CSIR Technologies and Interventions to maximise the availability of water for Scenarios of Industrial Growth

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IDEAS THAT WORK FOR INDUSTRIAL DEVELOPMENT

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Water – Why it Matters?

Water is a CATALYST!!!

A natural resource that serves as an input to industrial production processes and provides a vital role in associated support services.

Its absence is invariably a key constraint to industrialisation and industrialisation endeavours -

BUT its security of quality and quantity availability enhances socio-economic development and prosperity.




Outline of Presentation

- Strategic context and challenges facing the water sector in SA
- Current developments in water security relating to economic development and industrialisation
- CSIR Technologies and Interventions
- Concluding Remarks

Overall Strategic Context

International Context:
World Economic Forum identifies water as global risk since 2012
Further recognised through efforts at continent (NEPAD Water CoEs) regional level (SADC Water Division)

National Context:
National Development Plan (Chapter 4) - Economic Infrastructure - water recognised as foundation for socio-economic activities

02 Edition NWRS 2013: Strategic goals and plans for ensuring water security – equitable and sustainable future

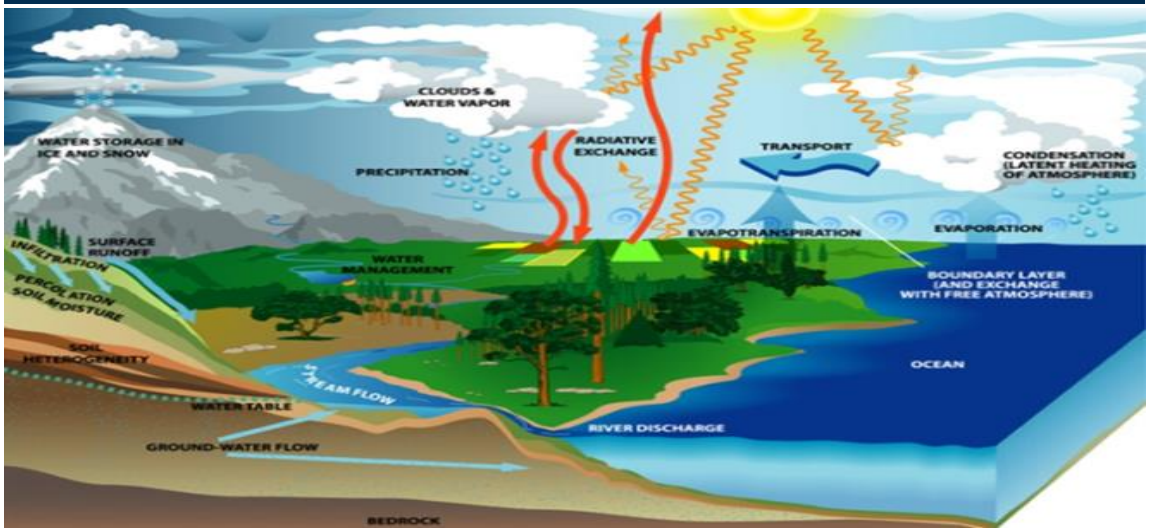
NWRS
National Water Resource Strategy

Water RDI 10-year Roadmap (DST/WRC) – focused contribution of RDI activities in the areas of water supply and demand

