Improved capacity for Johannesburg Water to respond to leakages
- Improved service delivery, particularly for underserved communities

VISION 2

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Collaborative and well-coordinated organizational culture between and within government agencies.	**How can the CoJ encourage behavioural changes to create a collaborative working environment within and between government organizations that promotes transparency, communication, integration and working towards a common goal for improved water resilience?**	**#2 Inefficient Internal Governance**

CHALLENGE DESCRIPTION

The City of Johannesburg has a highly bureaucratic, regulatory environment wherein teams tend to work in silos. This type of environment works to streamline individual efforts. However with the current resilience challenges compounded by the growth expectations for the City, this type of structure can result in inefficiencies with overlapping and unclear mandates.

Regardless of whether resources are plentiful or not, inefficient governance within and between government departments can result in a poorly managed and failing urban water system.

The City needs to consider how to create a positive and collaborative working environment across different departments whereby efforts are coordinated as opposed to duplicated and resources are used efficiently and effectively.

There will be resistance to change for most government departments and there is a challenge of attempting to change the organizational culture whilst ensuring that day-to-day tasks remain taken care of so that the City can still continue to operate. The additional challenge is where to locate the resources in order to enact the change and gain approval.

Executive buy-in is also necessary because of the respect given to hierarchy and top-down directives within the CoJ. The challenge for the city is to develop a clear strategy that outlines how the organizational structure is to change whilst ensuring that the municipality meets its day-to-day requirements.

Several other cities internationally and in South Africa have achieved the support of multiple departments through the appointment of a Chief Resilience Officer (CRO) who is responsible for championing and coordinating the efforts of other departments that is necessary to support resilience. This is something that the City of Johannesburg should consider.

VISION STATEMENT

While building resilience and tackling climate change are core priorities for the City, as a whole, it is not properly staffed with adequate resources or clear directives to tackle these issues. Collaboration between different departments and the breaking of silos within and across departments is critical.

The following needs shall be addressed:

- Identification of overlapping roles, responsibilities and mandates to ensure efficiency in the way programmes are executed and to minimise the wastage of critical resources
- Enabling a positive and collaborative working environment whereby employees remain motivated to continue their tasks
- Improved transparency and information sharing between and within government agencies to ensure effective decision making
- Streamline the values and priorities and ensure that all departments adhere to a common direction and goals

VISION 2

RELEVANT ASSETS AND RESOURCES

- Johannesburg Water Research Development & Innovation.
- City of Johannesburg Smart City Office.
- CoJ Climate Action Plan (CAP).
- CoJ Water Security Strategy
- National Water and Sanitation Master Plan (DWS)
- Integraed Vaal River System (IVRS) steering committee meetings (DWS).
- Updated of the IVRS Recon Strategy.
- City of Cape Town Directorate for Resilience and Future Planning
- City of Cape Town updated Water Strategy and Water Resilience Profile as example.
- Greater Cape Town Water Fund

SHOCKS AND STRESSES

- Wastage of financial resources
- Wastage of human resources
- Population growth and urbanisation
- Infrastructure failure
- Climate Change
- Water Security

OVERALL CHAMPIONS

Lead
City of Johannesburg (CoJ)

Partners
CoJ Environment and Infrastructure Services Department,
Joburg Road Agency,
Joburg Water,
Rand Water,
Department of Water and Sanitation,
Private Sector.

Approval
Mayoral Committee

VISION 2

ACTION 1.

Improve strategic alignment of relevant departments within the CoJ to build a collaborative and integrated approach to improved urban water resilience.

DESCRIPTION

This action aims to improve collaboration and coordination within and between water-related government agencies to enable an efficient and effective operation across the City's water cycle. Fulfilling this purpose is a complex task that requires strategic thinking and efficient stakeholder engagement at the city level and will take time. The city with its separate entities is structured to streamline tasks and prevent integration and therefore the challenge is to revisit all the different mandates between the water-related entities and redefine them as well individual roles and responsibilities to ensure accountability by eliminating overlapping responsibilities.

There is an opportunity to enact behavioural change and shift the City's organizational culture from a control culture to a collaborative one. Eliminating redundancies in overlapping mandates could assist with better management of human and financial resources. Having open lines of communication and constant collaboration makes for easier embedding of principles such as sustainability and resilience. Collaboration fosters stronger partnerships and ensures better strategic alignment where government agencies support one another on a shared vision.

This action is supported by the development of various strategic action plans such as the Water Security Strategy and the Climate Action Plan as well as the Vision 2030 that should be reviewed to find points of alignment. This should also include the plans of other relevant actors such as JoBurg Water, Rand Water, Provincial Government, and the DWS for the Integrated Vaal River System.

Each department within the CoJ has its own strategic plan and annual work plan that identifies priority actions and budgets. These should also be aligned for improved collaborative action towards water resilience.

Resources

- CoJ Water Security Strategy
- CoJ Climate Action Plan
- Vision 2030
- DWS IVRS Reconciliation Strategy
- City of Cape Town updated Water Strategy and Water Resilience Profile as example.

Stakeholders

Lead

- CoJ EISD

Approval

- Mayoral Committee

Next steps

- Strengthen existing partnerships through establishment of internal coordination forums, a Resilience Task Team, with a composition made of officials from relevant departments and agencies. The aim would be to improve dialogue, mend poor relationships, and forge new partnerships.
- Develop a strategy to align entities and departments by exploring current mandates, and outlining a common transition path.
- Map out existing roles and responsibilities and redefine to support envisioned goals including Key Performance Indicators.
- Once a plan of action has been established, ensure stakeholder buy-in prior to submitting for approval

Expected outcome

- Improved integration and strong relationships within and between government agencies.
- Streamlined approaches and practices that are more effective and efficient when it comes to resourcing due reduction in overlapping mandates and inefficiencies.
- More accountability due to defined roles and responsibilities and clear actions from this.

VISION 2

ACTION 2.

Embed an understanding of the value of water in the City's long terms prosperity among relevant departments within the CoJ to get support for resilience actions.

DESCRIPTION

This action aims to highlight the value and importance of water in order to improve the way water is valued. This includes improving water literacy by educating stakeholders about the way water is managed in the city, how water is sourced and the essential systems that require water to function. The challenge is that the importance of water and the city's reliance on the resource for the functioning of the economy is often neglected unless there is a water crisis. Due to the City's reliance on an external water supplier, water is not viewed as a top priority. To enable a water resilient city, it is necessary to enact a mindset shift from reacting to crisis to being proactive about preventing them and this starts with an understanding of how crucial water is to ensure continued survival.

By highlighting the value of water, the City is able to co-develop a clear vision of the importance of water, how water interacts with different departments and how different departments are reliant on the resource to function. If water is valued at the government level, there is an opportunity to share this sentiment with external stakeholders, improve their water literacy and enact a shift towards valuing the resource and the infrastructure that ensures its supply and potentially reducing the high per capita demand that the City deals with.

