UKaid
from the British people

RAND WATER

UKRI
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Global Alliance | Africa

ktn-uk.org/programme/africa #GlobalAllianceAfrica

Rand Water Innovation Challenges
- Information Session/Q&A

Agenda

10.00 GMT / 12:00 SAST – Welcome and Housekeeping
10.10 GMT / 12:10 SAST – Introduction to Global Alliance Africa and Open Innovation
10.20 GMT / 12:20 SAST – Introduction to Rand Water
10.40 GMT / 12:40 SAST – Rand Water Open Innovation challenges
11.00 GMT / 13:00 SAST – Q&A
11.20 GMT / 13:20 SAST – Next steps
11.30 GMT / 13:30 SAST – Close

RAND WATER

UKRI Innovate UK KTN | Global Alliance | Africa

Housekeeping

- The Information Session will last 1.5 hours
- Please use Q&A box for submitting your questions
- Please highlight any technical issues in Zoom chat
- This session will be recorded and shared later

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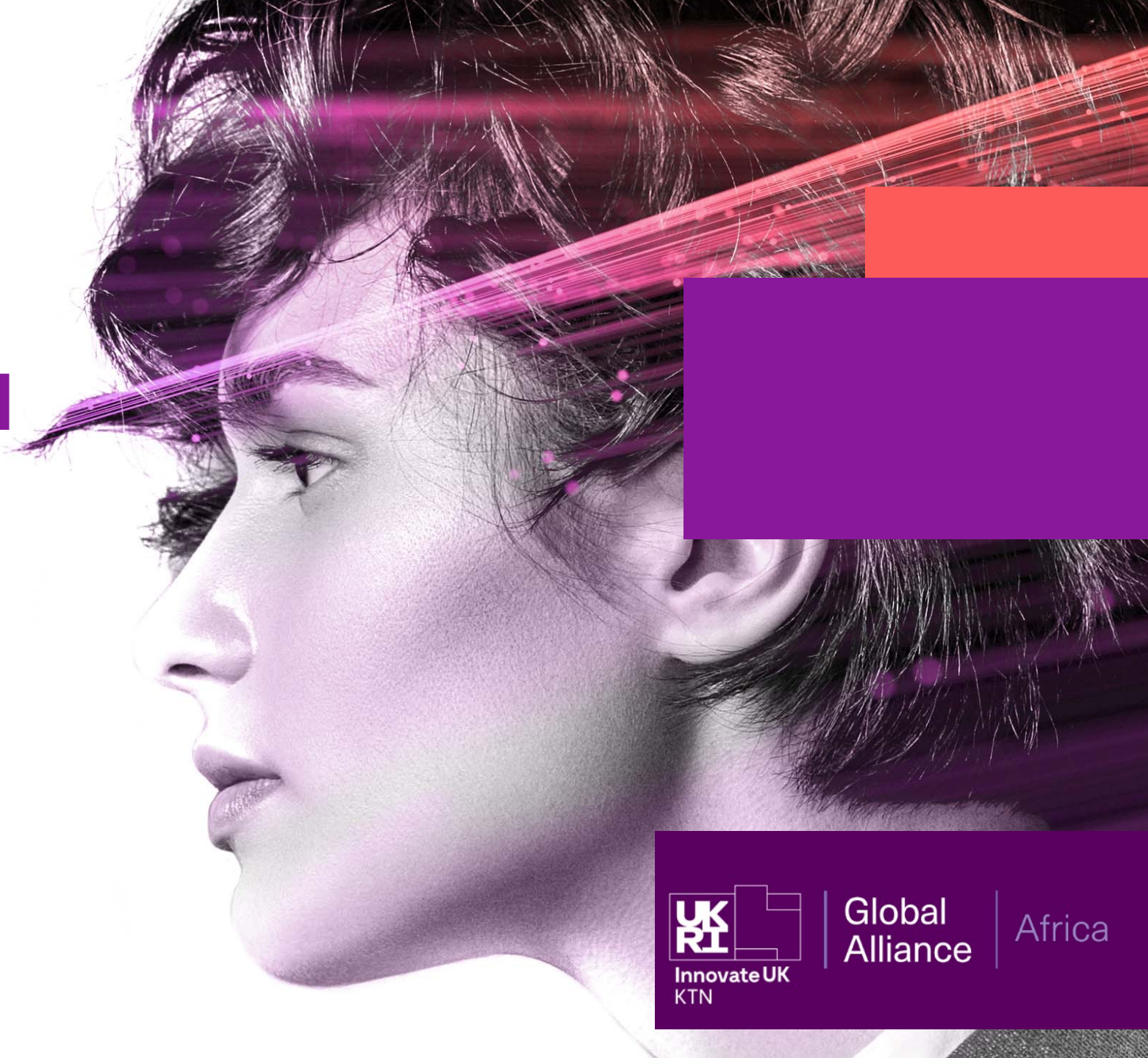
Innovate UK KTN



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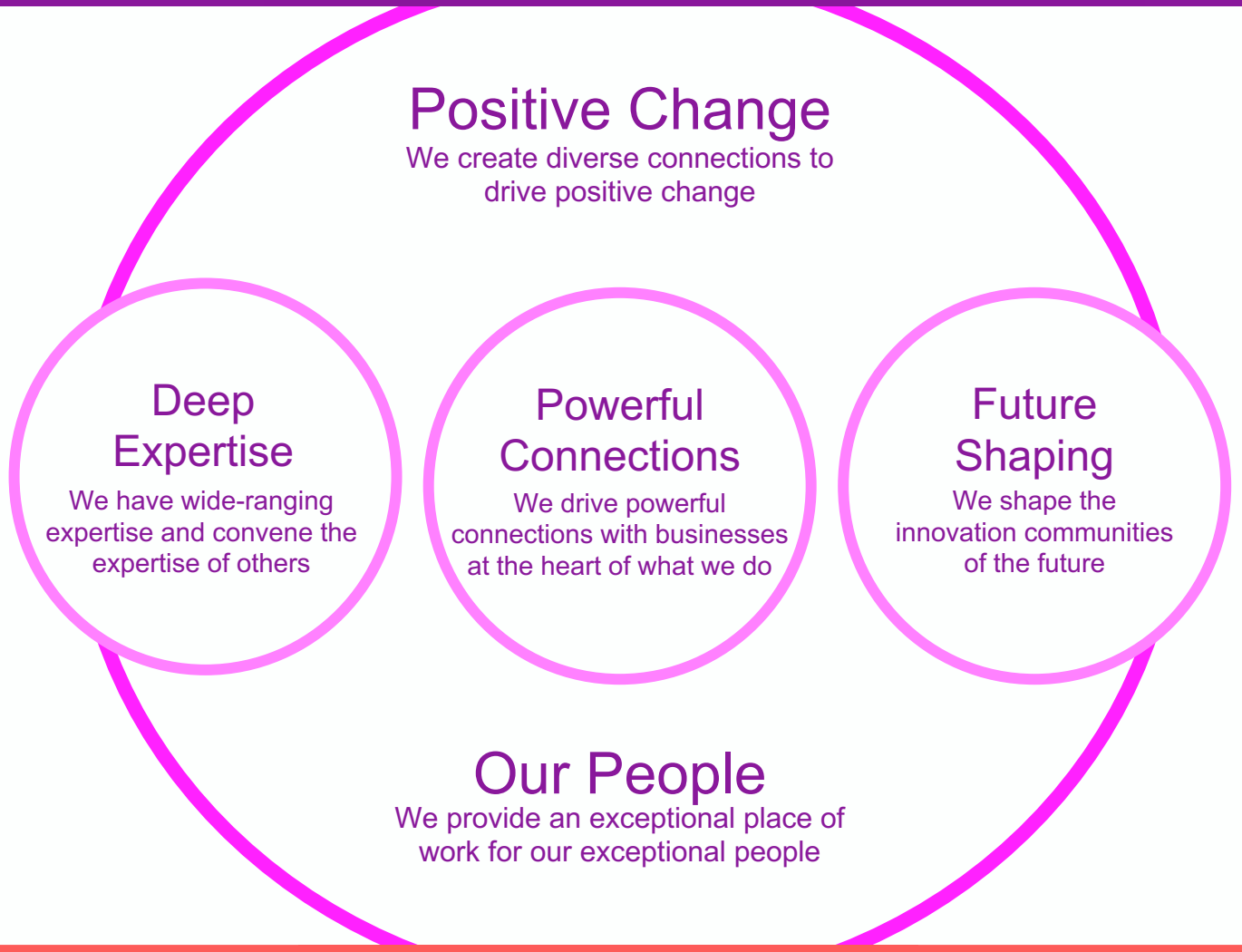
Positive Change Commitments



We will collaborate globally to create valuable international connections for innovators.

