The role of Future Water as an interdisciplinary research institute at UCT

Dr Kirsty Carden

Future Water research symposium: 'Equity and efficiency in allocating water in South Africa - Challenging attitudes, changing behaviours'

28 July 2017

Green water initiative in Africa

"*Large parts of the world are struggling to adapt to a drier reality, but challenges are especially dire in Africa's drylands. Africa's climate is its Achilles heel*" (Falkenmark, 2016)

- Direct management of scarce rainfall as part of a Water Revolution in Africa – a necessity for alleviating hunger and meeting the SDGs.
- Triple green revolution – productive use of green (rain) water; intensified and enhanced food production; sustainability and building water resilience in watersheds.

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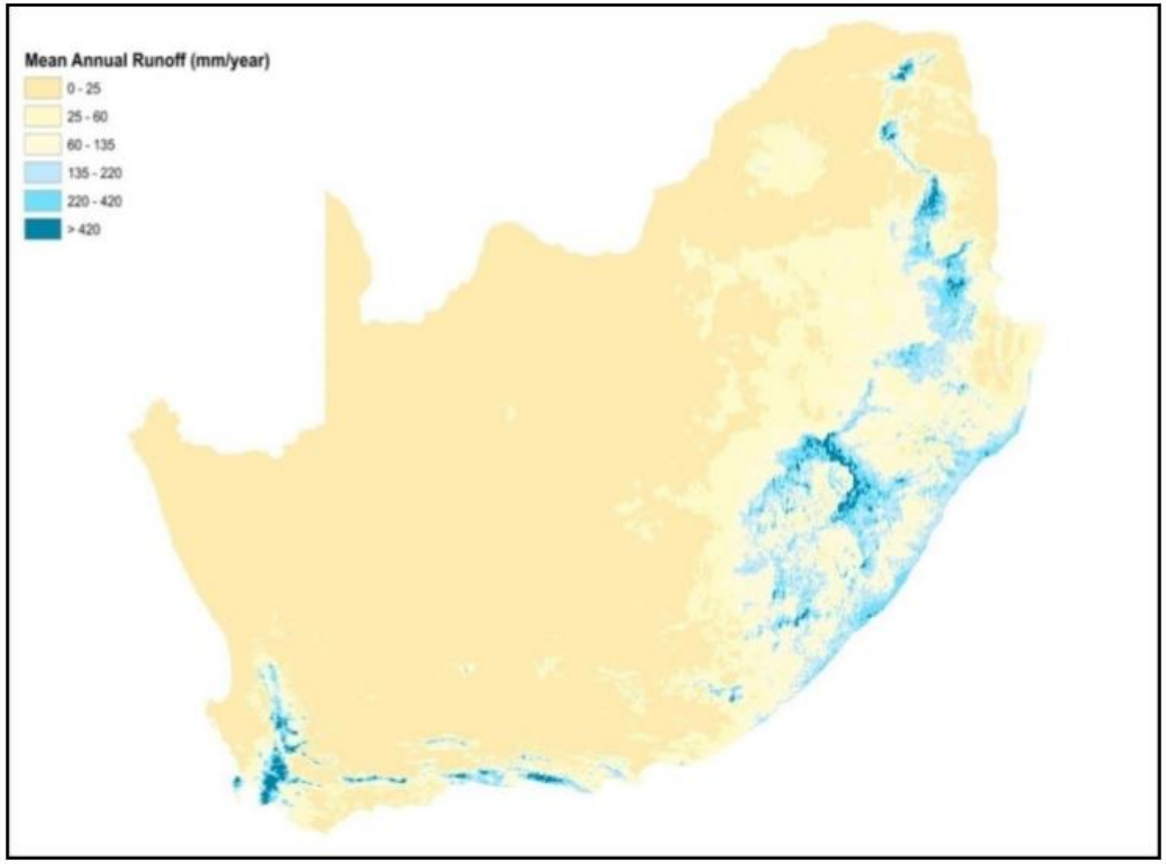
South African water resources



Mean annual runoff for South Africa (Nel *et al.*, 2013)

