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UK

An overview of challenges in the South African Water Sector

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Overview

- Water security as a lens to identify the range of challenges in the South African water sector



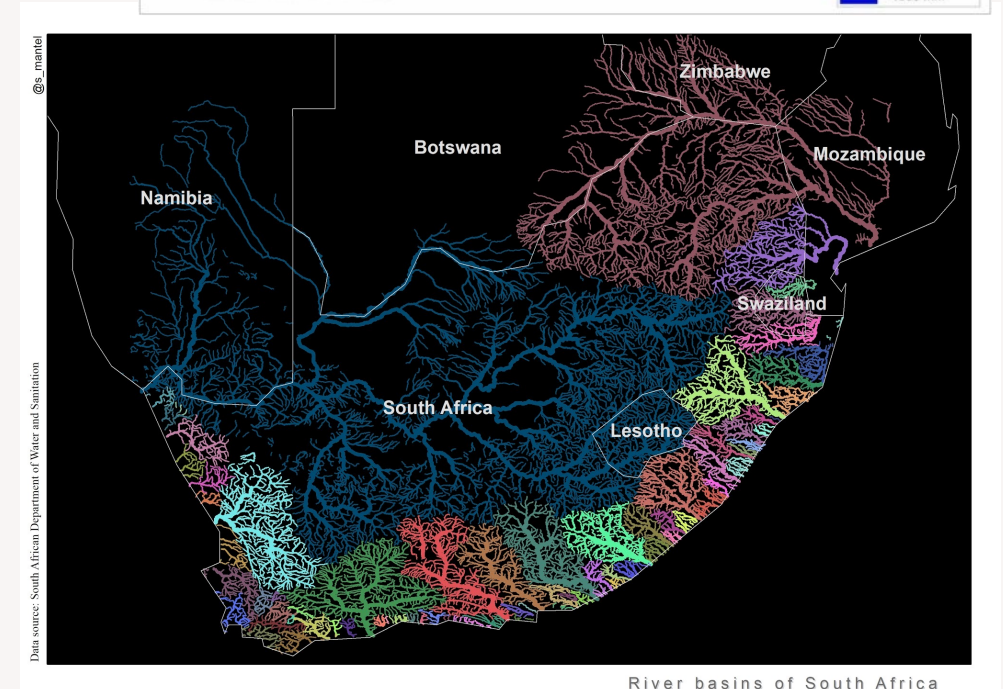
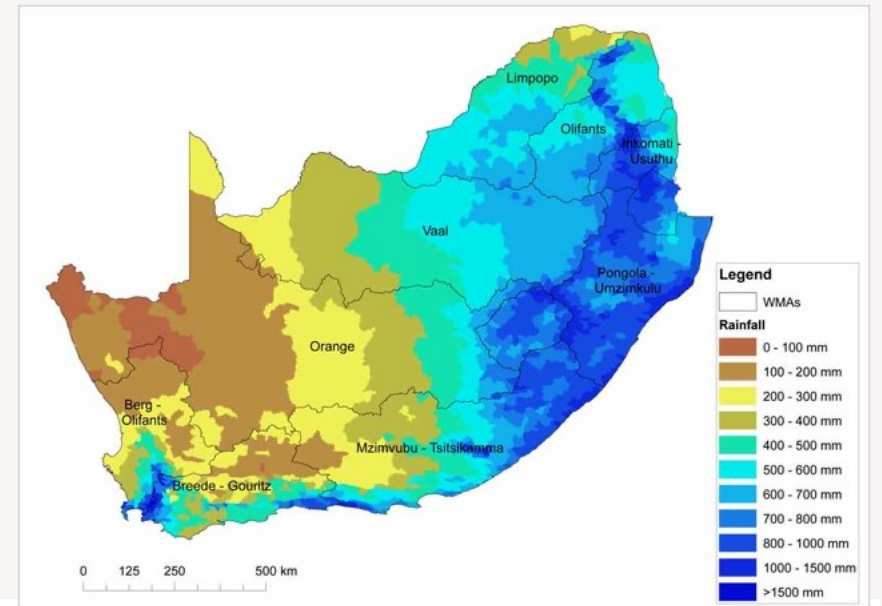
Source: ARQ Consulting Engineers

Defining water security

- UN Water defines water security as:
 - ‘the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability’.
- Common strands in other water security definitions include:
 - Water quantity
 - Water quality
 - Environment/sustainability
 - Risks/hazards
- Developing capacities to ensure water security
- Continuum of water security: insecure to secure