We will extend our activity beyond economic prosperity to also deliver sustainable societal & environmental benefit.

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OUR STRATEGIC PRIORITIES

OUR NETWORK

TRULY CROSS-CUTTING NETWORK

+40K UNIQUE ORGANISATIONS

90% SMES

+273K INNOVATORS IN THE UK

OVER 30 COUNTRIES

SECTORS

We create diverse connections in the following sectors and areas of focus to drive positive change

- AgriFood
- Biotechnology
- Chemistry
- Creative Industries
- Design
- Digital
- Electronics
- Energy
- Geospatial
- Health
- Industrial Maths
- Infrastructure
- Manufacturing
- Materials
- Photonics
- Quantum
- Robotics and AI
- Security and Defence
- Sensors
- Space
- Transport
- Water

CROSS-CUTTING AREAS

GLOBAL INNOVATION

DIVERSITY AND INCLUSION

PLACE

NET ZERO

ADOPTION AND DIFFUSION

Impact to innovation

66%

Introduced by KTN go on to **collaborate**

42%

Reach outcomes **faster** by 1-2 years

60%

Increased **investment** in R&D as a direct result from KTN engagement

£100m

Per year increased **investment** in R&D

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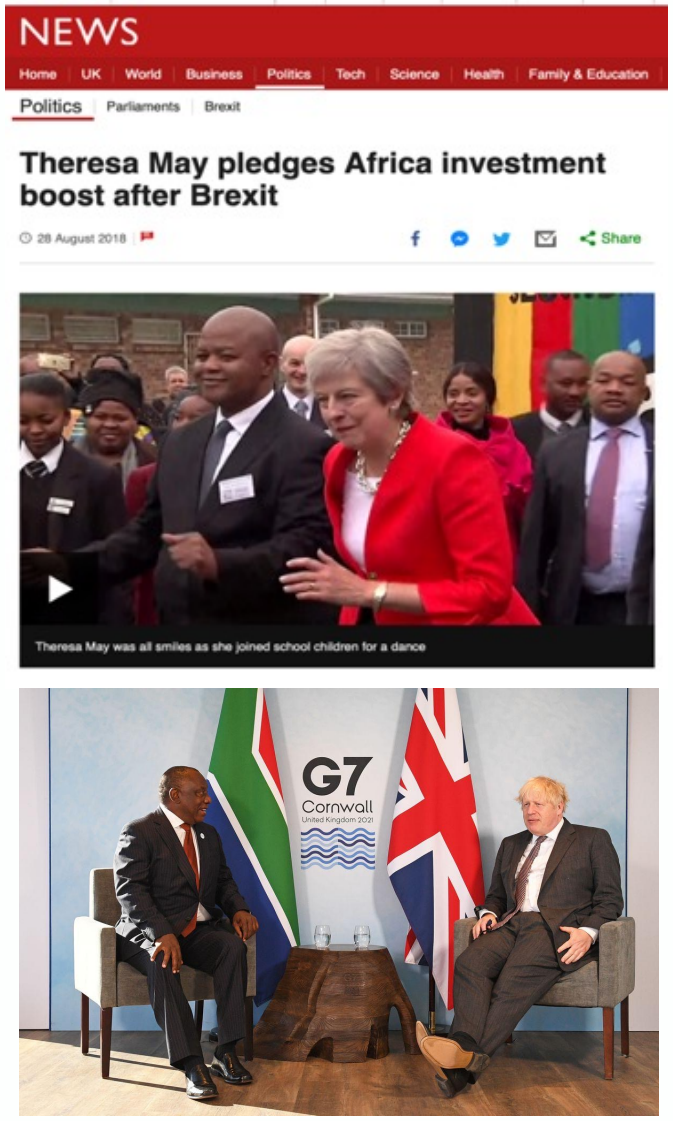
A New Approach to Africa



"With a shared passion for entrepreneurship, technology and innovation, now is the time for UK companies to strengthen their partnerships with Africa to boost jobs and drive prosperity both at home and overseas…

The challenges facing Africa are not Africa's alone. It is the world's interest to see these jobs created."

UK Government, August 2018

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Building UK-Africa Partnership through…

Local to Global

Open Innovation

Place-Based Innovation

Access to Funding

Collaborative R&D Funding

Strengthening the Investment Pipeline

Connected Innovation

Global Innovation Network

Deep Expertise

* Manufacturing & Materials | Transport & Mobility | AgriFood | Health | Climate Technologies | Digital Economy *

* Sector coverage subject to funding level & project priorities

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Innovation Exchange
(iX)

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Local Empowerment Through Collaboration

Innovation Exchange is a KTN programme specially designed to introduce company with technical challenges to innovators who are already working on the solutions.

Sector Technical Challenges

Large organisations, OEMS and Local Authorities have:

- Confidential challenges to solve with no time to explore markets
- Low exposure to companies outside the traditional industry supply chain

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Innovative solutions *<u>from other</u>* sectors

Solution providers find it difficult to:

- Open the right doors at a large org, OEM or local authority
- Prove the value proposition of products
- Understand customer's time constraints

Challenge owners

Solution providers

Previous Challenge Holders

KTN Innovation Exchange Process

(1) Challenge translation	(2) Competition	(3) Solution selection	(4) Relationship building	(5) Technology Development
Identify and translate innovation challenges with KTN	Prepare and release competition to extended KTN and innovation networks	Filter and select responses by Solution Providers to the call	Engage with chosen companies and identify routes for technology development	Distribute seed funding in line with project milestone criteria and reporting requirements
Workshop	Public competition	Selection and pitching	Project Plan	Seed Funding
September 2022- October 2022	**November 2022- January 2023**	**February 2022 – March 2022**	**April 2022**	**May 2023 - April 2024**

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Benefits for Challenge Holders

Supply chain strengthening
It helps build a route for greater and more diverse innovation content in supply chains

Quick and simple exposure to new technologies and markets
KTN delivers technology solutions from areas to which challenge holders do not normally have exposure and markets that are usually unavailable to SMEs (both in- and cross-sector)

Time efficient
It requires little time commitment, with the bulk of the resource and time provided by GAA

Expertise at no charge
We are fully funded by the UK government and there is no charge to you for our professional services

Optional disclosure
Challenge holder involvement can be made confidential if required

Companies using this project have said,
"It is surprisingly simple and very interesting; it has delivered a varied range of Technologies"

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Benefits for Solution Providers

Immediate access to large business
Successful applicants will be given the opportunity to pitch their solution to the Challenge Holder

Ongoing collaboration on project
The selected Solution Provider/s will collaborate with the Challenge Holder and gain access to local facilities, eg: farmland to carry out trials for piloting the solution

Seed Funding provision
Up to GBP 25,000 seed funding to work on the solution for this specific challenge in collaboration with the Challenge Holder

Pitching and development support
Support from KTN and mentoring from our development partners throughout the challenge process

Raising your profile
Make new connections and invitation to attend or present at future IUK KTN events

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Global Alliance Africa Open Innovation Challenges FY21/22