Resources

- CoJ Water Security Strategy
- CoJ Climate Action Plan
- Vision 2030
- DWS IVRS Reconciliation Strategy
- City of Cape Town updated Water Strategy and Water Resilience Profile as example.

Stakeholders

Lead
- CoJ EISD

Approval
- Mayoral Committee

NGOs
- Water for the Future

Next steps

- Assess and organise internal workshops to highlight how each department interacts with, values and is reliant on water.
- Organise external workshops and brainstorming sessions around how best to deliver the message through education and awareness campaigns around the city.
- Engage with the Executive Team and Mayoral committee to educate and lobby for water becoming a top priority for the City.
- Strengthen existing partnerships, mend poor partnerships and forge new partnerships to develop a clear vision centred around water that echoes throughout the municipality.
- Engage and partner with key stakeholders to effectively deliver the message
- Maintain constant awareness campaigns and include water literacy as an important aspect of education to streamline the message.

Expected outcome

- Water is valued and appreciated at an individual level to the extent that water usage is carefully controlled and people are water conscious.
- Water demand improved due to better management of water infrastructure including fixing leaks and preventing wastage timeously.
- Better water demand management prevents a wastage of resources and financial resources can be redirected to needs.

VISION 3

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Improved collaborative and effective relationships between the City and its external stakeholders.	**How can the City strengthen existing partnerships and build new ones by connecting and collaborating with external stakeholders to improve water resilience?**	**#3 External Stakeholder Engagement**

CHALLENGE DESCRIPTION

Johannesburg's water system planning and design processes currently lacks opportunities to engage with external stakeholders such as citizens, community-based organizations, civil society actors, the private sector, consultants and academia that has left them out of investment decisions and limits their capacity to access critical information about the water system they rely on. External stakeholder engagement is largely a tick-box exercise left to the end due to certain regulations requiring that stakeholders are informed of actions limiting stakeholder participation from the outset and valuable input that could be gained from their perspectives 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. Furthermore, poor relationships with stakeholders have resulted in a hostile environment with minimal communication and transparency.

In order to make inclusive and informed decisions on investments to strengthen water resilience, the City needs to engage effectively with external stakeholders. This requires actively integrating participatory processes in project design, decision making, and even implementation. It also requires improving the capacity of community-based organizations and civil society to understand the risks the city faces and help them navigate the city's complex institutional framework to advocate for solutions.

Through collaboration with the private sector, there are opportunities to enable water stewardship and simultaneously fund city initiatives.

Collaborating with academic and research institutions gives the City an opportunity to access data and information that could inform better decision making and provides the research institutions with the support and potentially funding they require to carry out their work.

VISION STATEMENT

This vision aims to address the mismatch between municipal actions and stakeholder needs by empowering stakeholders to influence the design, monitoring and implementation of water-related initiatives. It also aims to increase the awareness of stakeholders 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 stakeholders served by the city's water sector. It will also create opportunities for transparent communication of project implementation between the city and its stakeholders therefore creating accountability. The vision will strengthen the city's ability to build comprehensive engagement and will provide support to improve the effectiveness of existing efforts. This will benefit the city by reducing the burden through stakeholder involvement.

The following needs shall be addressed:

- Improve the awareness of water-related vulnerabilities among external stakeholders.
- Improve communication of risk between the City and stakeholders to improve awareness.
- Improve capacity of stakeholders to navigate the City's complex institutional framework.
- Increase opportunities for stakeholders to be involved in water-related project designs.
- Create platforms for stakeholders to monitor the implementation of water-related investments.
- Build accountability within CoJ's water sector.

VISION 3

RELEVANT ASSETS AND 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 visitors, many of them local. Its purpose is to help people understand and safeguard their environment and ensure integrated and durable development.
- 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.
- 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.
- 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.
- 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.

SHOCKS AND STRESSES

- Climate change impacts
- Population growth and urbanisation
- Outbreak of water-related diseases
- Infrastructure failure.

OVERALL CHAMPIONS

Lead
City of Johannesburg (CoJ)

Partners
Local civil service organizations, community leaders, academic and research institutions, private sector businesses, technical consultants

Approval
Mayoral Committee

VISION 3

ACTION 1.

Strengthen existing stakeholder engagement platforms and build new ones for improved and inclusive water resilience planning and implementation.

DESCRIPTION

Currently, external stakeholders such as the private sector, community-based organizations, civil society actors and academic/research institutions have limited voices in the planning of water-related projects within the CoJ. External stakeholders are usually engaged once a project has already been scoped to inform them of the activity rather than seek their input from the outset. Water literacy is also low with little public understanding of the roles and responsibilities of the different departments responsible for water-related service delivery. As a result, there is very limited understanding of how the urban water system actually operates, limiting stakeholder capacity to identify public sector entities responsible for meeting community's water needs and their potential input. External stakeholders 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 improving stakeholder engagement platforms with the City, by improving collaboration on water-related project development, increasing the visibility of stakeholder issues and contribution to program/project design.

This action is intended to benefit external stakeholders by giving them an opportunity to understand planned investments, communicate their context and challenges and help co-produce programs that are compatible with their needs.

It will also benefit the City in helping to ensure programs are in line with the needs of communities and identify pathways for reducing the burden placed on the City. This can be explored through mutually beneficial arrangements, i.e., private sector investments into water-related projects that enable business continuity through reducing the risk of water insecurity.

This action will encourage the integration of the knowledge and innovation between the city and stakeholders while also building on their relationship with communities to increase ownership of planned projects.

Resources

- 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.
- 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.
- 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.

Stakeholders

Lead
- City of Johannesburg

Partner
- Local civil service organizations, community leaders, activist groups, private sector, academic/research institutions

NGOs
- Mayoral Committee

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 Johannesburg.
- Identify relevant stakeholders who can have key contributions to the city's planning processes and understand what participatory approaches they want to engage with.
- Develop and pilot engagement and monitoring platform

VISION 3

This action will also create a framework for monitoring and evaluation for project and program implementation. This framework will effectively communicate the roles and responsibilities of different departments active in CoJ's water system, allowing stakeholders to understand who they need to hold accountable to ensure service delivery. As a result, it will ensure the transparency of water-related investments and create engagement opportunities so that communities can hold the government accountable for service delivery.

Outcome

- This action will grant stakeholders the platform to influence investments made in building water resilience across CoJ.
- 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 stakeholders together to convert context specific and informed program design into scalable actions that have localized relevance and ownership.
- It will allow stakeholders 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 and service delivery.

VISION 3

ACTION 2.

Develop and implement effective communication channels that can enable timely dissemination of information on water stresses and shocks among citizens.

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 Johannesburg'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 Johannesburg'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.
- "Day Zero" Communication Campaign: Cape Town issued a communications procedure to emphasize the need for behaviour change around water consumption in a manner that was inclusive, transparent, recognized good behaviour, and made it collaborative.
- 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.
- 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.
- 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.

Stakeholders

Lead

- City of Johannesburg, Disaster Management & Risk Unit

Partner

- Local civil service organizations, community leaders, schools, GCRO, funders

NGOs

- Mayoral Committee

VISION 3

Next steps

- 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 place-based approaches such as tactical urbanism).
- 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.
- 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.