CSIR Compact: sets the directive and mandate for the focus

CSIR | SHAREHOLDER'S COMPACT

Hydrological cycle: quantification and integration



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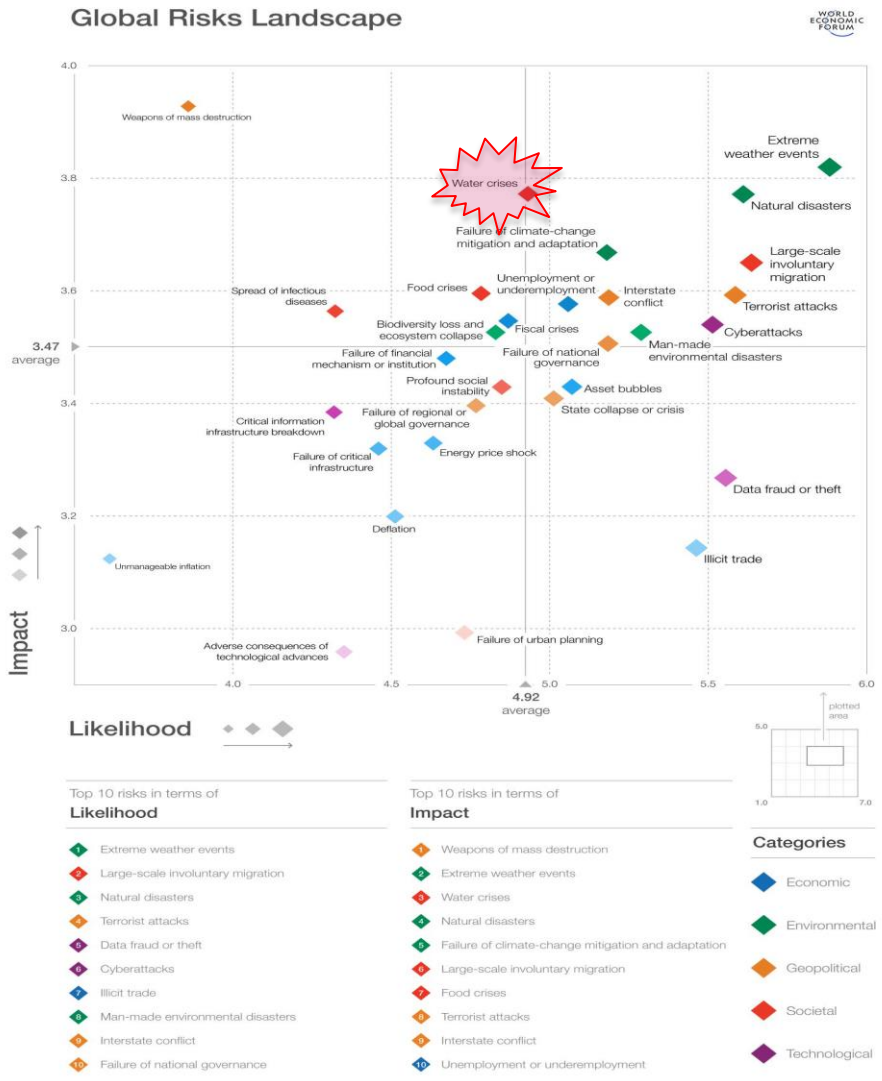
A Major Global Risk

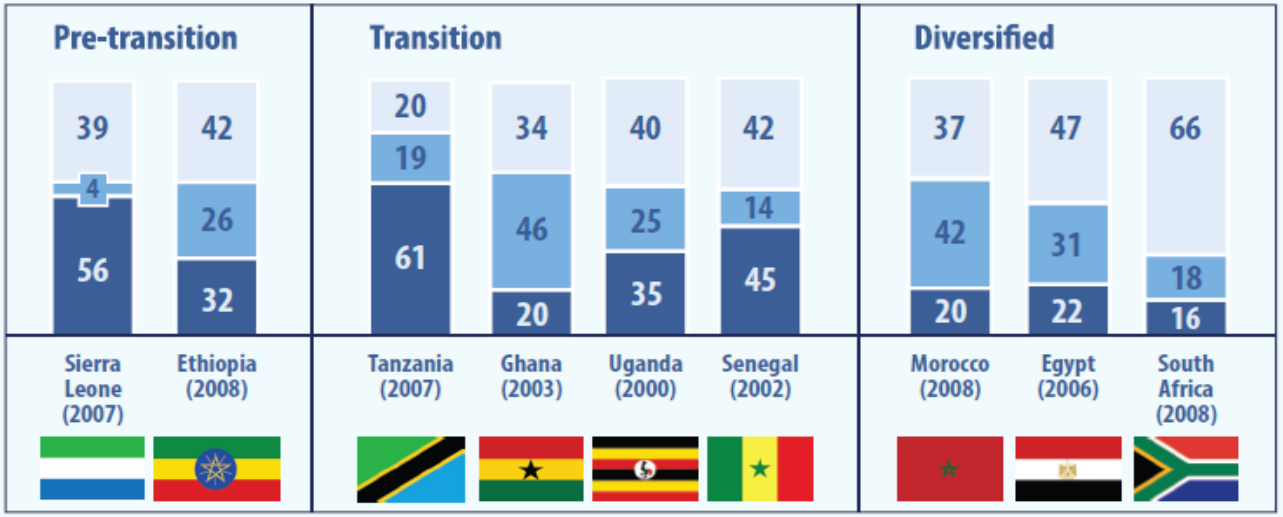


1. Unemployment and underemployment
   Profound social instability
2. Large-scale involuntary migration
   State collapse or crisis
3. Failure of climate-change mitigation and adaptation
   Water crises
4. Failure of national governance
   Profound social instability
5. Interstate conflict with regional consequences
   Large-scale involuntary migration

(WEF, 2017)