- **Kenya**
  - **Flamingo Horticulture**
    - False Codling Moth detection
    - False Codling Moth control
  - **WEEE Centre**
    - CRT recycling – new products
    - CRT recycling – energy reduction
- **South Africa**
  - **Unilever**
    - Plastic packaging reuse for online retail
    - Plastic packaging reuse for small traders

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Global Alliance Africa Open Innovation Challenges FY22/23

- **Nigeria**
  - **Hinckley Recycling**
    - Battery second life challenge
    - Battery inventory system challenge
  - **AgriFoods challenges TBC**
- **South Africa**
  - **Rand Water**
    - WTR drying challenge
    - WTR beneficiation challenge
  - **Hazardous materials challenges TBC**
- **Kenya**
  - **Agrifoods challenges**
    - Prevent crop damage by birds
    - Reduce post-harvest waste
  - **Transport challenges TBC**

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Introduction to Rand Water

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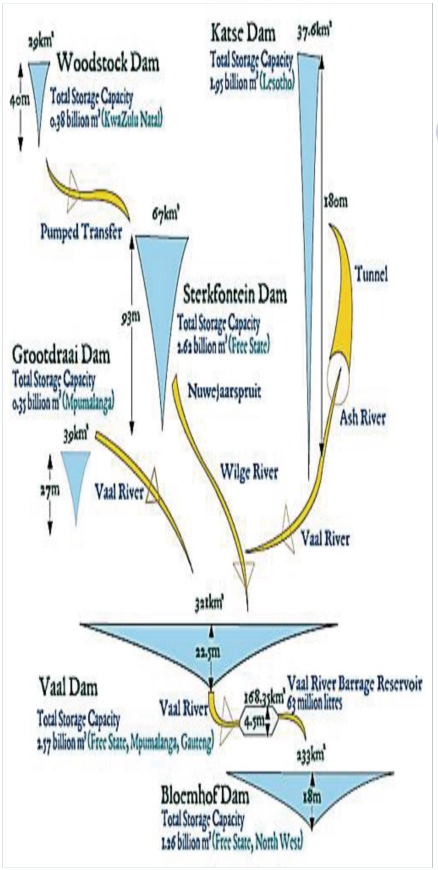
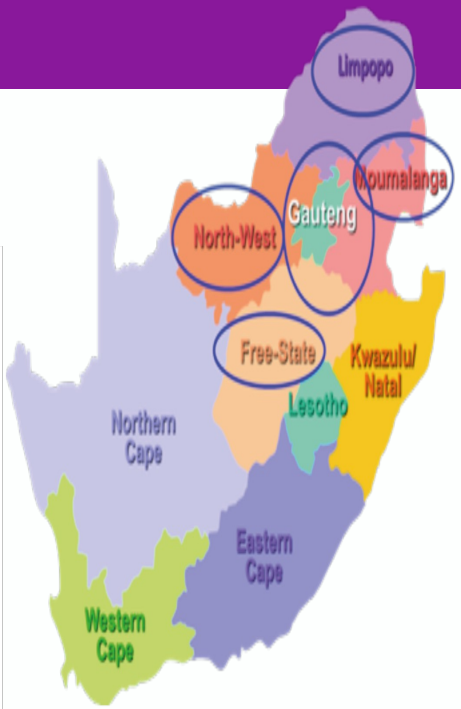
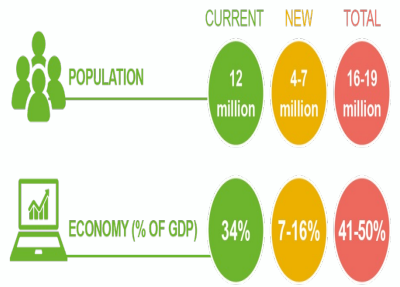
Rand Water







The exact numbers are difficult to calculate because the extended area incorporates portions of Limpopo, North West and Free State. Only Mpumalanga and Gauteng are included in total.

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About Rand Water

Vision

Be a provider of sustainable, universally competitive water and sanitation solutions for Africa

Mission

To consistently meet the expectations of Rand Water customers, partners and the government by strengthening the capacity to:

- Attract, develop and retain leading edge skills in the water services
- Sustain a robust financial performance
- Develop and sustain globally competitive capabilities in core areas
- Enter into and sustain productive partnerships; and
- Develop, test and deploy cost effective technologies

Strategic Objectives

- Achieve Operational Integrity and Use Best Fit Technology
- Achieve a High-Performance Culture
- Positively Engage Stakeholder Base
- Achieve Growth
- Maintain Financial Health & Sustainability

Innovation Driven Risk Based Strategy

- Growth of the organisation looking into various markets
- Establish a fully functional Innovation Hub (Innovation, Research & Development)
- To build a compliance driven & transformed Supply Chain Management function
- Proactive & modernised communication
- Proactive Stakeholder Management

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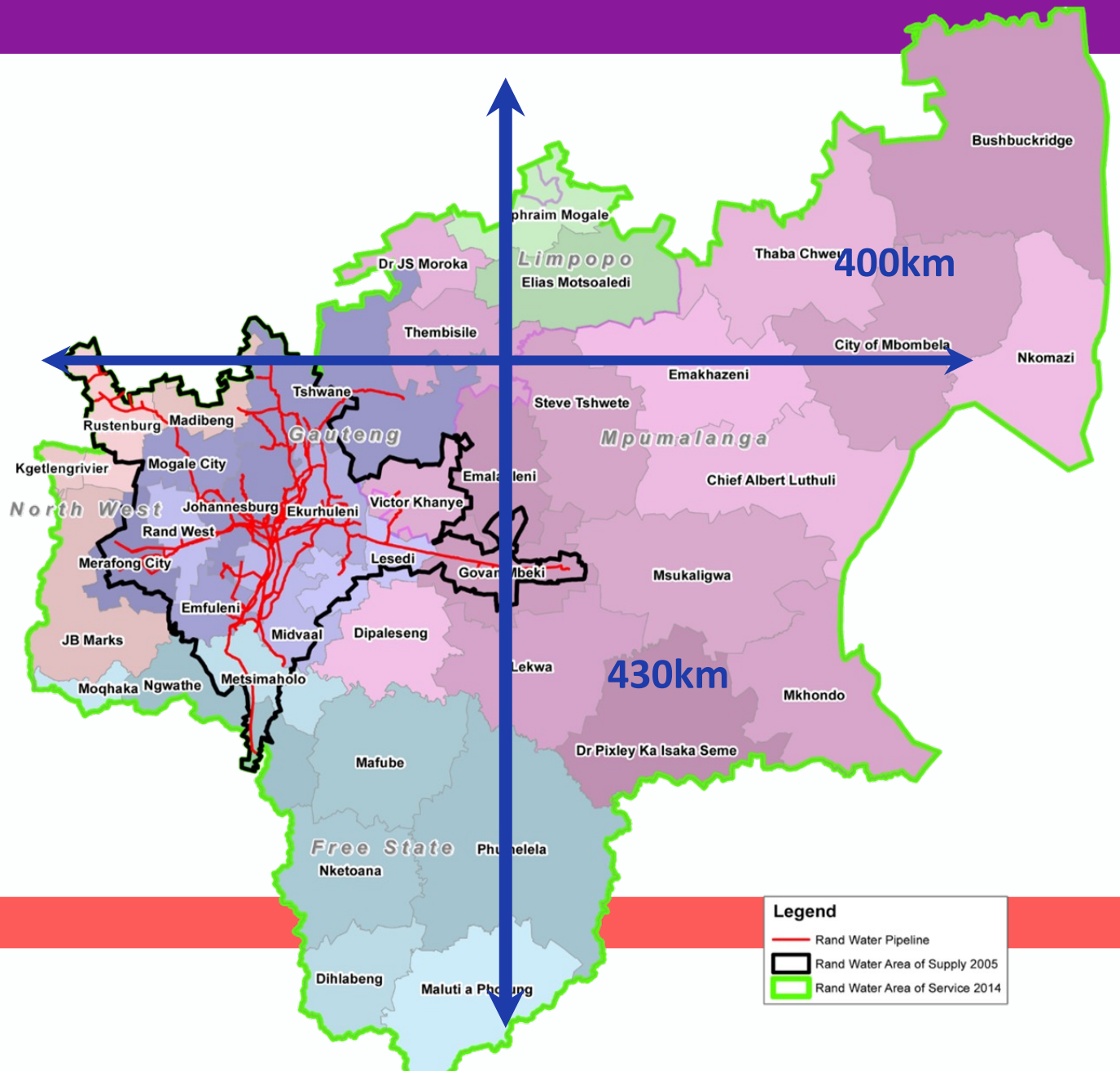
About Rand Water