- Uneven spatial distribution and seasonality of rainfall
- Relatively low stream flow in rivers most of the time
- Location of major urban and industrial developments remote from the country's larger watercourses
- 70% of South Africa's water resources are trans-boundary in nature

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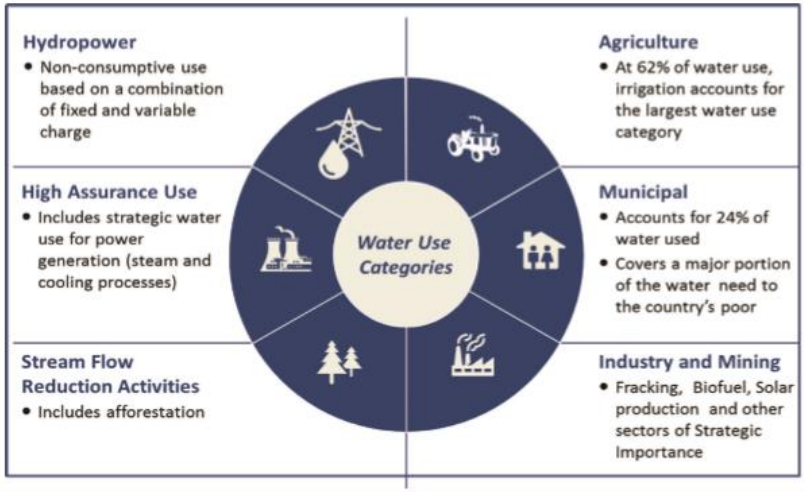
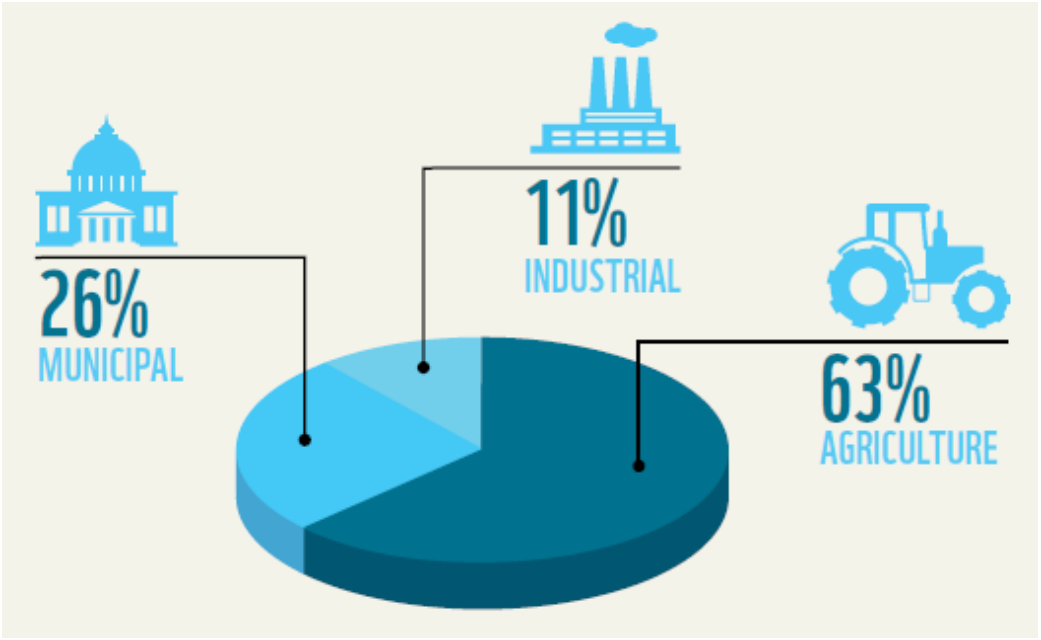
Water users & uses



- 6 water use categories.
- Differential water use charges
- Not all users liable for charges

- Agriculture ~63%.
- Municipal & domestic ~26%
- Industrial activities ~11 % (Mining ~2.5%)