Economic Growth & Business Risks

It creates jobs and stimulates GDP growth

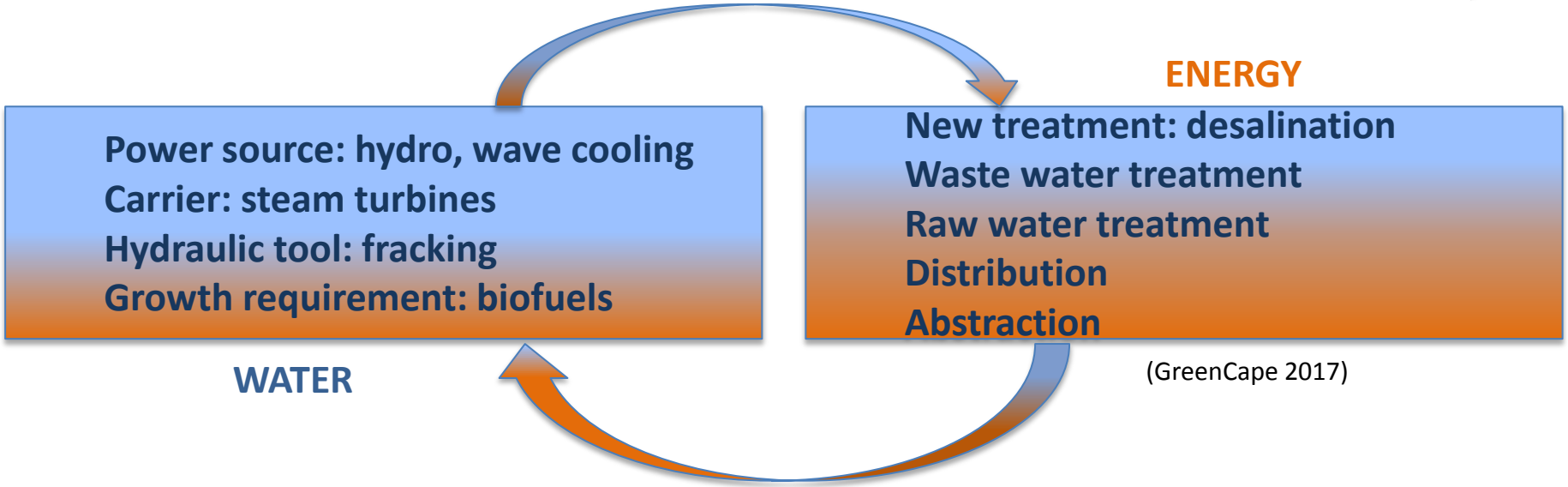


(UN Water Report, 2016 - McKinsey Global Institute).

Water-Related Business Risks

- Companies experiencing increased detrimental impacts from water (security of availability and quality) – *water-related impacts result in financial impacts*.
- 05th Assessment of IPCC Projects found that each degree of global warming would result in approximately *7% of global population exposed to a decrease of renewable water resources of least 20%* (UNCDP, 2016).
- With respect to climate change linkages – water is recognised as a very *significant risk regarding the likelihood and impact* of water crises, extreme weather events and natural disasters (WEF, 2017).

Interdependencies



(GreenCape 2017)

Water, energy and food (WEF) security constitute critical components of human well-being and include aspects of supply, demand and access to these three necessary components.

At the same time, climate change is likely to result in reduction of surface water availability, shifts in the seasonality of rainfall and runoff, growing water use demands and an increase in the magnitude and frequency of flood and drought events.

Environmental Sustainability & Industry

Its pivotal role in achieving environmental sustainability - securing the low carbon transition

- Certain emission reduction activities by companies are water-dependent.
- A (very!) scarce resource in SA - relationship between ecosystems and water management can be mutually beneficial – 'Water Footprint' and 'Green Infrastructure'.

Opportunities for Industry

- Incentives for *minimising water use* – direct cost savings – reduce water dependency and pollution
- Water *security and 'independence'* - increasing competition for the scarce resource from increased industrial water demands and waste water production.
- Associated future market growth for industrial intake - and waste-water *treatment technologies*.
- Water for industrialisation requires *management and operational interventions* at systems and individual user scales … governance to technologies!