- Water Trading Entity
- Bulk Water supplier mainly to municipalities
- Distribution network over **3 500 km** of large diameter pipeline
- Feeding **60** strategically located service reservoirs
- Supplied an average of **4 642 Mℓ/d** with peak day demand of **5 069 Mℓ/d**
- **Consumers 17.9 m**
- Largest water utility in Africa existing for **119 years**

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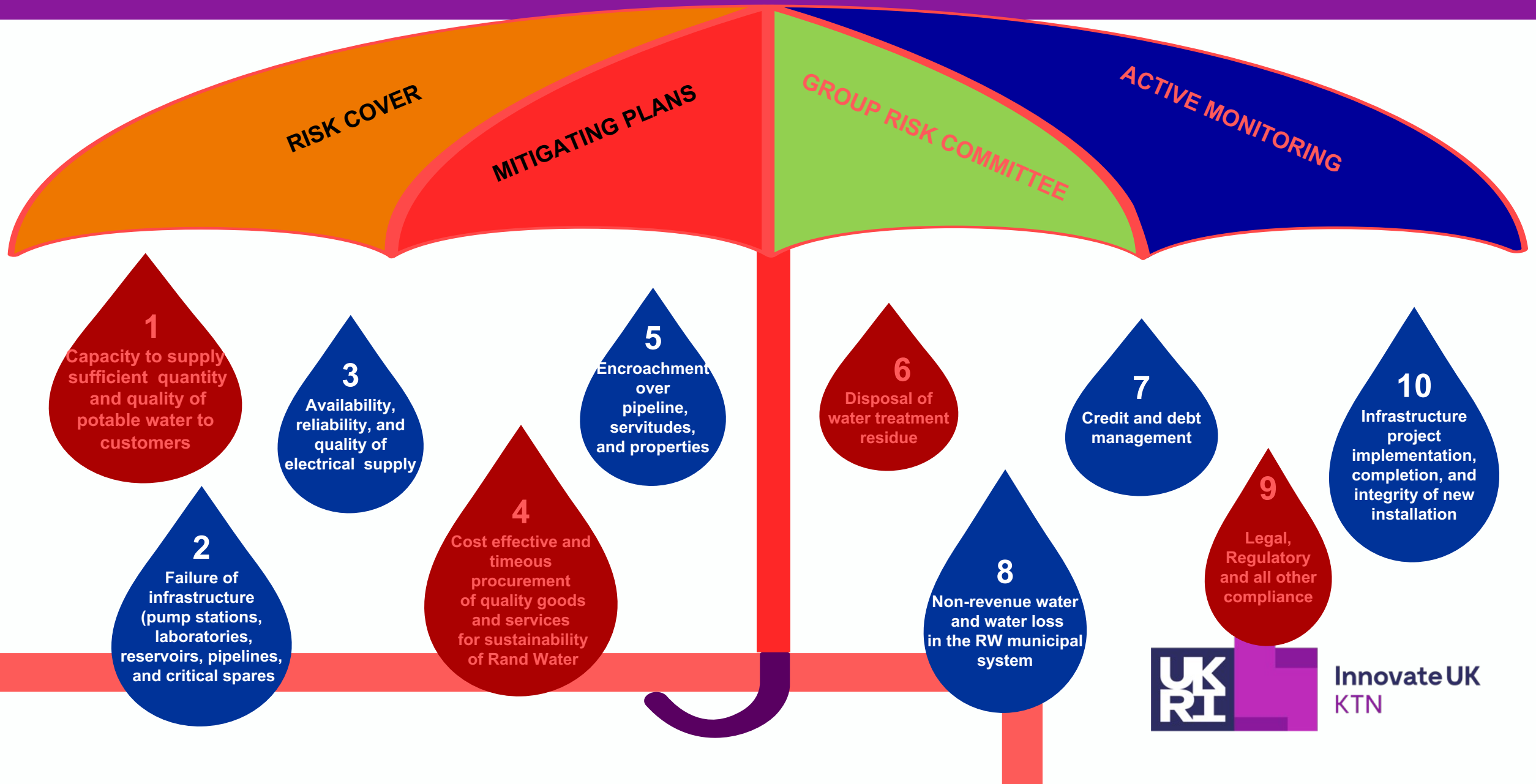
Rand Water – Top 10 risks



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Rand Water – Innovation Plans

Innovation project plans and its related contribution to advance Rand Water's Core Business and creation of new revenue streams to the Sector as a whole

FY2023

- Data Analytics
- Online Water Quality Analysis
- Ground Water
- Virtual Reality & Digital Twins
- Vandal Proof Units
- Water Treatment Residue

FY2024

- Ground Water
- AMD Water Treatment & Recovery
- Hydro Energy
- Sensors Analytics
- Membrane Predictive Technology

FY2025

- Digital Twins
- Virtual Reality
- Neural Networks

FY2026

- Digital Twin Of Key Infrastructure
- Virtual Reality
- Blockchain Advanced Analytics

FY2027

- SMART – Digital Water Company
- SMART Pipeline Network
- Virtual Sensors
- Predictive Analysis

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Rand Water
Water Treatment Residue Challenges

RAND WATER

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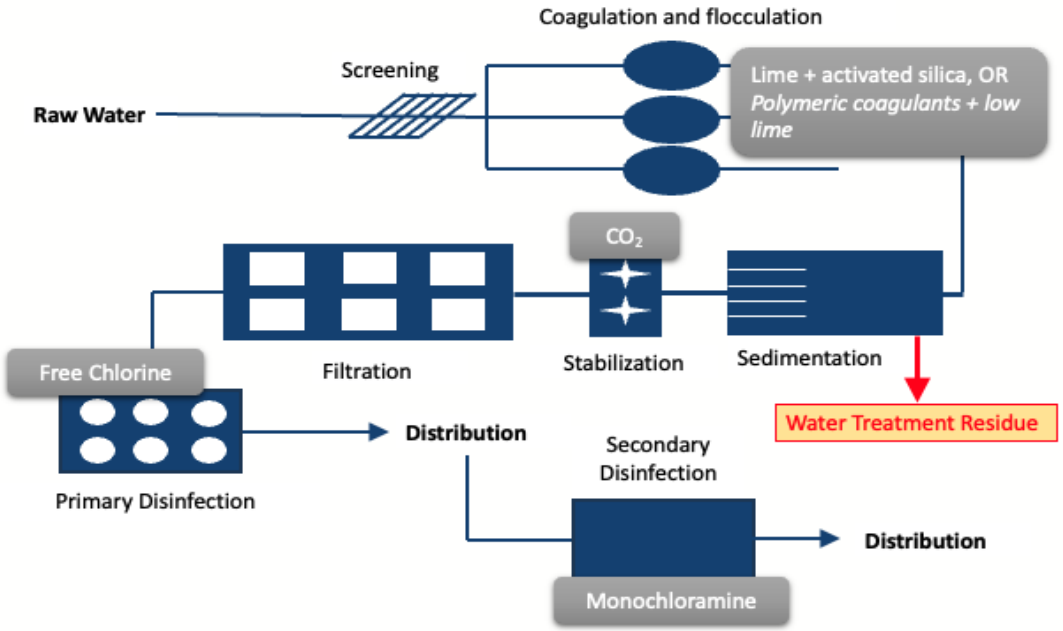
Rand Water - Water Treatment Process