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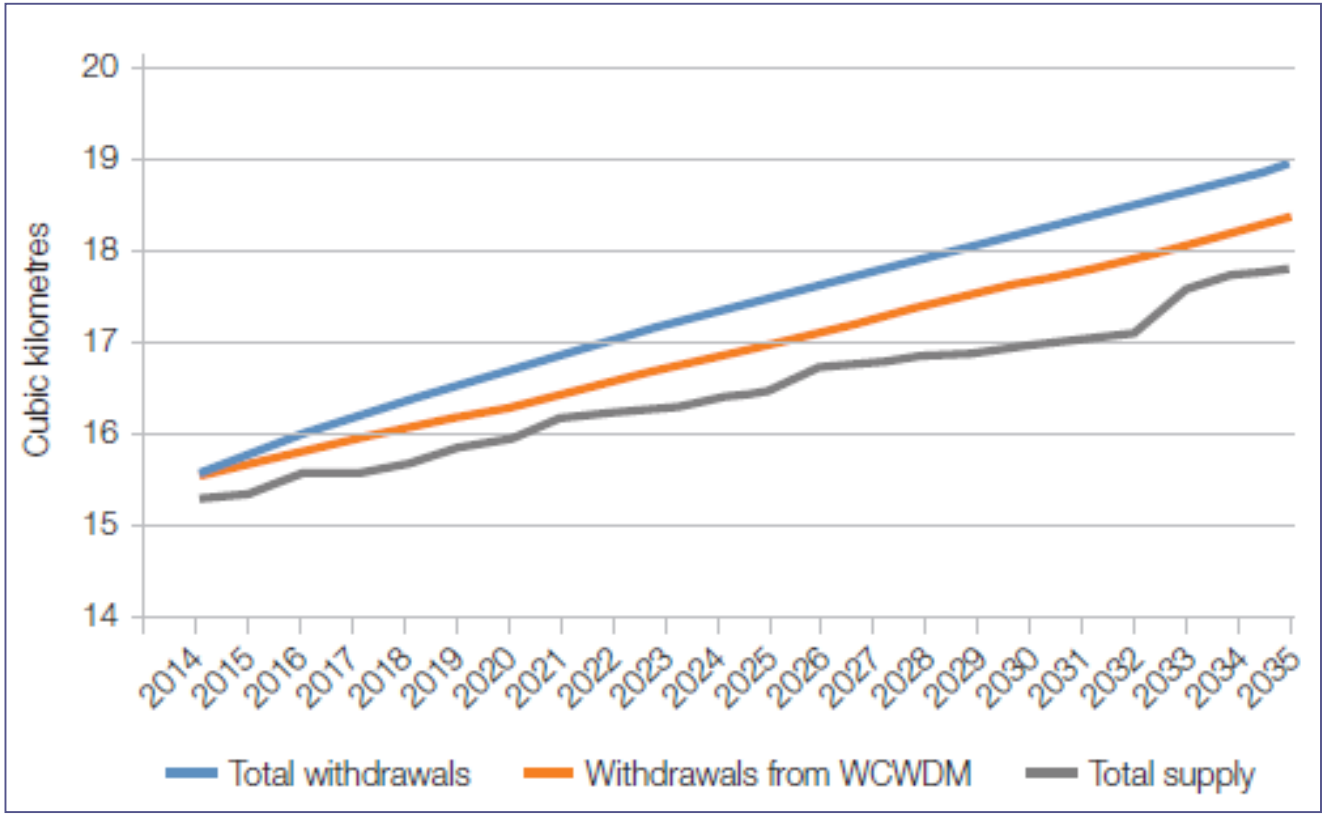
SA's water 'crisis' - "*too much, too little, too dirty*"

- Low rainfall / high evaporation
- Urbanisation
- Population growth
- Services backlogs
- Poor water quality
- Leakage / wastage
- Fragmented institutions
- Quality of life
- Poverty / inequality



(Source: Hedden, 2016)

…the availability of water of acceptable quality is predicted to be the single greatest and most urgent development constraint facing South Africa" (*Scholes, 2001)*

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Water quality issues

Land-based activities impact ecosystems by introducing pollution, which alters the quality of water resources:

- Agriculture – runoff from irrigation bring nutrients and salts from fertilisers used in farming
- Industries – effluents and discharges
- Mining – defunct mines discharge acid water into the environment
- Human settlements – partially or untreated sewage discharges