Context

- South Africa is a dry country
 - Ranked 29th driest country out of 193 countries
- Annual rainfall is about 50% of the world's average
 - 463mm mean annual precipitation
 - Water scarcity is a norm
- Uneven spatial distribution of rainfall across the country



Mega-trends in African cities

1 – Climate change

- Rising surface temperatures
- Reinforcing water scarcity and drought risks
- Pressure on already limited water supplies
- Increased demand for water; negatively affects crop production
 - Impacts food security
- Heightened vulnerability
 - Weak adaptive capacity, high dependence on ecosystem goods for livelihoods and less developed agricultural production systems
- Rural-to-urban migration

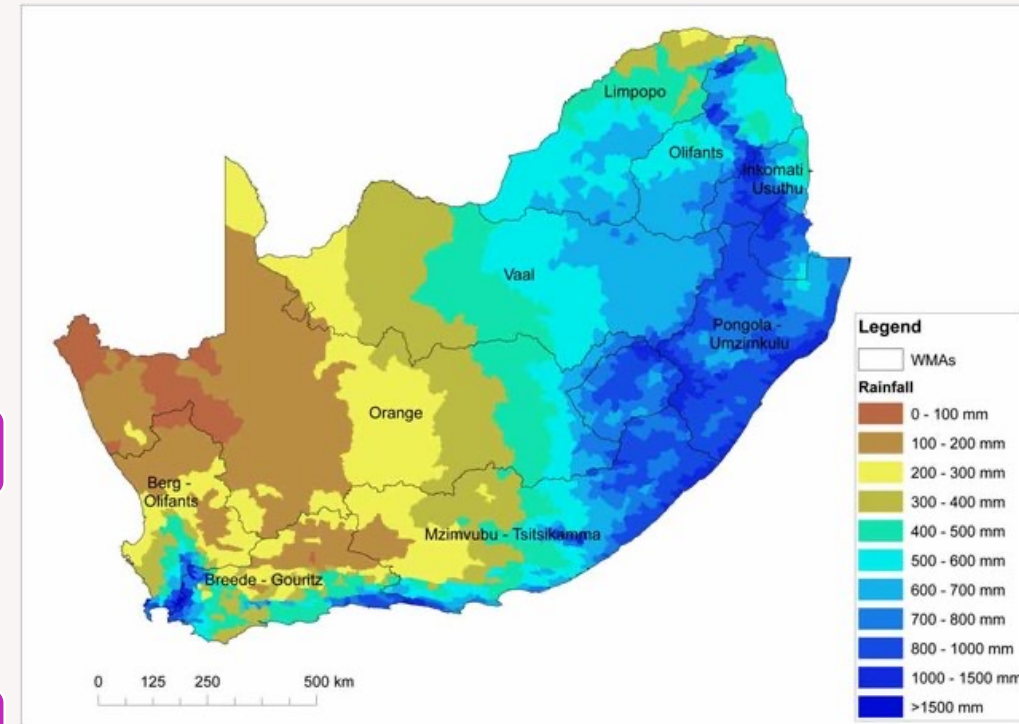
2 – Urbanisation

- Growing levels of urbanisation
- Transformation of landscapes
- Sprawl of cities
- Informal settlements – unplanned, poor infrastructure, practices

3 – Demographic change

- Growing populations
- Interlinked with urbanisation: concentrated in cities; inter-regional migration

These mega-trends adversely impact water security



Adapted from OECD 2020

Drivers of water insecurity

- According to ASSAF (2023), the major drivers of water insecurity in South Africa include:
 - Poor water and sanitation infrastructure maintenance and investment
 - Inequitable access to water
 - Poor water quality
 - Unsustainable water demand
- Insecurities are amplified by
 - Floods
 - Droughts
 - Poor infrastructure planning and maintenance