CURRENT RAND WATER TREATMENT PROCESS



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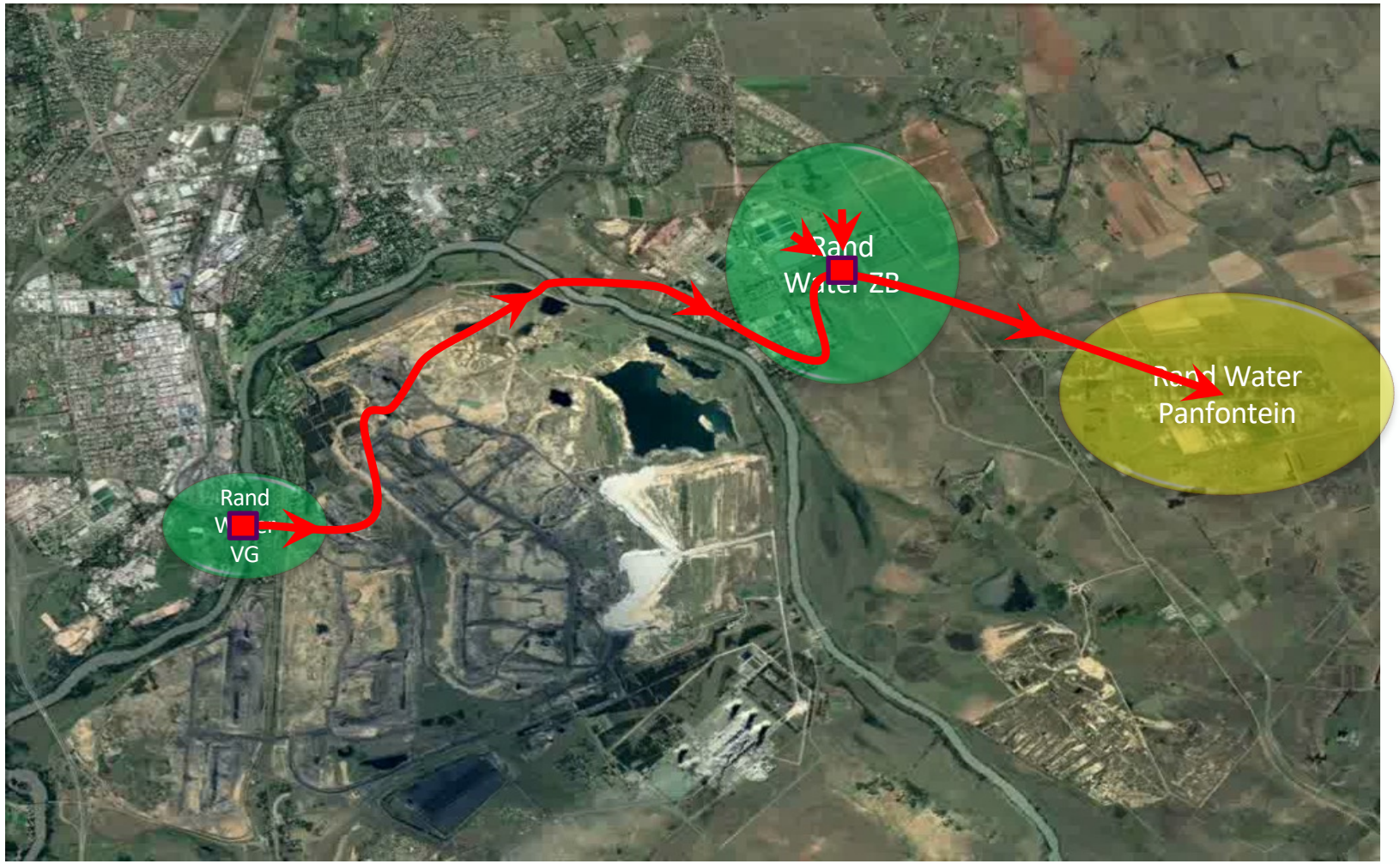
Water Treatment Residue Flow



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Water Treatment Residue Flow

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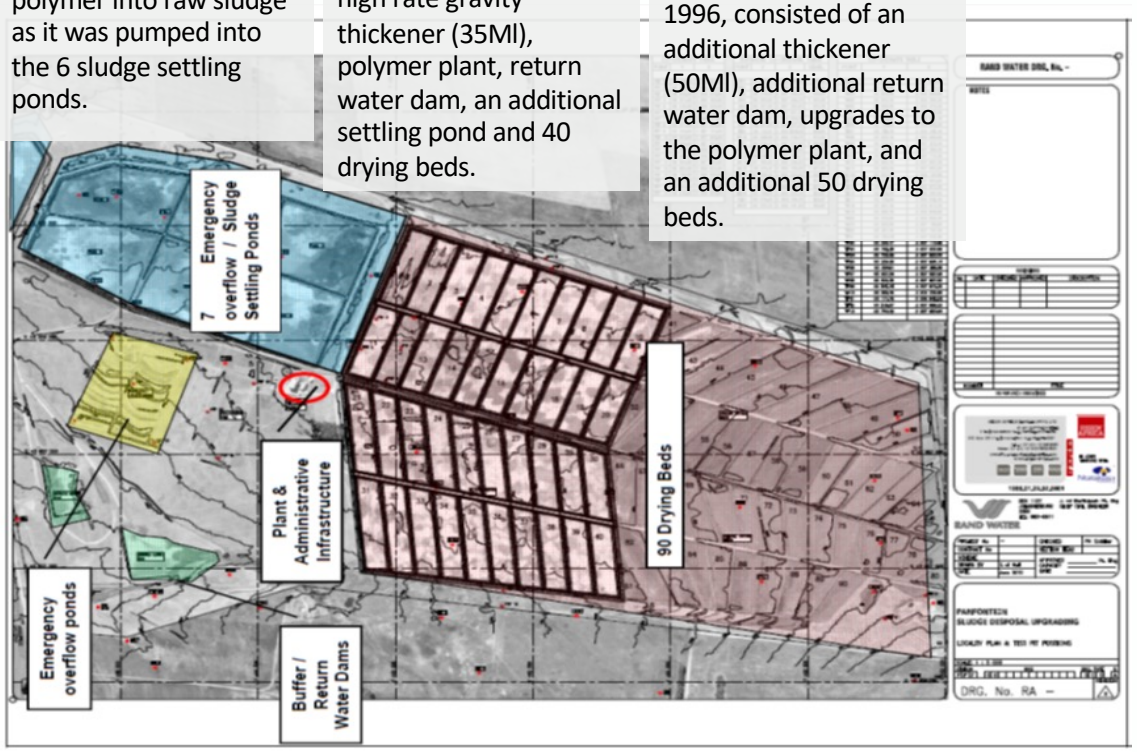
Establishment of Panfontein

Commencing in 1984, the site was established in a series of phases

Phase 1 started in 1984 as a polymer dosing plant, dosing diluted polymer into raw sludge as it was pumped into the 6 sludge settling ponds.

Phase 2 followed in 1992, consisting of one high rate gravity thickener (35Ml), polymer plant, return water dam, an additional settling pond and 40 drying beds.

Phase 3 implemented in 1996, consisted of an additional thickener (50Ml), additional return water dam, upgrades to the polymer plant, and an additional 50 drying beds.



Area: +/- 6 km2

2003 – Operating Permit from the Department of Water & Sanitation/Department of Environmental Affairs

The final upgrade to present state, started in 2007 to upgrade 40 of the existing drying beds. The wall heights of the beds were to be increased (from 1.5m to 4m) to create more disposal capacity.

20 beds were approved and upgraded, with the inclusion of an impermeable High Density Poly Ethylene (HDPE) liner as required by legislation.

The upgrade was completed in 2014. Inclusion of the liner, poor design and limited bed rotation has depleted capacity quite rapidly.