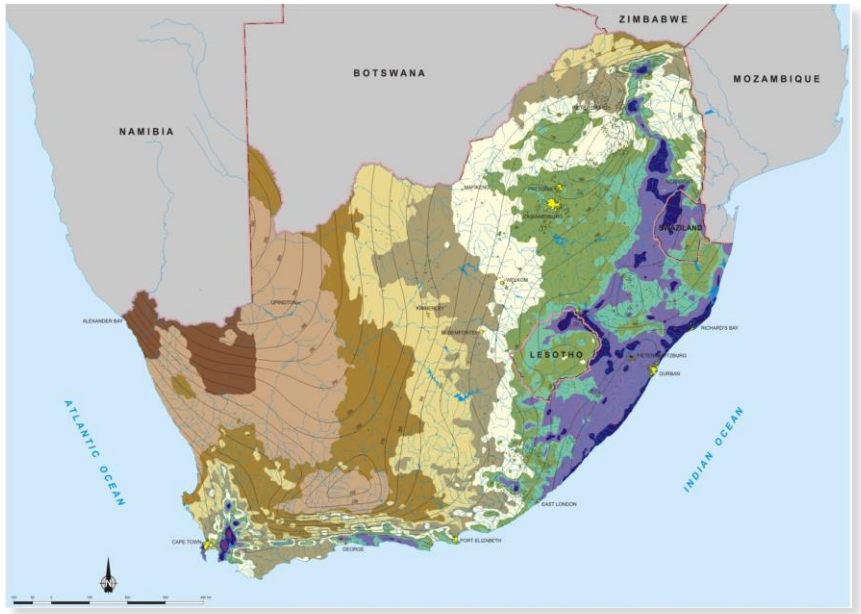
Transboundary Water Management

Regional Outlook

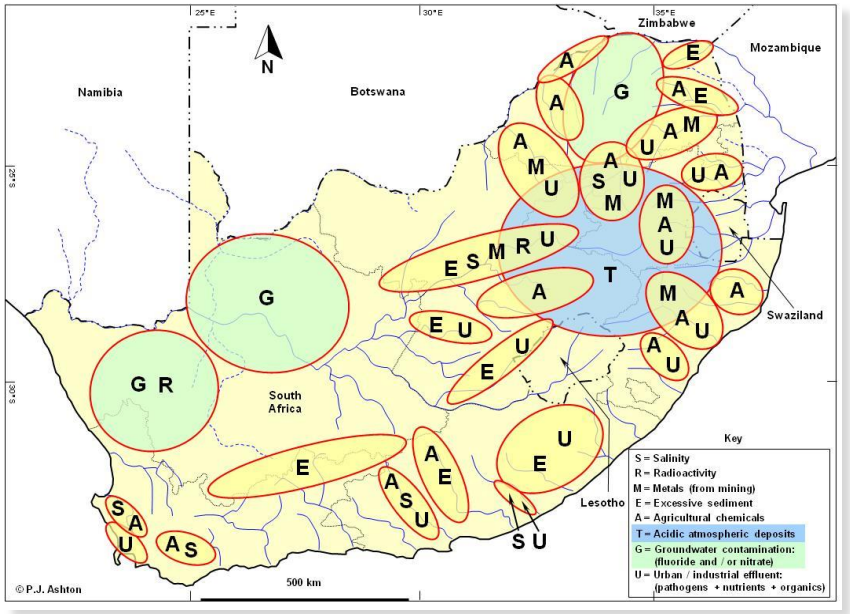
- Africa comprises more or less 9% of world's fresh water resources and 11% of world's population
- Around 75% of sub-Saharan Africa falls within 53 international river basin catchments crossed by multiple borders
- Four international river basins in SA:
  - Cover 60% of land area
  - Contribute 45% of total river flow
  - Support 70% of GDP