Expected 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.

VISION 4

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Well-run secure digital systems operating in real time to inform decision making with well-maintained data collection, and well-functioning infrastructure.	**How can the City focus on encouraging the sharing and building of new ways to access shared data within and between government departments?**	**#4 Slow uptake of digital water**

CHALLENGE DESCRIPTION

In order to prepare for future water-related natural disasters and monitor the quantity and quality of Johannesburg's water systems, the city must address the challenge of ensuring data is well managed, actionable, of high quality, accessible and shared between stakeholders.

Systems for data collection, analysis, storage and usage for decision making is fragmented and poorly managed across a range of different teams and departments. There is a need to streamline digital systems in the city and ensure a transparent and collaborative approach is taken between and within government agencies. External stakeholders who rely on the city's data to design solutions are also affected by poorly managed digital information systems.

There is an added issue of the risks of cybersecurity attacks and a lack of financial resources and capacity that has resulted in a slow uptake towards digitizing systems.

VISION STATEMENT

This vision aims to equip the City with better information systems that enable better decision making with the most up-to-date and accurate information at all times. This will allow optimal and effective operation of the city's urban water management systems. 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 should be integrated into data platforms and strategic projects to encourage sharing data among stakeholders and across different agencies, as well as decrease the presence of biased data. Investments from the private sector and the promotion of entrepreneurship can also be leveraged to increase the financial resources available to support data collection and improve data quality and accessibility.

The following needs will be addressed:

- 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

RELEVANT ASSETS AND RESOURCES

- StoryMaps: Platforms like the ESRI ArGIS 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.
- 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.
- IWA Publication of Digital Water (Link).

VISION 4

- City of Cape Town Bulk Water Operational Decision Support System (DSS).
- Umgeni Water Information System.
- CSIR Greenbook on Climate Risk (Link).

SHOCKS AND STRESSES

- Climate change impacts
- Failure of critical infrastructure
- Vandalism and theft
- Increasing risk of droughts.
- Pollution spills and water quality risks
- Floods

OVERALL CHAMPIONS

Lead
City of Johannesburg: EIS

Partners
GCRO, Gauteng Province, DWS, SWPN, WRI.

Approval
Mayoral Committee

VISION 4

ACTION 1.

Leverage (and develop if necessary) existing data platforms to build a water resilience dashboard for informed decision-making support for the CoJ.

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 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 Johannesburg 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 what can be done differently and to work together using a shared framework.

This action aims to develop a water resilience dashboard for the CoJ similar to what was done for the City of Cape Town following the recent Day Zero crisis and leveraging on existing data platforms locally and globally, to facilitate the collection, consolidation, harmonization, storage and support access to data related to Johannesburg's water sector.

This would include information on available water resources, water demands, water consumption, drinking water storage, treatment capacity, supply, distribution, water resources quality/ pollution, sanitation, stormwater, wastewater, early warning systems and observed flooding, etc. Much of this information already exists but is not accessible form a single integrated system.

This action would also help to identify areas of missing data for new monitoring systems.

Resources

- City of Cape Town bulk water operational decision support system (DSS). This is a DSS stet up to monitoring near real time data on water use across the city and also includes linking to hydrologic models in terms of future water supply risks as well as simulating opportunities for ensuring continuity of service during maintenance. The DSS also includes information on water quality as well as levels of chemicals at treatment plants, etc.
- Ethekwini Strategic Hub which is a series of dashboards that provide insights on various functions and operations of the municipality. Ethekwini municipality has provided differentiated access to the dashboards. Some are primarily for internal use (eThekwini Municipality officials) and others are available to the public. Making these tools available to the public supports our objective of becoming a responsive city and promote co-governance. A key goal for the municipality is to encourage citizen engagement and avail information for citizens to make informed decisions. (Link)
- ResilSIM: A decision support tool that rapidly estimates the resilience (a modern disaster management measure that is dynamic in time and space) of an urban system to the consequences of natural disasters.
- Mike Operations (Powered by DHI)
- Delft-FEWS state of the art flood forecasting and early warning system.

Stakeholders

Lead

- City of Johannesburg

Partner

- Rand Water, Academic Institutions, City of Cape Town, WRC, Private Sector

NGOs

- Mayoral Committee

VISION 4

Next steps

- Mapping of all existing databases and systems for data storage in the Johannesburg 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.
- Research examples of existing data platforms setup by other cities, assess costs and benefits to help further refine the scope of the dashboard for City of Johannesburg.
- Seek funding to develop and launch a data platform that can integrate information from the various water-related data systems in existence in the city

Expected outcomes

- Enhanced capabilities for data sharing through an innovative data platform which will lead to improved decision-making for water resilience.
- 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 Johannesburg's urban development and growth.
- Leverage new technologies to create a framework that encourages innovation and entrepreneurship around data and provide an enabling environment for private sector involvement.

VISION 4

ACTION 2.

Leverage (and develop if necessary) existing data platforms to build a water resilience dashboard for informed decision-making support for the CoJ.

DESCRIPTION

This action aims to develop pilot projects that enable small scale changes prior to large scale investment and implementation in digital water investments. Pilot projects will be outcomes orientated with clear implementation pathways and stringent project management to ensure success. Using lessons learnt from pilot projects, the city will have a better understanding of what works and what does not in the context that it operates within. This will avoid wasting resources to implement large scale initiatives that fail without being tested first. One such pilot project example includes using a reporting system that alerts operation and maintenance teams of damaged infrastructure due to burst pipes, vandalism or theft to enable quick response and mobilisation to reduce wastage and losses.

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
- Case Study* – Data Eye: Intelligent ICT implementation in the Takahashi River Basin that aims to revitalize the region using data utilisation activities through collaborations between public and private sectors of the local community
- 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
- 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
- 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

Stakeholders

Lead
- Johannesburg Water

Partner
- Private Sector

Approval
- Mayoral Committee

Next steps

- Johannesburg Water to identify pilot projects through their research and development programme.
- Develop a data management plan.
- Develop a stakeholder engagement plan
- Establish a monitoring framework.

Expected outcomes

- A greater understanding of what digital systems work and don't work in the context of Johannesburg will be gained prior to large scale investment and implementation. Pilots will influence Johannesburg's urban water resilience plans by adopting a water-related focus to data management strategies in the city. By establishing monitoring mechanisms, in strategic city projects, there will be an increase in data accountability and transparency.
- Through stakeholder engagement, pilot projects will encourage citizen participation and input towards building better systems for ensuring optimal service delivery of digital solutions.

VISION 5

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
A resilient city, capable of surviving, adapting to, growing and thriving from acute shocks and chronic stresses	**How can the City improve co-ordination and obtain political buy-in to encourage a shift towards better knowledge and championing of resilience and incorporation into planning and decision-making?**	**#5 Lack of Resilience Planning**

CHALLENGE DESCRIPTION

The City acknowledges the need to better incorporate resilience into its planning processes.