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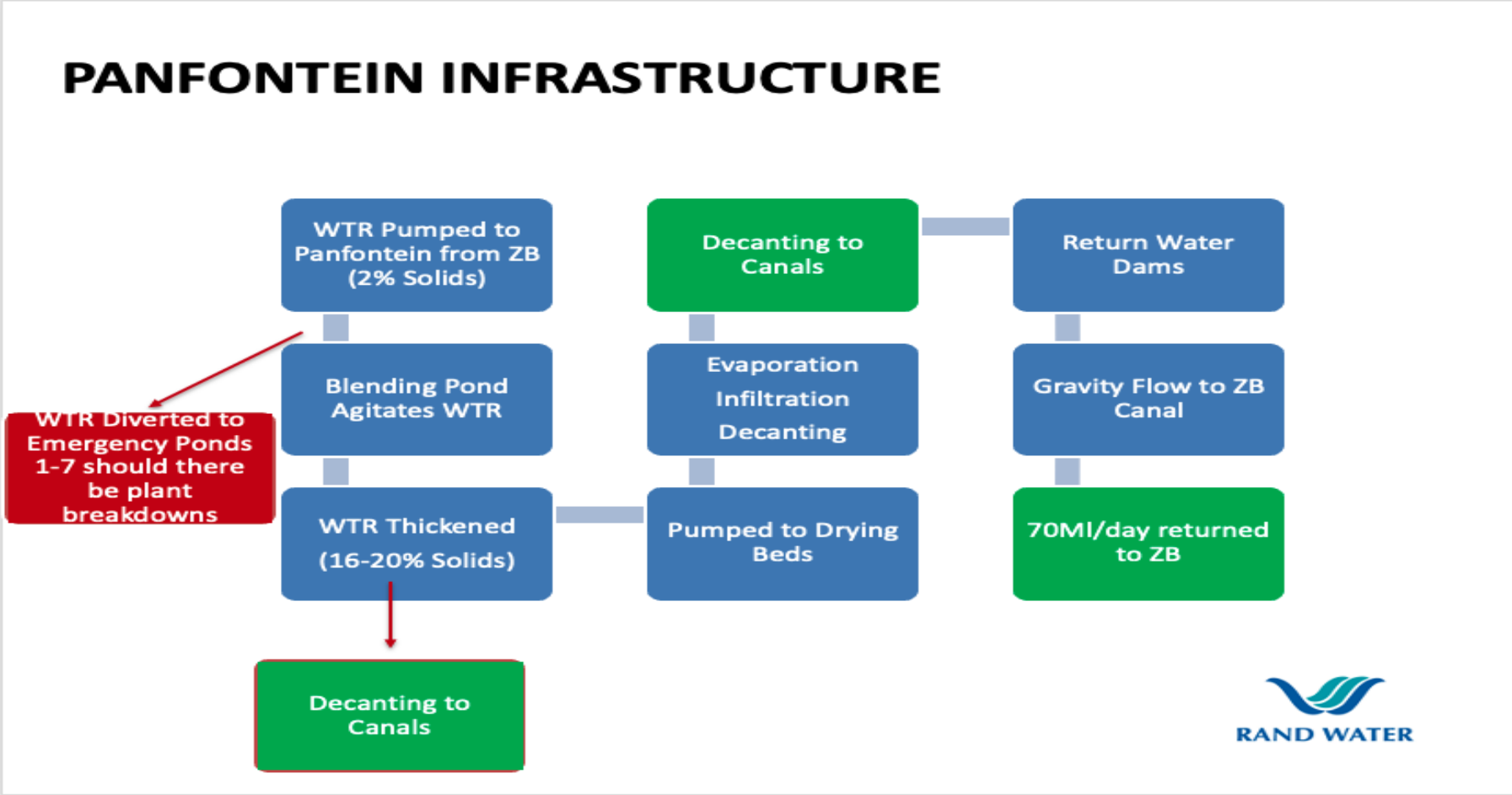
Panfontein Process Flow



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Operating Philosophy for Treatment of WTR

- WTR is scoured from the sedimentation systems at Zuikerbosch and Vereeniging stations at an ideal consistency of ~1.8 - 2.0%m/v solids and gathered at Central Sludge 2 at Zuikerbosch.
- From Central Sludge 2, it is pumped through one of two 700 mm pipelines to Panfontein.

- At Panfontein there are 7 sludge settling ponds with an average size of approximately 350m×350m×5m. Settling pond six is used as a balancing pond where ideally mechanical agitation keeps the solids in suspension. Agitation system design was not optimal, not operational. The balancing pond (blending pond) serves as a holding pond from where the sludge is pumped for processing.
- WTR is pumped from the balancing pond to the plant, an anionic polyelectrolyte flocculent (polyacrylamide) is added to the raw WTR and flocculation occurs.

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Operating Philosophy for Treatment of WTR

- Treated WTR moves to high rate gravity thickeners (35Ml and 55Ml) where aggregation of the solids occurs resulting in phase separation.
- Solids particles settle to the base of the thickener where a mechanical rake scrapes thickened WTR to the centre.
- Underflow pumps extract this product (now at an ideal consistency of 16- 18%m/v) from the thickener to the drying bed pumps for dispersion onto drying beds.

- Tests conducted, as far back as 1995, proved that a 180mm layer of 20%m/v thickened sludge applied to a drying bed will take 35 days to dry.
- Current average amount of sludge treated at Panfontein varies between 70 Ml/d and 85 Ml/d, translating to approx. 600 tons of dry sludge a day.

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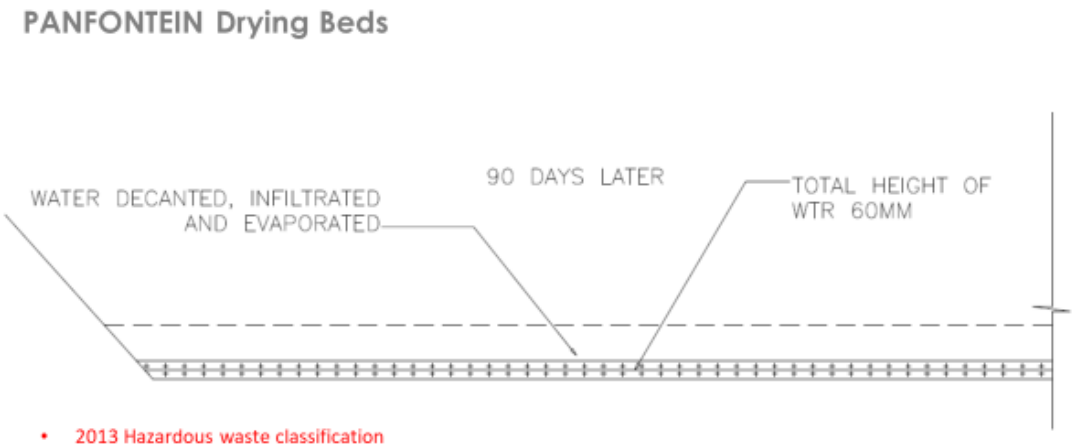
Drying beds at Panfontein



- 2013 Hazardous waste classification
- Beds 1-20 reduced water removal
- No harvesting, allot of water trapped in the beds
- Sacrificial beds projects
- Insufficient beds to rotate
- No more space

RAND WATER

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Composition of Rand Water's WTR

Macro Chemical Composition of WTR		
Determinant	Range (% m/m)	Mean (% m/m)
Loss on ignition (LOI)*	15.2 - 25.7	19.6
Silicon as SiO_2	33.2 - 47.6	41.9
Aluminium as Al_2O_3	14.5 - 20.6	18.1
Iron as Fe_2O_3	6.4 - 9.1	7.9
Calcium as CaO	4.2 - 15.7	7.9
Magnesium as MgO	1.8 - 2.6	2.1
Potassium as K_2O	1.2 - 1.8	1.5
Titanium as TiO_2	0.4 - 0.6	0.5
Manganese as MnO	0.0 - 0.3	0.2
Phosphorous as P_2O_5	0.1 - 0.2	0.1
Sodium as Na_2O	0.0 - 0.2	0.1