Challenges within SA Water Context

Availability and Supply

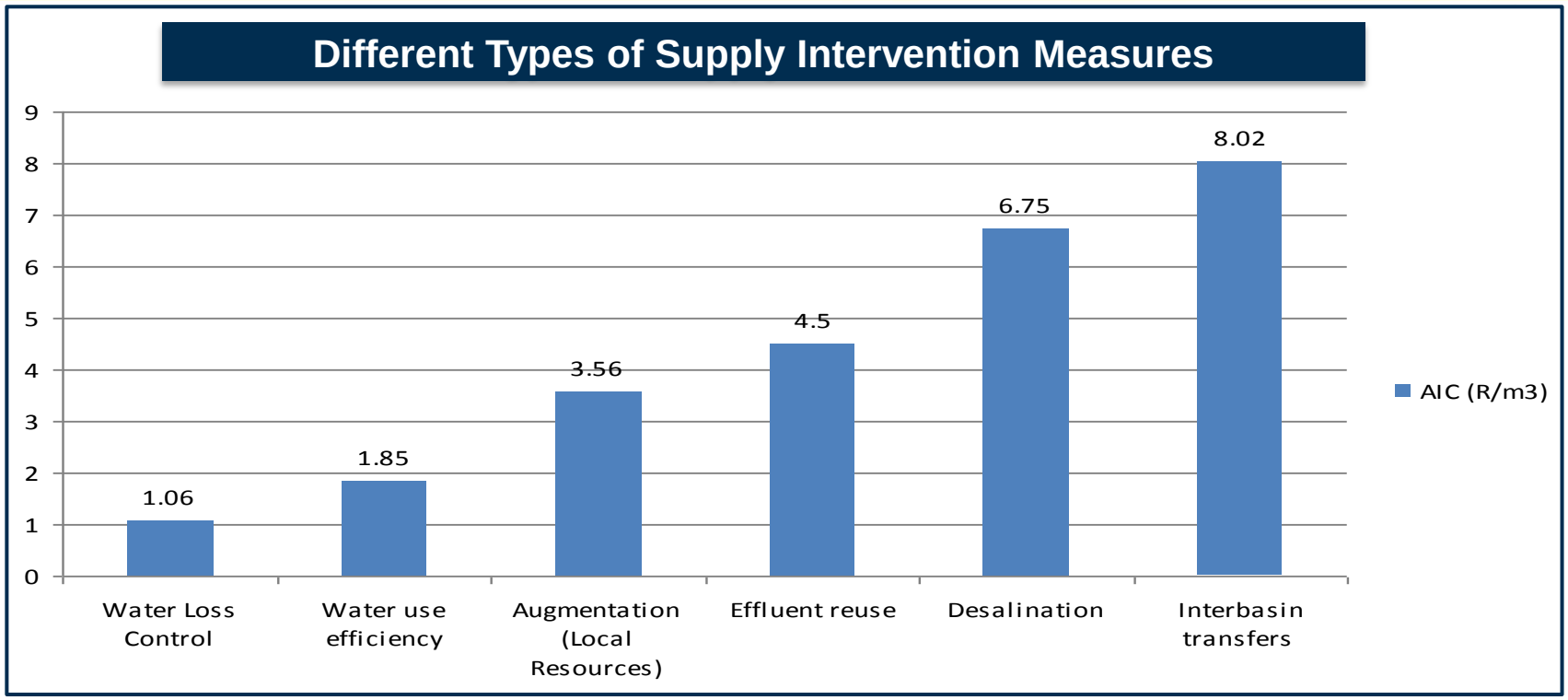


Water Quality Problems

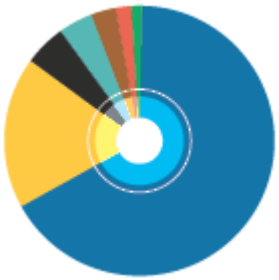


- South Africa is semi-arid - 30th driest country in the world
- Constraints – limited water availability to meet increasing and competing demands
- Increasing water quality problems pose severe risks to industry and society

Current Developments & Trends



Water use per sector:



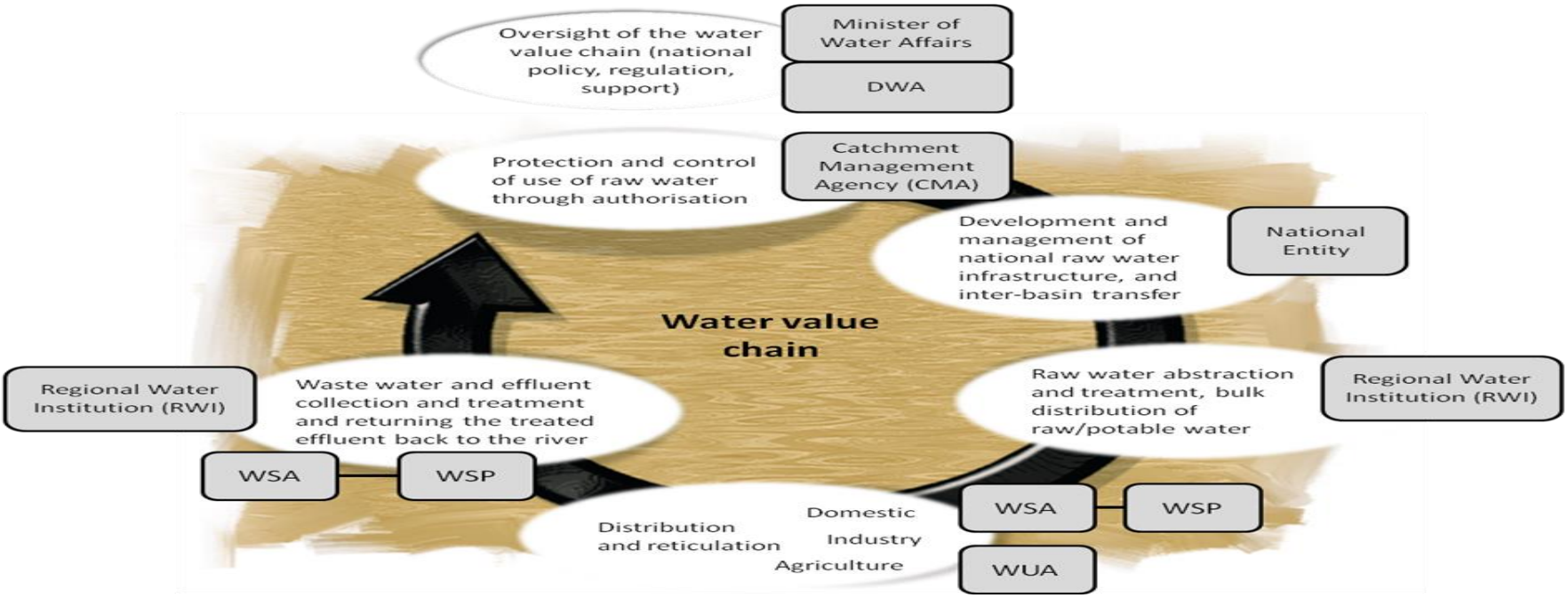
IRRIGATION	67%
URBAN	18%
MINING	5%
RURAL	4%
AFFORESTATION	3%
POWER GENERATION	2%
TRANSFERS OUT	1%

(GreenCape 2017)

R1.3m - Estimated replacement value of water infrastructure and resources (DWS).

R855bn - Average investment required over 10-years (DWS).