Source: Comins 2021

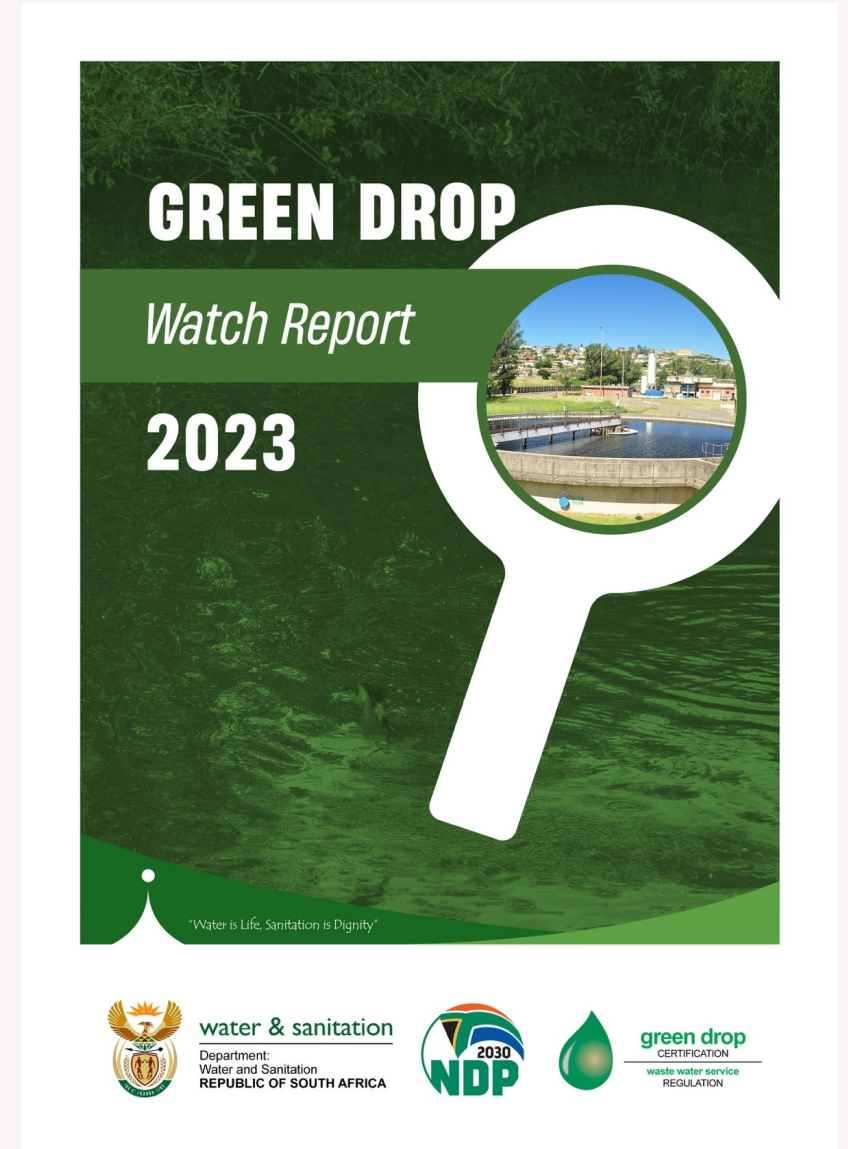
Blue Drop Water Report 2023

- Programme is focused on the current condition of drinking water infrastructure and treatment processes from a technical perspective
 - 141 water supply systems were inspected
 - Technical site assessment scores of 69%
 - Status is *partially functional with average performance*
 - 85% had average, good and excellent
 - 15% - poor and critical conditions
 - The cost to restore is R1.5bn
- Drinking water quality analysis
 - Microbiological water quality status
 - Excellent – 38%
 - Good – 11%
 - Poor to bad – 51%
 - Chemical compliance status
 - Excellent - 16%
 - Good – 14%
 - Failure to comply – 71%
 - 13 water supply systems have no water quality data
 - Indicates a lack of monitoring



Green Drop Watch Report

- Purpose is to improve wastewater management in South Africa
 - Revitalised in 2021
- Statistics from 2022
 - 850 wastewater treatment works
 - 334 wastewater treatment works were in a critical state in 90 municipalities – 34%
 - Issued with non-compliance notices
 - Required to submit Corrective Action Plans
- 2023 update
 - 168 Corrective Action Plans were submitted to DWS
 - March 2023: 34 out of 168 Corrective Action Plans were being implemented
 - DWS has issued directives; and criminal charges in some cases
- The majority of wastewater treatment works do not comply with national minimum standards.
 - Collectively, this results in chronic pollution of water resources
 - Impacts on the health of communities



Infrastructural Challenges

- Maintenance of ageing infrastructure
 - Results in extensive water losses
- Lack of investment in infrastructure
 - Outcomes: Cholera outbreak in Hammanskraal in Tshwane
 - 15 deaths, 40 people hospitalised
- Pollution from wastewater works
 - Linked to load shedding
 - Results in biodiversity loss; threat to human health
 - But wastewater has the potential to become a resource when it is treated correctly
 - Through resource recovery and reuse