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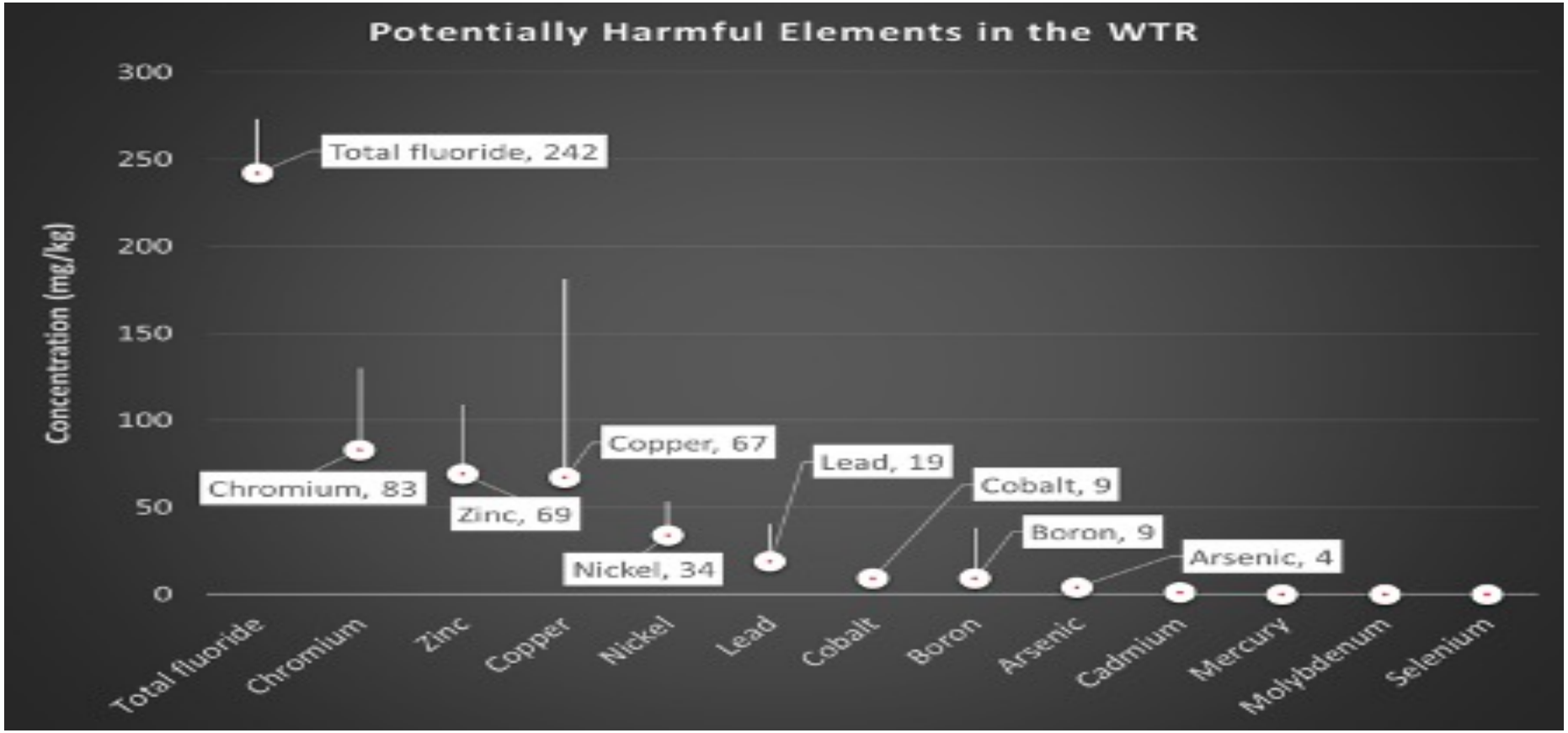
Potentially harmful elements in the WTR



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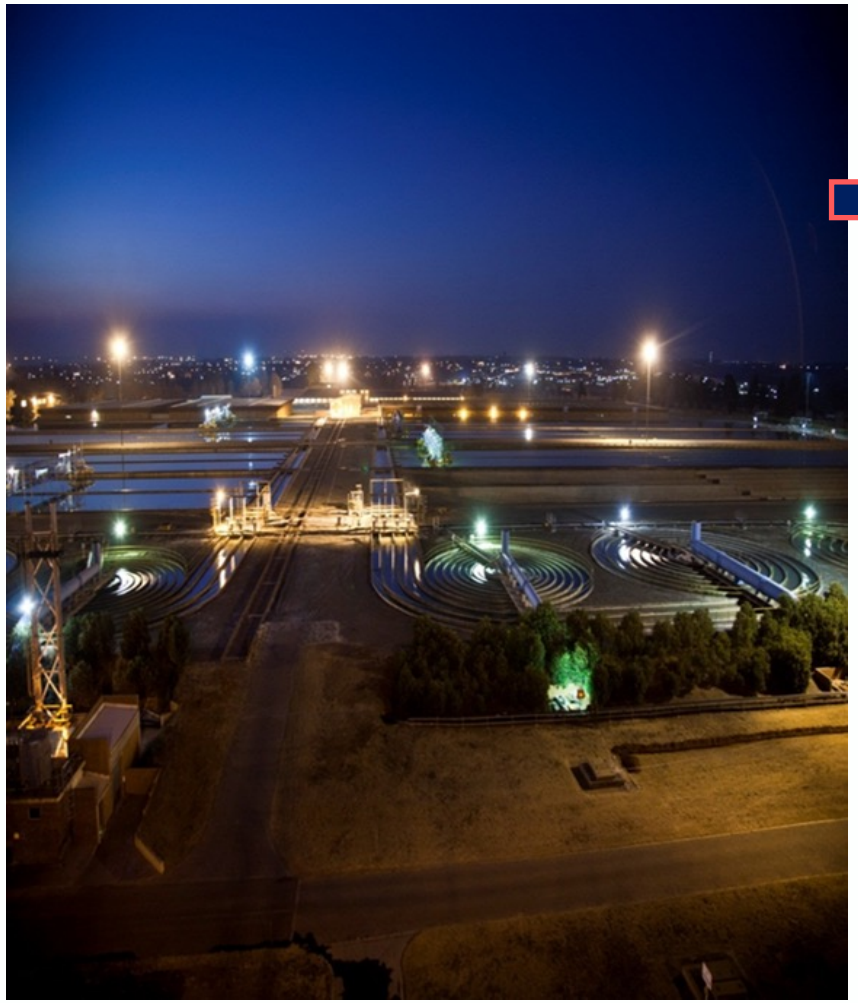
Graphic representation of the drying beds



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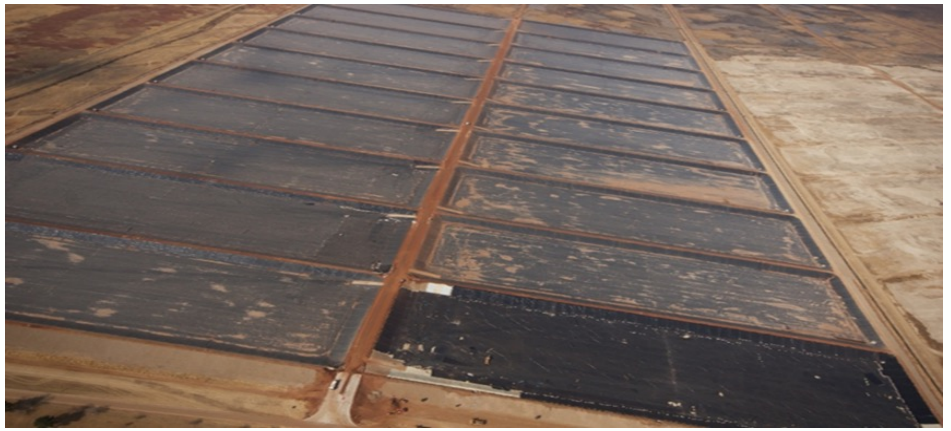
Graphic Representation of the Drying Beds



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Accelerating the Concentration of Water Treatment Residue

Innovate UK KTN | Global Alliance | Africa

Challenge

Rand Water is actively looking for solutions which can rapidly and effectively remove water from Water Treatment Residue at their treatment facility.