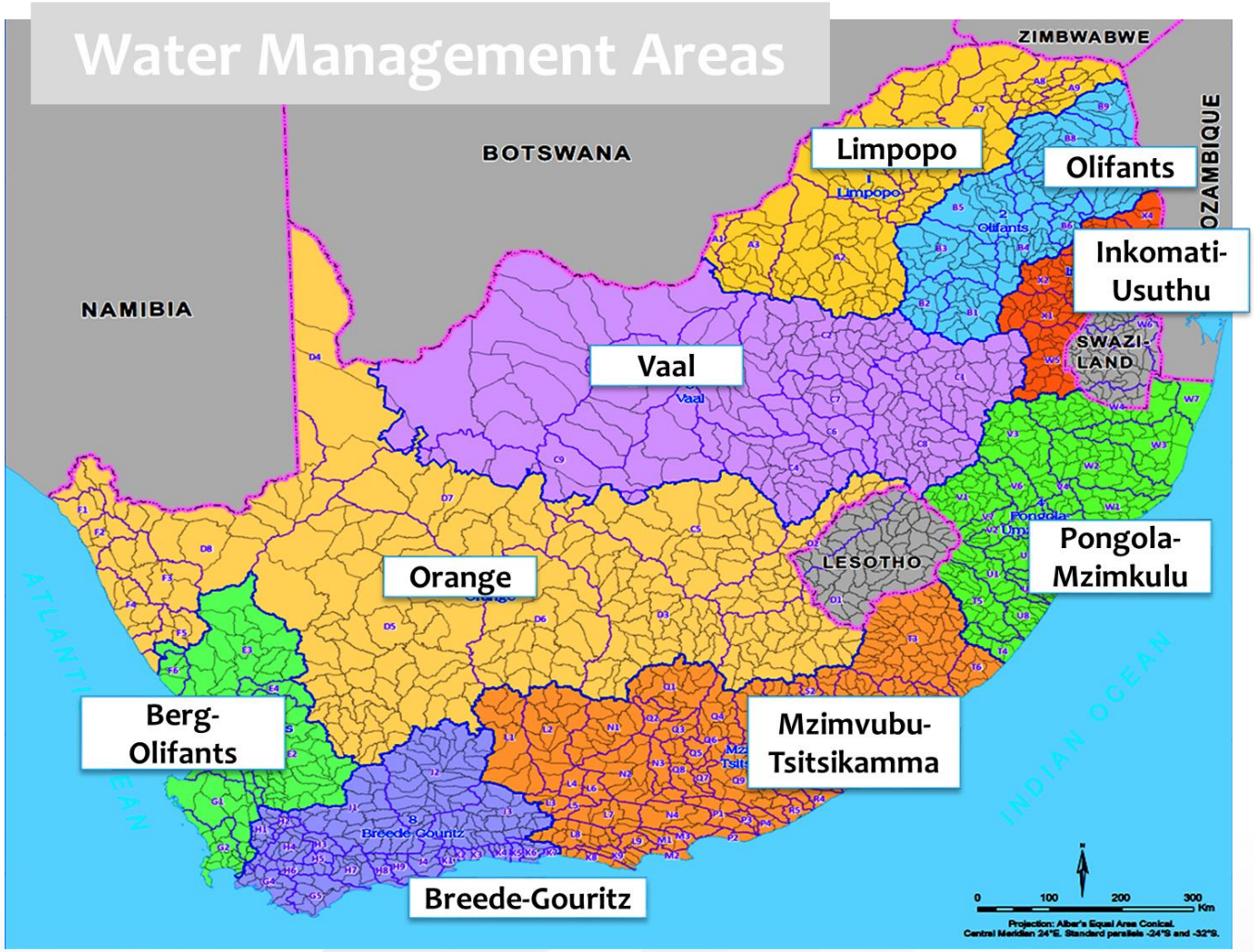
Functional Role-players in Water Value Chain