The City currently lacks a driving force to embed a resilience mindset into its planning and implementation and across multiple departments.

The City would benefit from the prioritization of vulnerabilities geared towards the development of a resilience strategy that engages the inputs of relevant external stakeholders and integrates its siloed resources towards a common vision that strengthens its response to shocks and stresses, including those caused by water-related events. Such a strategy should also help the City unlock potential co-benefits that can help strengthen other interconnected systems, increasing the City's overall urban resilience.

VISION STATEMENT

This Vision proposes the establishment of a dedicated Resilience Team headed by a Chief Resilience Officer with a primary mandate to embed resilience into all aspects of the way the city operates and across multiple departments.

The Resilience Team will encourage the City to embed resilience, not as a "nice to have" but as "business as usual" across all departments and in the way that it operates from urban planning to implementation and will help the City cope with challenges including growth and climate change.

Establishing a dedicated Resilience Team would assist with prioritising areas of need and dedicating resources accordingly, while creating coordination among relevant stakeholders towards the common goal of improving the City's overall resilience. It is critical that this is established at the highest level to operate across all departments.

The following needs will be addressed:

- Establish a resilience office/department to embed the principles of resilience and to lead and champion priority initiatives across several departments in a resilience plan.
- Align with the Climate Action Plan (CAP) to identify priority actions/projects that can then be packaged for adaptation funding.
- Engage with external stakeholders to inform them on the principals of resilience thinking.
- Prioritising and tackle key vulnerabilities.

RELEVANT ASSETS AND RESOURCES

- Johannesburg Water Resilience Profile and Action Plan
- City of Johannesburg Climate Action Plan
- City of Johannesburg Water Security Strategy.

SHOCKS AND STRESSES

- Climate change impacts
- Infrastructure failure
- Epidemics and pandemics
- Rapid population growth & urbanisation
- Environmental degradation
- Unemployment
- Water insecurity

OVERALL CHAMPIONS

Lead
City of Johannesburg

Partners
Resilient Cities Network, C40 Network, National Treasury CSP, National Business Initiative, Gauteng Provincial Government, Universities, CSIR, Strategic Water Partners Network, Private Sector, RandWater, DWS.

Approval
Mayoral Committee

VISION 5

ACTION 1.

Establishment of a resilience office to institutionalize principles of resilience within CoJ's structure and support the implementation of the Water Resilience Plan.

DESCRIPTION

This action aims to embed the principle of resilience in the way the City of Johannesburg operates through the creation of a dedicated resilience office. This will help the city with identifying and prioritizing its areas of vulnerability and developing a strategy for how best to use scarce resources to combat shocks and stresses that seek to undermine the city. The creation of a resilience office will also address the need for better collaboration and facilitate engagement among city departments currently working in silos, allowing the City to work in an effective and integrated manner towards a common goal of resilience. The purpose of a Resilience Office would be to:

- analyse the way the city operates to identify areas that could be adjusted to enable resilience,
- develop a holistic vision of resilience for the City that is developed through extensive stakeholder engagements that breaks internal and external divisions,
- build buy-in among leadership to carry a message of resilience throughout government departments,
- engage with and work across =different departments towards implementing a shared vision of resilience,
- liaise with a wide range of external stakeholders to build partnerships that enable collaboration and coordination, attract investments and ensure resources are leverage holistically and in alignment with the city's resilience vision.

A major task of the Resilience Office/Directorate would be to assist in the implementation of the CoJ's Water Resilience Plan. This could include the following:

- Develop an implementation plan for the visions and actions listed in the Water Resilience plan.
- Develop a Year 1 action plan including a MEL plan, embed the same in city's annual budget and priorities.
- Lead in coordination efforts across agencies and departments to advance the priority action in the Water Resilience Plan.

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.
- Institute of Coastal Adaptation and Resilience (ICAR): Example of a research centre for applied research at universities dedicated to city collaboration and support.
- City of Cape Town: Example of Resilience Strategy, trainings for city officials on resilience thinking and approach in institutionalizing resilience as part of a city's structure. (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.

Stakeholders

Lead

- City of Johannesburg

Partner

- Resilient Cities Network, City of Cape Town Directorate for Resilience and Future Planning

NGOs

- Mayoral Committee

Next steps

- Gather examples on how other cities have institutionalized resilience within their city structure and consider options for CoJ.
- Mobilize resources for establishing a resilience office (internally and externally)
- Establish where a resilience office (or responsibility) would be best structured in the city and seek approval and buy-in for its creation.
- Develop and provide training and engagement opportunities on resilience thinking to ensure consistent understanding of the concept and buy-in among and between City departments.
- Leverage existing resources and engage stakeholders to support the implementation of the Water Resilience Plan for CoJ.
- Establish an engagement platform with in- ternal and external stakeholders to ensure that collaboration and coordination is consistent and efforts are structured for maximum impact and further support.
- Monitor and evaluate progress to continuously update the approach and incorporate lessons learnt.

VISION 5

Outcome

- A plan to implement the water resilience action plan with secured buy-in that ensures resilience thinking is institutionalized with in the city structure
- Improved understanding and knowledge of integrated planning around urban resilience, with water being a key entry point
- Realized demonstrative projects to build water resilience in the city.
- Collaboration and coordination among relevant internal and stakeholders

VISION 6

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Equitable and just service provision reflective of collaborative relationships between the City and its communities for water security.	**How can the City build trust and better collaborate with external stakeholders and the private sector to develop sustainable, equitable and holistic solutions for service provision to indigent and vulnerable communities?**	**#6 Systematic Inequality in provision of basic water services: Formal vs Informal Areas.**

CHALLENGE DESCRIPTION

In order to prepare for current and future water-related challenges, it is necessary for the city to address the level of inequality that exists when it comes to basic service provision.

Informal settlements, indigent and low-income communities typically have the lowest percentages of access to basic service provision and are the most vulnerable to water-related shocks and stresses and therefore the issue related to informality needs to be addressed.

The challenge that the city faces is that informal settlements are generally located on land deemed unsuitable for formal habitation such as within floodplains or environmental buffer zones. This makes service provision challenging by having to balance citizen's right to access to water and adequate sanitation and the legality of providing permanent services on land that is illegal for occupation. These areas are also critical in terms of maintaining ecosystem services which reduce the risks of floods and droughts as well as for biodiversity and connectivity. The open spaces, typical impacted by informal areas are also very often critical in terms of providing clean air and in helping to cool the city in the face of climate change.

VISION STATEMENT

This vision aims to achieve more equitable access to water by focusing on improving the safe and reliable access to water of the marginalized and vulnerable groups. A special emphasis and focus on marginalized and vulnerable communities and households is needed to narrow the gap and inequities in general at the city level. Ensuring equitable access will help to improve the health conditions, productivity and livelihood of the poorest households and of the city as a whole.

Targeted pro-poor programs and projects are required to address the special needs of low-income households and communities in regard to the access to safe and reliable water. This entails developing grounded and realistic strategies through research and experimentation that are well-articulated to the specific needs and more effective to address the above-mentioned complex problems and challenges. More flexible, inclusive and innovative approaches are thus needed for orienting towards pro-poor programs and projects. There is also an opportunity to engage with the private sector and to match their water stewardship initiatives with pro-poor programs.