Water stress in South Africa

1. South Africa will demand 17% more water than exists by 2030; water supplies are already almost fully allocated.
2. New businesses and industries find it increasingly difficult to access water licenses, particularly in overdrawn catchments.
3. Renewed emphasis on the need for:
   - innovative solutions
   - technologies and processes
   - highly skilled individuals

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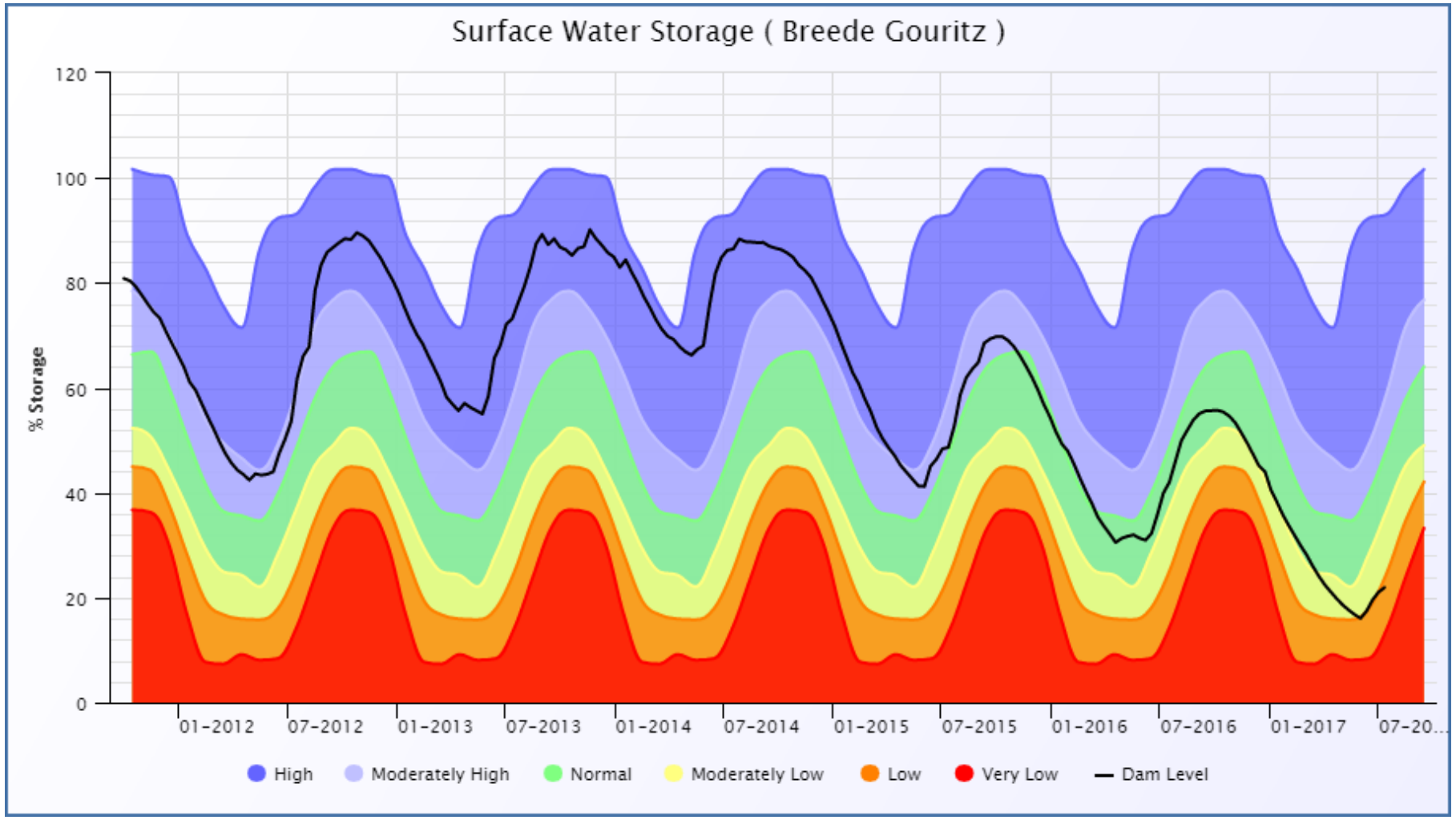
Meanwhile in the Western Cape