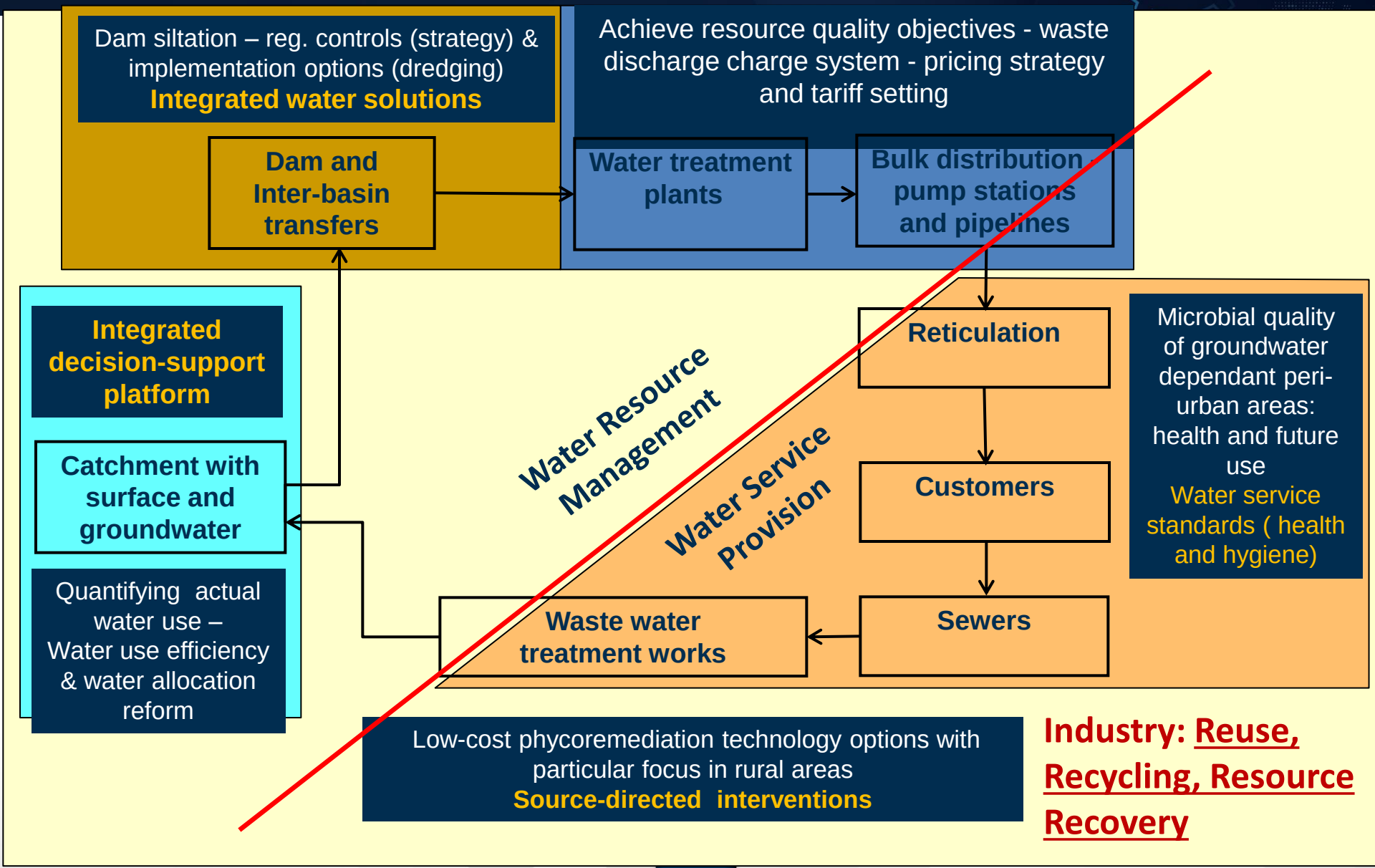
SA water industry mainly consists of regulators, water boards, national agencies and other public entities that directly contributed approximately R6.4bn or 0.4% to the country's annual GDP in 2016 (IPAP).

Private sector involvement in water is mainly as users and confined to the provision of supplies and professional services (IPAP).

Institutional Arrangements – Geographical



RDI Opportunities in the Water Value Chain



CSIR Technologies & Interventions

Some Examples …..

Water Quality - pollution detection and treatment:

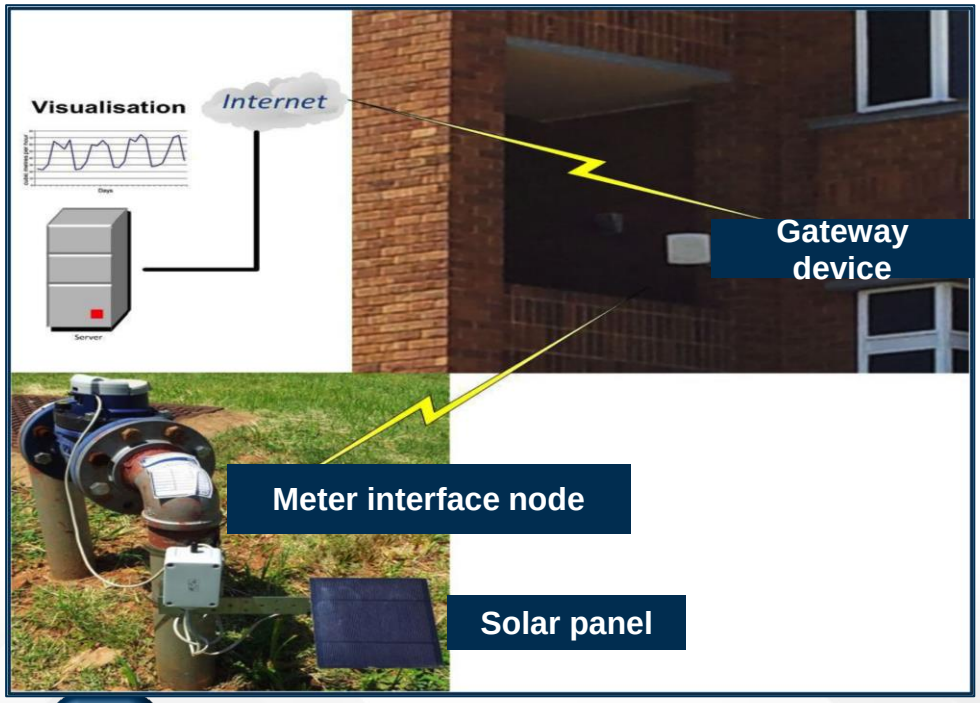
- Low-cost rapid pathogen detection technology
- Near-real-time water quality monitoring system
- Polymer-based adsorbents for removal of toxic pollutants from water – application in acid mine drainage treatment, EDCs, and emerging contaminants (nano-scale)
- Multi-scale modelling, analysis and advanced computation (water/energy linkages)
- Low-cost passive waste treatment technology - facilitate effective and efficient removal of nutrients and pathogens in WWTWs effluent in rural areas in particular
- Desalination of inland contaminated water streams for maximum recovery of water
- Ecological infrastructure and its role in water resource management