The following needs will be addressed:

- Implement targeted financing mechanisms to improve access to WASH and reduce vulnerability of the marginalized communities. More flexible and innovative approaches are needed to improve access to water and address the specific needs of the marginalized communities and vulnerable groups. Particularly, it is important to develop innovative and appropriate financial and institutional arrangements that best fit the needs of vulnerable groups (e.g., targeted subsidies, cross-subsidization schemes, flexible payment, institutional arrangement that includes off-grid approaches and small-scale providers, micro-finance institutions...).

- Implement participatory approaches to identify pro-poor indicators and monitoring systems. Developing more appropriate, relevant and effective monitoring systems and local data are also needed. This entails conducting research, piloting and testing in order to develop locally relevant indicators. In addition, this shall be conducted through participatory vulnerability assessment and mapping in order to devise an appropriate monitoring system.
- Supporting and capacitating existing grassroots actors who are best suited and placed to fill the gap in access to water for poorer communities are also required. Focus needs to be given while capacity building to grassroots informal small-scale providers, women and community initiatives. Empowering marginalized and vulnerable groups like women, girls, disabled people, etc. through training, and targeted financial (e.g., micro-finance programs) and technical support is important.

RELEVANT ASSETS AND RESOURCES

- Water Resilience in a Changing Urban Context: Africa's Challenge and Pathways fro Action (Link).
- Mapping vulnerability in Gauteng (GCRO) (Link).
- Pathways to Water Resilient South African Cities (DANIDA): To identify opportunities for, and generate knowledge on, the physical and institutional integration of decentralised nature-based solutions into the urban water cycle to support and accelerate a transition towards water resilience in South African cities. (Link)
- Future Cities South Africa: Soweto Strategic Area Framework (UK Prosperity Fund). (Link)
- Upper Jukskei Catchment Mangaement Plan (CMP).
- Research on the use of SuDS in Gauteng (Department of Rural Development).
- Water Senstive Urban Design (WSUD) for South Africa: Framework and Guidelines. (Link)

SHOCKS AND STRESSES

- Water insecurity
- Water quality
- Disease outbreak and health stress
- Climate change and flooding
- Sanitation and hygiene
- Corruption: petty corruption at local level
- Damage due to theft and vandalism

OVERALL CHAMPIONS

Lead
City of Johannesburg

Partners
Water for the Future, Local CBOs and NGOs. Gauteng City Observatory and other research institutions. International donor agencies and partners.

Approval
Mayoral Committee

VISION 6

ACTION 1.

Acknowledge and celebrate community-led initiatives around access to basic service provision and develop mechanisms for supporting such interventions support.

DESCRIPTION

The provision of basic water and sanitation services are critical aspects for any community, but are severely lacking in informal settlements. Not only does a lack of basic services impact on the quality of life, and health of communities, but it also means that wastewater is also not safely dispose of an contributes to high levels of pollution impact both the downstream environment and other communities. Finding innovative solutions is particularly challenging in informal areas. This is as a result of the dynamic nature of the communities, the large number of people, and a lack of any formal planning. Very often informal settlements are located in high-risk areas which are hard to service in a traditionally way. Even in formal areas, there is a severe challenge with "backyard" developments that puts additional pressure on the current water and sanitation services.

There are, however, already several initiatives undertaken by the CoJ, communities, NGOs, and academic institutions that focus on solving issues related to basic service provision. This action aims to encourage the city to acknowledge and celebrate these community-led initiatives and to partner with the organisations leading them to understand key focus areas and implementation challenges they face whereby the city is able to provide support and to help in rolling out successful solutions to other communities in the CoJ. This review should include examples from other cities, particularly in Africa that are faced with a similar challenge of providing basic services for rapidly growing informal areas.

Resources

- Pathways to Water Resilient South African Cities (DANIDA) (Link)
- Accessble Greywatre Solutions for Urban Informal Townships (URBWA) (Link)
- Future Cities South Africa: Soweto Strategic Area Framework (UK Prosperity Fund) (Link)

Stakeholders

Lead

- City of Johannesburg EISD, JBF, MMC

Partner

- SALGA, SACN, community organisations, academic institutions, WRC, private sector & international organisations.

Approval

- City of Johannesburg, MMC

Next steps

- Establish stakeholder engagement platform to investigate existing initiatives and demonstrate a willingness to collaborate and provide support
- Use innovative ideas to celebrate ongoing activities to encourage more civil society actors to get involved.
- Partner with international organisations to provide resources and support
- Host workshops and planning sessions to gauge where additional support is required, how lessons learnt can be considered in future initiatives and how initiatives can potentially be scaled for greater impact.

Expected outcome

This action will increase stakeholder engagement and communication with the city to collaborate and support positive initiatives that contribute to building water resilience. By celebrating and showcasing the impactful work being carried out in the city, there is an opportunity to create hope among citizens and a willingness to want to get further involved. There is an opportunity for greater and more far-reaching implementation to solve the issue of basic service provision by spreading the load and benefiting larger communities.

VISION 6

ACTION 2.

Open competition to design and implement innovative solutions to provide basic services for informal settlement areas and trading areas.

DESCRIPTION

Johannesburg has an opportunity to solve its challenges by leveraging innovative solutions developed by its citizens. This action aims to incentivize citizens to come up with ways of solving the challenge of basic service provision in informal settlement areas. This gives the city an opportunity to engage with schools, universities, research institutions and the private sector to find alternative ways of solving challenges that prevent the achievement of water resilience. It also provides a platform for engagement and continued partnership to implement and monitor solutions that are selected for pilot testing. A particular area of concern is the lack of basic services at informal trading areas and markets. There have been efforts to build public facilities, but these are met with resistance from the traders which then leads to a lack of services and health and safety risk as there is also no control of wastewater.

By organizing an open competition to develop innovative solutions, the CoJ would potentially not only be able to identify innovative solutions, but as these would be initiated by the community, then they would also more likely have the support of community which is vital in ensuring they continue to be successful.

Resources

- 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.
- 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.

Stakeholders

Lead

- City of Johannesburg

Partner

- Water for the Future, WIBC, Engineers Without Borders, University civil society organisations and community leaders

Approval

- Mayoral Committee

Next steps

- Gain approval to host a competition and brainstorm a set of prizes that will incentivize people to participate.
- Scope out the competition including the purpose, the prize and terms and conditions
- Run the competition and market it using a range of platforms including social media
- Partner with stakeholders including the private sector to judge the entries
- Grant the winner/s an opportunity to collaborate with the city to implement their solution

Outcome

This action will increase participation from citizens in helping to solve the city's challenges and build water resilience. It will also create a collaborative environment between the city and its stakeholders and enable long-term partnerships.