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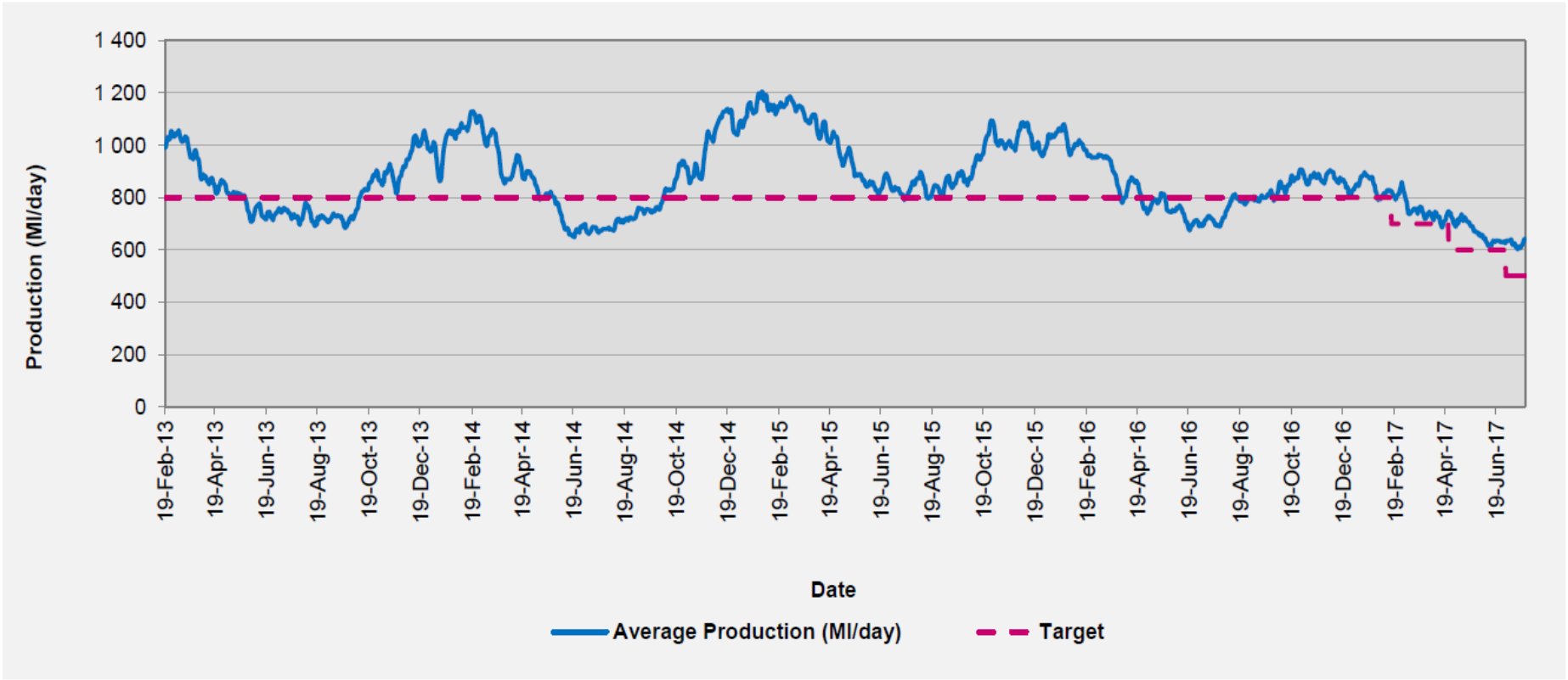
Cape Town's dam storage levels and daily demand

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

City of Cape Town: Water Dashboard

24 July 2017

DAM STORAGE (%)	WEEKLY DAM LEVEL CHANGE (%)	AVERAGE DAILY PRODUCTION (Ml/d)
27.4	1.0 ↑	643
	increase since last week	(Target 500Ml/d)