This challenge has both technical and commercial aspects. Primary drivers for this pilot project include:

- Management and disposal of WTR
- Environmental compliance
- Cost effective and economically viable solution

There is a pilot project for beneficiation/valorisation of WTR running concurrently. This aims to create new products and services that generate commercial value.

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Challenge

The drying facilities are close to capacity and sustainable innovative solutions with minimal environmental impact for the dewatering process are needed. Rand Water is particularly interested in solutions which **address circularity, water security and resilience, and water reuse.**

Rand Water is looking for innovative solutions, which are sustainable and environmentally friendly, to accelerate the WTR drying process and preferably allow for recovery of water for reuse. These solutions may **create an intervention at any stage of the treatment process** prior to sedimentation, or at the Panfontein disposal site itself.

Target Audiences

Solutions are invited from, but not limited to, the following sectors:

- Agricultural sector
- Engineering and Design
- Chemical Sector
- Construction & Infrastructure
- Materials
- Mining

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Functional Requirements

A solution would ideally provide the following:

- **Increase the speed of concentration/dewatering** of WTR (increasing solids from 16-20% to 75-100%)
- Solution must be **scalable across all drying beds** at facility (for solutions based at Panfontein)
- Cost effectiveness and **economic viability**
- **Upstream focus is preferred** so as to retain as much water as possible at the water treatment works before reaching Panfontein (thus reducing the scale of WTR volumes requiring processing downstream)
- **Environmentally friendly operation** enhancing consumer perceptions of sustainability
- Ideally improve, but at least meet minimum **regulatory and statutory requirements**
- Technological maturity: **preference for late stage solutions** (TRL 7+) that have passed proof of concept stage, are in pilot, ready to commercialize or commercialized. However lower TRL ideas will also be considered.

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Technical Requirements

- Solution may be **integrated with Rand Water's existing system or may be a separate system** alongside it.
- Please detail any **new infrastructure requirements** for this solution
- The existing pipelines are designed to transport sludge with less than 5% solids – so **new transportation methods** may be necessary also
- Solution must be **applicable in modular format**, so it may be scaled progressively
- Solution must **reduce drying time of WTR by >50%** from 30-45 days to range of 10-20 days
- Solutions should estimate life cycle costing with a **20-year planning horizon**

Operating Conditions

- Solution must operate for **12 hours minimum** (daytime)
- Solution availability **24/7 would be preferable** (day and night)
- Solution should **reduce typical drying time by at least 50%** on average across the year
- Solution must be able to **operate in all seasons**
- Solution must be **non-polluting**

Innovative Solutions to Beneficiation of Water Treatment Residue

Innovate UK KTN

Global Alliance | Africa

Challenge

Rand Water is looking for solutions which can transform large volumes of dry/semi-dry/wet water treatment residue at their treatment facility into products or services with commercial value.

This challenge has both technical and commercial aspects. Primary drivers for this pilot project include:

- Generation of new products and solutions
- Revenue generation and extracting commercial value
- Job creation and skills transfer

There is a pilot project for accelerating the concentration of WTR running concurrently. This aims to lessen the drying times required to improve operational efficiencies.

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Challenge

Rand Water is looking for innovative solutions, which are sustainable and environmentally friendly, to **utilise this dry water treatment residue**.

The process of recovering value is known as **Beneficiation** and the process of generating new value is **Valorisation**. Both of these concepts are applicable to this challenge.

Previous uses considered for WTR have been for soil beneficiation (expired approval) and brick making (previous thermal process investigation).

Target Audiences

Solutions are invited from, but not limited to, the following sectors:

- Agricultural sector
- Engineering and Design
- Chemical Sector
- Construction & Infrastructure
- Materials
- Mining

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Functional Requirements

- Solutions must be able to **process large volumes** of the WTR
- Complete or **near complete removal** of WTR
- Compliance with **regulations for Type 3 Waste***
- Cost effectiveness and **economic viability** of the solution
- Potential for **generating new value/ revenue**
- Potential **reuse** of WTR constituents
- Possible generation of clean energy and **environmental friendliness**
- Ideally improve, but at least meet minimum **regulatory and statutory requirements**, as well as consumer perceptions pertaining to environmental sustainability
- Technological maturity: **preference for late stage solutions** (TRL 7+) that have passed proof of concept stage, are in pilot, ready to commercialize or commercialized. However lower TRL ideas will also be considered.

UKRI Innovate UK KTN

Technical Requirements

- Solution may be **integrated with Rand Water's existing system or may be a separate system** alongside it.
- Please detail any **new infrastructure requirements** for this solution
- Solution must be applicable in **modular format**, so it may be scaled progressively
- Solution should be **viable for large volume usage** (approx. 600 tonnes/day as dry solids)
- Solution should be able to accommodate significant **WTR composition fluctuations**
- Solutions should estimate life cycle costing with a **20-year planning horizon**

Operating Conditions

- Solution must be easily **transportable by road**
- Solution must be **robust and stable** under normal temperatures
- Solution must be viable for **internal and external** environments
- Solution must be able to **operate in all seasons**
- Solution must be **non-polluting**
- A **minimal liquid discharge** solution shall be preferable

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Cost Requirement & Market Opportunity

- The solution process must be **cost-effective** in terms of ROI (or at least cost-neutral)
- There is **500-600t/day of feedstock available daily** (available at no cost) to be monetised
- Winning solution providers will become **long-term partners**, gaining access to all WTR stocks available

Application Information

Innovate UK KTN | Global Alliance | Africa

Deployment Timescale

- 16 Nov 2022 – Competition Launch
- **30 Nov 2022 – Information session/Q&A**
- **31 Jan 2023 – Deadline for applications**
- Feb 2023 – Selection and notification of finalists
- Mar 2023 – Pitch day
- Mar 2023 – Selection of Winner
- Apr 2023 – Collaboration Discussions
- May 2023 – Pilot programme activated

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Eligibility

Applicants must be:

- **Established** businesses, start-ups, SMEs, individual entrepreneurs or academics.
- **Collaborative** solutions (Business to Business B2B and B2R&D) are valid applications. If collaborative solutions are being submitted, a single lead organisation (industrial or academic partner) needs to register the application.
- **Priority** is given to solution providers based in South Africa, Nigeria and Kenya. However, innovative solutions from the UK and RoW also welcome.

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Assessment

Applications will be assessed on:

- **Relevance** to the topic
- **Innovative** nature of the subject
- **Coherence** of the proposed business model
- **Feasibility**/economic viability
- **Development potential**
- **Maturity** of project/solution
- **Ease of implementation/**ability to launch project quickly
- **Suitability** for the African Market

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Rewards & Benefits

- Up to **GBP 25,000** seed funding (Subject to T&C)
- Opportunity to pitch your solution and **collaboration/partnership** with Rand Water
- **Access to materials** and Rand Water facilities
- **Technical support** from Rand Water team
- **Mentorship programme** with Startup Discovery School (facilitated by KTN)
- **Sector expertise** from KTN
- **Support in the development** of a prototype or pilot
- Invitation to attend or present at KTN events
- **Investor** introductions (if investment is required)

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Challenge Applications

Accelerating the Concentration of Water Treatment Residue
innovationexchange.ktn-global.org/challenges/214
lnkd.in/eyVkZDDu

Innovative Solutions to Beneficiation of Water Treatment Residue
innovationexchange.ktn-global.org/challenges/215
lnkd.in/eZCzRVJi

Event slides, recording and application details will be emailed to everybody who has registered for this event.

UKRI Innovate UK KTN

Q&A Session

Innovate UK KTN | Global Alliance | Africa

Thank you.

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