VISION 7

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
A liveable city with accessible and well-maintained blue-green infrastructure.	**How can the City encourage the widespread promotion of blue-green infrastructure in the development planning process and leverage initiatives with stakeholders to promote water sensitive design education, training and implementation?**	**#7 Slow uptake of Water Sensitive Design**

CHALLENGE DESCRIPTION

Mainstreaming resilience is necessary to develop interest and support among urban planning professionals to build integrated planning skills. In addition, increasing awareness around possible integration of green/blue infrastructure and nature-based solutions (NbS) can enhance ownership and active participation of youth and communities in an integrated planning process.

VISION STATEMENT

Promoting water-sensitive design through integrated and participatory planning and implementation is key to any resilience-building efforts. As such, this vision is centred around the creation of an ecosystem of knowledge resources, tools and guidance documents to enhance integrated planning and implementation efforts around improved stormwater and wastewater management, 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 will be addressed:

- 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)
- 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.
- Increase skilled experts in the city to improve integrated planning efforts.

POTENTIAL ACTIONS

- Open completion to design and implement innovative solutions to provide basic services for informal trading areas.
- Identify, support and expand community-led, owned and maintained low-cost nature-based infrastructure solutions for CoJ.
- Support for existing invasive alien plant clearing program by City of Johannesburg.
- Feasibility study and design of TRMP for CoJ.

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".
- WRC Guidelines and Community of practice for Water Sensitive Design adapted for implementing in Africa.
- CRC for Water Sensitive Cities (WSC).
- WWF and SANBI Water4Nature (W4N).

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
City of Johannesburg (CoJ) EISD

Partners
Future Water Instute (UCT), WITS, UJ, WRC, ICLEI, WRI, WWF, SANBI, DANIDA, Water for the Future (TNC).

Approval
Mayoral Committee

VISION 7

ACTION 1.

Identify, support, and expand community-led, owned, and maintained decentralized low-cost nature-based solutions (NbS) for water infrastructure.

DESCRIPTION

There are existing nature-based solutions (NbS) pilot projects within the city. In formal areas, these have proved to work successfully within enclosed estates with private maintenance contractors appointed to maintain the infrastructure. Within informal areas, success stories of noticeable improvements in water quality with the installation of nature-based solutions include community participation and inclusion from the outset where community members have taken ownership of the process, are actively involved in construction and ensure continued operation and maintenance thereafter. The examples cited above have been citizen led interventions with limited interaction with the local council.

This action is targeted at relationship building between the local council and external stakeholders to support the implementation of nature-based solutions for urban water resilience. It is also targeted at job creation through facilitating the training and upskilling of local unemployed citizens to ensure continuous operation and maintenance of infrastructure after construction. Using low-cost materials would support recycling and leverage existing resources that could be repurposed in construction. This would also ultimately improve water quality, enhance amenity and liveability of communities through the introduction of more blue-green infrastructure.

By using decentralised nature-based solutions for stormwater and grey water treatment, it would ensure better quality runoff entering the river systems and help to alleviate the pressure on existing wastewater treatment infrastructure or the backlog of service provision.

The City of Johannesburg already has a program of clearing of invasive alien plants from catchment areas that could be enhanced with additional resources including funding as well as technical and management support.

Resources

- CoJ Alien Plant Clearing Program.
- Gauteng Sustainable Drainage Systems (SuDS) Research (Link)
- Case Study* - Sustainable Drainage Systems (SuDS) for managing surface water in Diepsloot informal settlement, Johannes- burg, South Africa.
- Case Study* - Water Sensitive Urban Design (WSUD) case study review in Gauteng (Link).
- Transformative Rivers Management Program (TRMP) successfully applied in Ethekweni.
- The Nature Conservancey (TNC) Water for the Future Technical Assistance program.

Stakeholders

Lead

- NGOs, Companies, Communities & Nature-Based Solutions Experts (private sector consultants, academics and researchers)

Approval

- City of Johannesburg, Environment and Infrastructure Services Department (EISD) and Johannesburg Roads Agency (JRA).

NGOs

- ICLEI, WRI, Water for the Future (TNC)

Next steps

- Identify city champions to lead this initiative.
- Develop a stakeholder engagement plan using previous lessons learnt to enable good relationship building.
- Identify communities of need and external stakeholders who would add value to the process.
- Understand the context and explore appropriate solutions by ensuring complete stakeholder engagement, using local knowledge and understanding the community's needs.
- Develop a business case based on the solutions identified and explore alternative community needs and potential other opportunities.
- Present the business case to potential investors and secure self-sustaining funding.
- Ensure longevity through continuous engagement and ongoing education and succession planning.

Expected outcome

- Improved coordination and ownership of projects and infrastructure investment for water resilience.
- Active participation of stakeholders in project planning and implementation.
- Reduced maintenance costs
- Skills development and job creation.
- Improvement of water quality, amenity and liveability.
- 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 Johannesburg.

VISION 8

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Diversified water sources that improve water security.	**How can the City improve water security by introducing redundancies in the water supply system through the implementation of alternative sources of water including groundwater, rainwater harvesting, and potable re-use?**	**#8 Lack of alternative water sources implementation**

CHALLENGE DESCRIPTION

Johannesburg does not lie on or near a strategic water source and therefore is heavily reliant on surface water transferred via the Integrated Vaal River System (IVRS), supplemented by the Lesotho Highlands Water Project that relies on an international treaty between South Africa and Lesotho. Due to this dependency and Johannesburg's economic significance, there is a need to improve water security and reduce the risk by diversifying its sources of water through the integration of alternative sources such as groundwater, wastewater re-use, acid mine drainage and rainwater & stormwater harvesting.

Options for alternative water sources have been explored in the City, but there are several challenges that present themselves with each alternative. Groundwater exploration is limited to areas outside of dolomitic areas where borehole drilling can result in sinkhole development. Using treated effluent and rainwater and stormwater harvesting would reduce flows downstream of the city where users are reliant on the supply and there are concerns with the quality of water and the ability to maintain health standards associated with these. This would also require additional licensing from the Department of Water and Sanitation who manages the catchment and would be limited to the allowances that are approved. One of the options that is potentially feasible is acid mine drainage (AMD) - this is groundwater that is contaminated as a result of mining activities. AMD has stigmas and perceptions attached to it, relating to it being considered "too contaminated" to even be considered and there are also concerns with regards to who should pay the high cost of treatment for AMD.

Alternative water sources that could be considered include both large scale centralized scheme such as boreholes, AMD and centralized direct and indirect potable re-use as well as implementation at by individual households or business.

VISION STATEMENT

This vision supports exploring the barriers and changing the perceptions that exist around alternative sources of water in the public and private realm to identify what can be done and to build water security and overall water resilience for the CoJ.

An important component in helping to get support is through the implementation of demonstration plants and pilot studies which can be used to develop an improved understanding of the operational requirements and health standards required as well as being used to public support.

The following needs will be addressed:

- 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.
- A need to develop 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.
- Changing the perceptions around alternative sources of water from being viewed as hazardous to being a reliable resource.
- Expansion of current feasibility studies into scalable and bankable projects including the development of demonstration plants.
- Updated municipal by-laws and tariff structures to support alternative water use.