Source: African News Agency

Water-energy nexus challenges

- Water supply and wastewater treatment are driven by the supply of electrical energy
 - Creates a water-energy nexus
 - Electricity is produced from 15 water-cooled power plants, each operating at more than 3l of water per unit sent out and consuming more than 100Ml/day.
 - Chronic energy shortage
- Combination of poor electricity supply and ageing investment in water infrastructure – key constraints to water for growth and development
 - Vast quantities of wastewater are produced for water uses
 - There is frequently insufficient treatment when wastewater is disposed

Water pollution

- Impacts health: related to improper hygiene, poor sanitation or contaminated water
- Disease transmission: cholera, diarrhoea, typhoid etc.
- Access to safely managed sanitation
- Impacts of farming on water quality
 - Farming practices: nitrates and phosphates -> leads to eutrophication
 - Soil erosion
- Lack of monitoring data: need monitoring data to address pollution issues effectively
- Solid waste runoffs
- Pollution increases the costs of wastewater management



Source: Luhanga 2021

Water scarcity and droughts

- Water-scarce environment; water stress
 - High levels of evapotranspiration
- Water stress in SA – medium to high (20 to 40%)
 - Water stress is the ratio of withdrawals to supply
- Drought consequences include:
 - Increased food prices
 - Impacts on agriculture
 - Day Zero situations, e.g. Cape Town
 - Water restrictions; risk of turning off all taps
 - Impacts on agriculture and tourism



Source: Resilience Shift

Water abundance and floods

- Floods and landslides: loss of lives, damage to infrastructure
 - Exacerbated by rapid urbanisation, uncontrolled urban growth and unregulated informal settlements in floodplain areas
- Landcover change
 - Impermeable surfaces
- Impacts urban poor – often living on marginal land
- Loss of lives, disruption to traffic and economic activities, exposure to health risks (sewage, industrial waste and waterborne diseases)



Source: Stewart 2022

Climate change

- Climate change is influencing the biosphere
 - More frequent and intense hydro-climatic extremes – SA being a hotspot for floods, droughts and heatwave events
 - Becomes a socio-economic threat
 - COP27 – over 80% of climate adaptation strategies were water-related
- Biodiversity and water are linked
 - Ecosystem services
 - Ecological infrastructure: nature-based equivalent of engineered infrastructure
 - EI is viewed as a critical resource for tackling water security challenges
 - Water purification, flow regulation
 - Biological degradation adversely impacts water security



Sources: Dlamini 2017; Bennie 2019

Insufficient access to water and sanitation

- Urban access to safely managed piped water – SA 99%
- Challenging in the context of urban population growth and unplanned urbanisation
- Disparities related to urban water access within cities
 - Linked to where services are concentrated
 - Urban versus rural versus peri-urban
- Growing demand for water – growing middle-class
 - Overwhelms existing urban infrastructure and challenges the capacity of institutions
- Informal settlements: Free Basic Water Programme
 - Tension between payment for water services and free basic water (universal)



Source: Bratton 2017

Some solutions

- Demand management
 - Reducing water demands
 - Recycling wastewater
 - Promoting land use management alternatives
 - Education
- Supply management
 - Supplementing water supplies locally
 - Increasing the water supply mix
 - Less reliance on surface water
 - Focus on groundwater abstraction, water reuse
 - Desalination in water-scarce coastal areas
 - Centralised versus decentralised systems
 - Interbasin transfers



Source: Mistry 2022.

Some solutions

- Nature-based solutions
 - Ecological infrastructure, ecosystem services
 - Requires source-to-sea management approach of catchments
- Collaboration
 - Partnerships between state and non-state actors
 - Growing number of networks
 - Growing calls for cross-sectoral collaboration

Some solutions: Digitalisation in the water sector

- Smart water meters
- Sensor networks
- Leak detection systems
- GIS
- Remote sensing for drought analysis
- Data analysis
- Remote monitoring
- Automation in treatment plants
- Customer engagement platforms
- Blockchain for water management
- Predictive modelling
- Mobile apps for water reporting
- Desalination Technology
- Drones for infrastructure inspection
- Water conservation gamification
- Real-time monitoring of water supply and demand
- Smart irrigation systems
- Digital twin technology
- Cloud-based data storage
- AI for water treatment
- Smart wastewater management
- Augmented reality for training

Concluding statements

- With challenges, comes opportunities for innovation
 - Harness ingenuity
- Holistic overview of challenges in the water sector
 - Call focuses on digitizing and improving wastewater management

Q&A



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