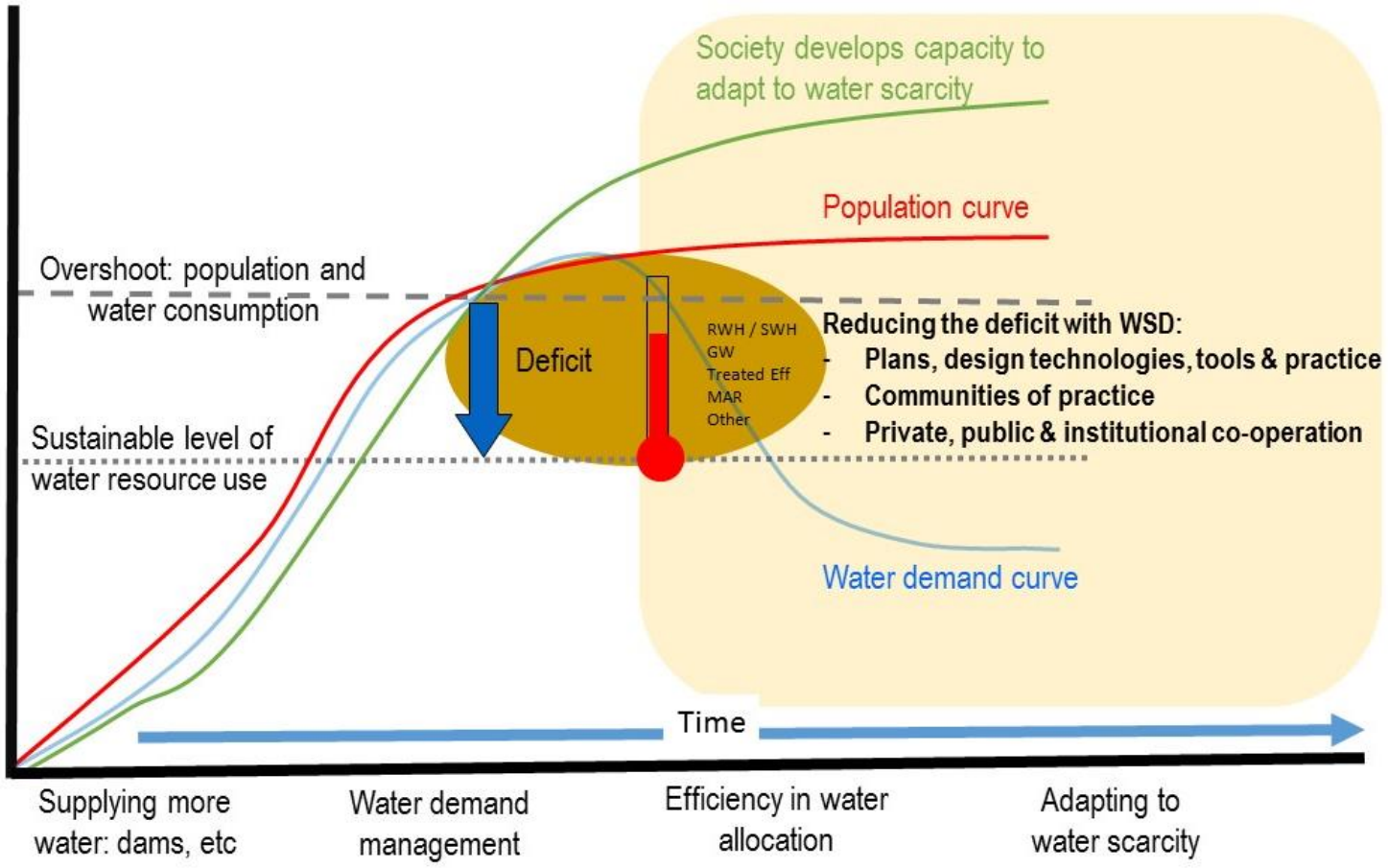


‘Future proofing’ cities (Wong, 2012)