RELEVANT ASSETS AND RESOURCES

- DWS Acid Mine Drainage Feasibility Study
- Review of re-use opportunities within CoJ.
- Updated CoJ Stormwater Manual including consideration for stormwater harvesting.
- Successful application of direct potable re-use in Windhoek and Beaufort West.
- CoJ Water Security Strategy.
- City of Cape Town Updated Water Strategy
- City of Cape Town (and Western Cape Government) updated By-laws that consider household use of alternative water sources.
- Feasibility and design studies for proposed DPR by the City of Cape Town.

SHOCKS AND STRESSES

- Water insecurity
- Flooding
- Public health
- Environmental degradation
- Infrastructure failure
- Old infrastructure that is jeopardizing water quality

OVERALL CHAMPIONS

Lead
City of Johannesburg and Joburg Water

Partners
DWS, WRC, Rand Water, Johannesburg Roads Agency, com- munities and civil society groups

Approval
Mayoral Committee, DWS

VISION 8

ACTION 1.

Develop guidelines and appropriate pricing for alternative water sources technologies by private commercial users and tackle the stigma (and other roadblocks) limiting their safe and sustainable implementation.

DESCRIPTION

There is an aversion to exploring alternative sources of water due to the stigmas and perceptions that are associated with them.

This action aims to address the perceptions and change them through awareness and education. By singling out perceptions that citizens have and addressing them in a logical way using the findings from research and studies, there is an opportunity to change their perceptions and increase their willingness to support and make use of alternative sources of water. This in turn will increase the support for the city to incorporate alternative sources of water into its water security planning and increase redundancies. It will also help in providing guidelines for individual households and business to implement their own alternative water source options and ensure that they are managed in a safe and sustainable way.

Due to the climate of the CoJ, there is opportunity for individual businesses and households to implement simple rainwater harvesting systems as well as household greywater systems, but these need to be regulated by the CoJ to ensure they are done safely.

Resources

- DWS Acid Mine Drainage Feasibility Study
- Review of re-use opportunities within CoJ.
- Successful application of direct potable re-use in Windhoek (Namibia) and Beaufort West.
- CoJ Water Security Strategy.
- City of Cape Town Updated Water Strategy
- City of Cape Town updated By-laws that consider household use of alternative water sources.
- Feasibility and design studies for proposed direct potable re-use by the City of Cape Town.

Stakeholders

Lead

- City of Johannesburg, Johannesburg Water

Partners

- WRC, CSIR, JRA, Rand Water, Universities, Private Sector, NGO's, civil society groups and community leaders, religious groups

Approval

- Mayoral Committee, DWS

Next steps

- Review and update municipal by-laws.
- Identify case studies of successful implementation of alternative sources.
- Partner with research groups who are familiar with alternative water sources.
- Partner with experts in public engagement such as social scientists and media personnel.
- Develop a compendium of best practices and technologies for the use of alternative water sources in the context of City of Johannesburg.
- Investigate and build cases around all the public perceptions that relate to alternative sources of water through surveys and workshops
- Develop an engagement campaign to build awareness and change perceptions through education and myth busting.

Outcome

- Design standards and guidelines for alternative water sources and use.
- Changed perceptions around alternative sources and increased willingness for use.
- Support with technical expertise, human and financial resources from external stakeholders to integrate, regulate and manage alternative water sources.
- Improvement of water security.

VISION 8

ACTION 2.

Develop guidelines and appropriate pricing for alternative water sources technologies by private commercial users and tackle the stigma (and other roadblocks) limiting their safe and sustainable implementation.

DESCRIPTION

Several cities across the world are considering alternative water sources including groundwater, rainwater harvesting, grey-water use, direct potable re-use (DPR), and desalination. Local examples of these include Windhoek in Namibia which was the first city in the world to implement DPR and Beaufort West (for DPR). The City of Cape Town is also well advanced in considering alternative water sources, including DPR and sea water desalination, as part of its updated Water Strategy.

Within the CoJ, DWS has conducted feasibility studies for re-use as well as the treatment and use of Acid Mine Water. The CoJ already provides treated effluent to some businesses, but has not yet developed a pilot study for providing this as potable water. The CoJ has also considered the potential for stormwater harvesting as part of the updated stormwater design guidelines. It is critical that the necessary studies and detailed design of these alternative water source options are fast-tracked and implemented in order to address the increased water security risk for the CoJ. They are likely also to have other co-benefits in terms of also helping to address the increasing flood and water quality risks. A critical next step is to implement pilot studies of these alternative supply options.

Resources

- DWS Acid Mine Drainage Feasibility Study
- Review of re-use opportunities within CoJ.
- Successful application of direct potable re-use in Windhoek (Namibia) and Beaufort West.
- CoJ Water Security Strategy.
- City of Cape Town Updated Water Strategy
- City of Cape Town updated By-laws that consider household use of alternative water sources.
- Feasibility and design studies for proposed direct potable re-use by the City of Cape Town.

Stakeholders

Lead

- City of Johannesburg, Johannesburg Water

Partners

- WRC, CSIR, JRA, Rand Water, Universities, Private Sector, NGO's, civil society groups and community leaders, religious groups

Approval

- Mayoral Committee, DWS

Next steps

- Identify case studies of successful implementation of alternative sources.
- Partner with research groups who are familiar with alternative water sources options
- Partner with experts in public engagement such as social scientists and media personnel.
- Identify and implement pilot projects to test different technologies, to learn lessons for implementation and to get public support.
- Investigate and build cases around all the public perceptions that relate to alternative sources of water through surveys and workshops
- Develop an engagement campaign to build awareness and change perceptions through education and myth busting and a clear plan for implementation with specific target dates.

Outcome

- Improvement of water security.
- Pilot test facilities for alternative water supply options including direct potable re-use, AMD and stormwater harvesting.
- Improved public support for alternative water supply options.
- Secured funding for implementation and guidelines for operation and maintenance.

VISION 9

VISION STATEMENT	OPPORTUNITY STATEMENT	RELATED CHALLENGE
Robust financial model supported by sustainable financial resources.	**Can the City develop a plan for diversifying revenue streams and better management of financial resources through stakeholder engagement and including potential private sector partnerships?**	**#9 Unsustainable Funding and Finance**

CHALLENGE DESCRIPTION

The prioritization of equitable and resilient water infrastructure and solutions that ensure the needs of the most vulnerable communities are met is contingent on having the resources to invest in and sustain them. Currently the CoJ, like most other municipalities in South Africa has a very inefficient revenue collection system resulting in high costs of non-revenue water and a lack of funds for investing in operation and maintenance as well as the development of new water infrastructure.

This vision supports the creation of a robust financial model for water that is supported by sustainable financial resources to ensure long-term implementation of plans and programs.

A robust financial model is not only dependent on having sustainable financial resources but also how resources are allocated and used.

VISION STATEMENT

This vision is focused on helping 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 partnerships and investment in the water sector. There is a need to enhance the capacity of the city by involving external experts who are well versed in the financial planning of complex, strategic projects.