CSIR Technologies & Interventions

Some Examples…..

Water Use:

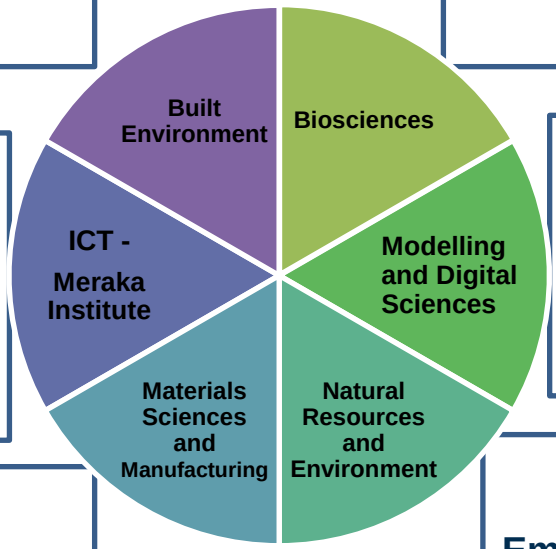
- *Agricultural biological control agents* - ability to improve soil health and crop growth rate - reduce water utilisation in agriculture
- *WaterGrid-Sense* - for applications promoting smart water use (water loss control at municipal level)
- *Water Use Measurements* – analysing water user behaviours for more accurate monitoring and planning of water allocations to promote water use efficiency and enhance productive water uses (water use audits – validation and verification)



Multidisciplinary & Integrated Approach

Infrastructure interventions support .
Waste water treatment technologies – membrane distillation.
Smart buildings – water use efficiencies and optimisation.

Effluent treatment technologies.



Wireless sensor networks - reticulation management .
Dynamic hydraulic model for water pressure management.

Advanced modelling – water demand and supply; Leakage detection; Water quality.

Rapid pathogen detection technology.
Water & waste water purification – novel adsorbent technologies (to treat AMD and their industrial focus)
Near real-time monitoring systems .

Emerging contaminants.
Governance and planning support.
Industrial water and waste water treatment

Concluding Remarks

- Global trends in water innovation and technology can be categorised into three areas: Reduce, Remediate, Reuse (3-Rs). In response to these, CSIR has identified innovations in its SET portfolio to reduce raw water dependence and achieve discharge compliance, to treat wastewater (remediation), reuse water, and beneficiate nutrient recovery.

- Industrial water is becoming a fast growing sector of the global water market; each industry facing substantial challenges, i.e. tighter water quality standards, new wastewater discharge regulations and issues surrounding scarce water resources.

- This means that there are now major opportunities for SET solution providers to offer cost-effective, innovative solutions designed to reduce water use through improved efficiency.

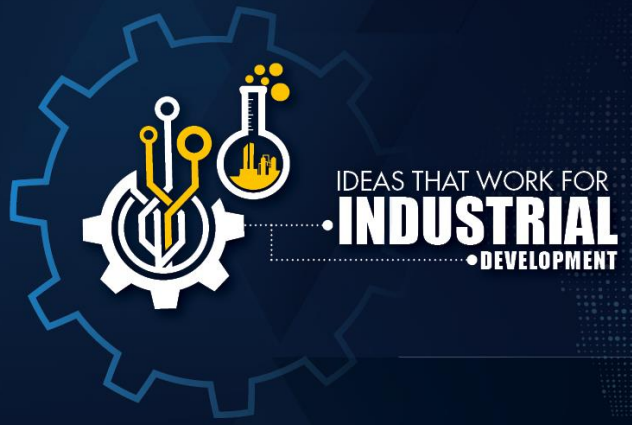
- *"Critical to economic growth is policy alignment and coherence. If we can get this right as government, and at the same time the private sector can better organise itself in relation to water and the emerging industry, we will make progress."*

Garth Strachan, DDG: Department of Trade and Industry.

Take Home Messages

1. Water is a **CATALYST** for industrialisation – its security is paramount!!!

2. Main opportunities for industry lie in:
   Reuse,
   Recycling, and
   Resource Recovery.



Thank You

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