Particular areas of knowledge building identified include the reduction of non-revenue water, 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 and 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.

The following needs will be addressed:

- Proper coordination of investments between government institutions based on city needs and priorities.
- Partnering with private sector to secure investment that further develop water stewardship and leveraging private sector and international investment to meet the funding gaps and meet future needs and address future risks.
- Stakeholder engagement for skills development, training and capacity building.
- Ensuring ethical conduct, transparency and data sharing to meet the requirements of securing external funding.

- Improve understanding of infrastructure backlogs and condition to prioritize maintenance, rehabilitation, refurbishment and replacement.
- Equitable and fit-for-purpose water resources management development taking into consideration different needs and applications
- Optimize water use efficiency and cost-recovery of existing water services, through increasing awareness and enhanced coordination and planning in water sector.
- Forecasting future demand accurately and ensure that funding can be used flexibly for both long-term planning and immediate priorities creating sustainable plans that use resources efficiently

RELEVANT ASSETS AND RESOURCES

- CoJ Water Security Strategy
- CoJ Climate Action Plan (CAP)
- National Water Resources Strategy
- Johannesburg Integrated Development Plan

SHOCKS AND STRESSES

- Decreasing availability of funds
- Overlapping mandates
- Capacity gaps
- Water-related natural disasters
- Water pollution
- Water resources mismanagement

OVERALL CHAMPIONS

Lead
City of Johannesburg, Joburg Water, DWS.

Partners
SWPN, NBI, DWS, Rand Water, National Treasury, International Donor Agencies (IDA)s, SA Cities Network, SALGA, WRC, Research Institutes.

Approval
Mayoral Committee

VISION 9

ACTION 1.

Address current investment gaps by exploring and establishing public-private partnerships with large private sector water users with strong water stewardship values (e.g. SWPN).

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 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 the 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.

One such example of a pilot project is to engage the Strategic Water Partners Network (SWPN), a key platform to facilitate new forms of partnerships between Government, the private sector, civil society and other key stakeholders.

The SWPN, hosted by the NEPAD Business Foundation is a recognized industry leader in multi-stakeholder approaches to water resource management and provides a neutral platform for engagement on water issues and has several members who are large water users in the City of Johannesburg and Gauteng.

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. (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 projects. (Link)
- Strategic Water Partners Network (Link)
- Development Bank of South Africa (DBSA)
- City Support Program – National Treasury.

Stakeholders

Lead

- Strategic Water Partners Network

Partners

- Rand Water Department of Water and Sanitation, National Business Initiative, large-scale private sector water users (i.e. Johannesburg Water's biggest customers).

Approval

- City of Johannesburg (CoJ).

Next steps

- City of Johannesburg (CoJ) and the Strategic Water Partners Network (SWPN) to conduct a planning workshop whereby parties engage on the potential avenues for collaboration and develop an official plan moving forward.
- Approach large private sector water users within Johannesburg as potential partners to help engage with solving water-related issues to reduce risks to business continuity.
- Identify and implement a potential pilot project to help develop the systems needed for more widespread application of similar public private partnerships within the CoJ.

Expected outcomes

- Enabling environment review would help assess near term and medium-term reforms needed to enhance private sector investment in the water sector
- 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
- Together the two approaches and assessments help increase opportunities for immediate and long-term private sector investment in the water sector in Johannesburg.
- Improvement of the management of water in Johannesburg to enable a more efficient and effective system that also helps to solve the issues of a lack of financial resources and lack of capacity

VISION 9

ACTION 2.

Address current investment gaps by exploring and establishing public-private partnerships with large private sector water users with strong water stewardship values (e.g. SWPN).

DESCRIPTION

The private sector can play an important role in bridging The City of Johannesburg, like most cities is reliant on utility revenue streams (e.g., water and electricity) to fund its operations. The tariff model is built on cross-subsidization where high-income earners pay for services that cross-subsidize low income earners. There is, however, a growing issue with debt collection in the city with the provision of essential services to citizens who do not pay for them. Poverty and unemployment have grown in the city, resulting in an increase in people who cannot afford to pay for services.

Additionally, there is the challenge of a "lack of willingness to pay". Among other reasons, some of these include those citizens who have outstanding, unresolved queries with the City who refuse to pay their monthly bills until their issues are resolved, and there are others who are privy to the "culture of entitlement" expressing the sentiment that government services should be free and that they are "owed" to them.

In the event that the City has attempted to take action by cutting off services, citizens have responded by protesting and damaging infrastructure contributing to the City's backlog. Therefore, there is a poor debtors collection system in place which contributes to the lack of funds that the city has to operate with resulting in a backlog in maintenance and service provision building up since 2008. There is an opportunity to build relationships with communities to engage with them on this issue in an attempt to resolve it and dissolve the hostility that exists. Furthermore, there are opportunities to engage with the private sector on subsidizing services to marginalized low-income communities as part of their water stewardship commitments. Additionally, the City can explore best practice case studies of how to improve revenue collection and changing the financial model to make it more practical and sustainable in the long-run.

Resources

- National Treasury Guidelines
- City Support Program (CSP)
- South African Local Government (SALGA)
- Strategic Water Paters Network (SWPN).
- SA Cities Network.

Stakeholders

Lead

- City of Johannesburg Revenue Shared Services Centre

Partners

- Johannesburg Water, City Power, Strategic Water Partners Network, National Business Initiative

Approval

- National Treasury

Next steps

- Identify international case-studies.
- Conduct workshops to identify challenge areas related to revenue collection and brainstorm possible options/ solutions.
- Develop, prioritize and execute actions by identifying external stakeholders who could potentially assist in execution

Expected outcome

- Improved collaborative relationships between the CoJ, communities and the private sector.
- Improved financial model for the COJ to operate an improved revenue collection processes to increase financial resources.
- Better service provision due to better resource availability makes for a more efficiently functioning city that improves the quality of life for its citizens making the city attractive.

NEXT STEPS

As circumstances change, this Water Resilience Profile is expected to be an ever-evolving and improving blueprint of potential actions - one that takes advantage of existing programs and relationships while advancing change through new collaborative actions to build resilient and equitable water infrastructure, systems and services for all the residents of Johannesburg.

The Johannesburg Profile provides a set of strategic water resilience actions to be implemented by CoJ and partners. As a partner to the City, WRI will continue to work closely with CoJ towards advancing water resilience in Johannesburg. At the time of publishing the Johannesburg Water Profile, WRI, Joburg Water, and CoJ worked together to identify priority projects correlating to the actions to be implemented through the Urban Water Resilience. WRI aims to continue mobilising funds through the African Cities Water Adaptation Fund (ACWA Fund), an integrated approach to finance innovative urban water resilience solutions at scale. The fund offers full project lifecycle support, helping local leaders utilise the latest knowledge and resources to understand their climate and water risks and socio-economic impacts; identify, prioritise and prepare projects; structure deals and connect to grants and capital; and scale delivery by standardizing project development manuals, deals and contracts."

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