- Resilient (coping capacity), liveable (comfort capacity) and sustainable (carrying capacity) cities
- Blue / green corridors integral elements of city’s drainage infrastructure for flood conveyance
- Influence of socio-technical dynamics
- Managing stormwater as a resource
- Enhancing water-energy-waste nexus
- Multi-functional infrastructure - hybrid between centralised and decentralised; meet basic needs, enhance aspirational needs

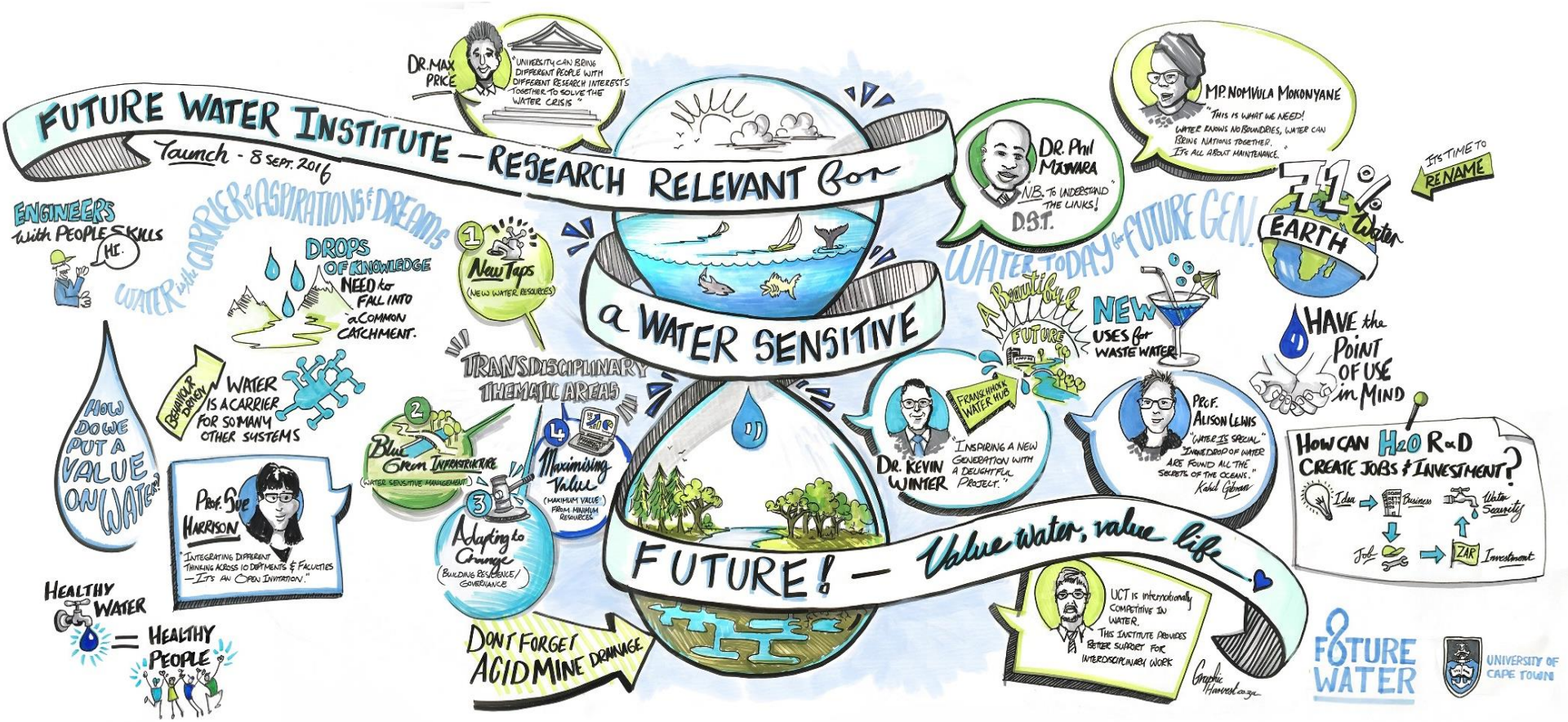
Design principle – “keep water in the town / city”

Resource thresholds



Adapted from Ohlsson, 2000

Introducing Future Water



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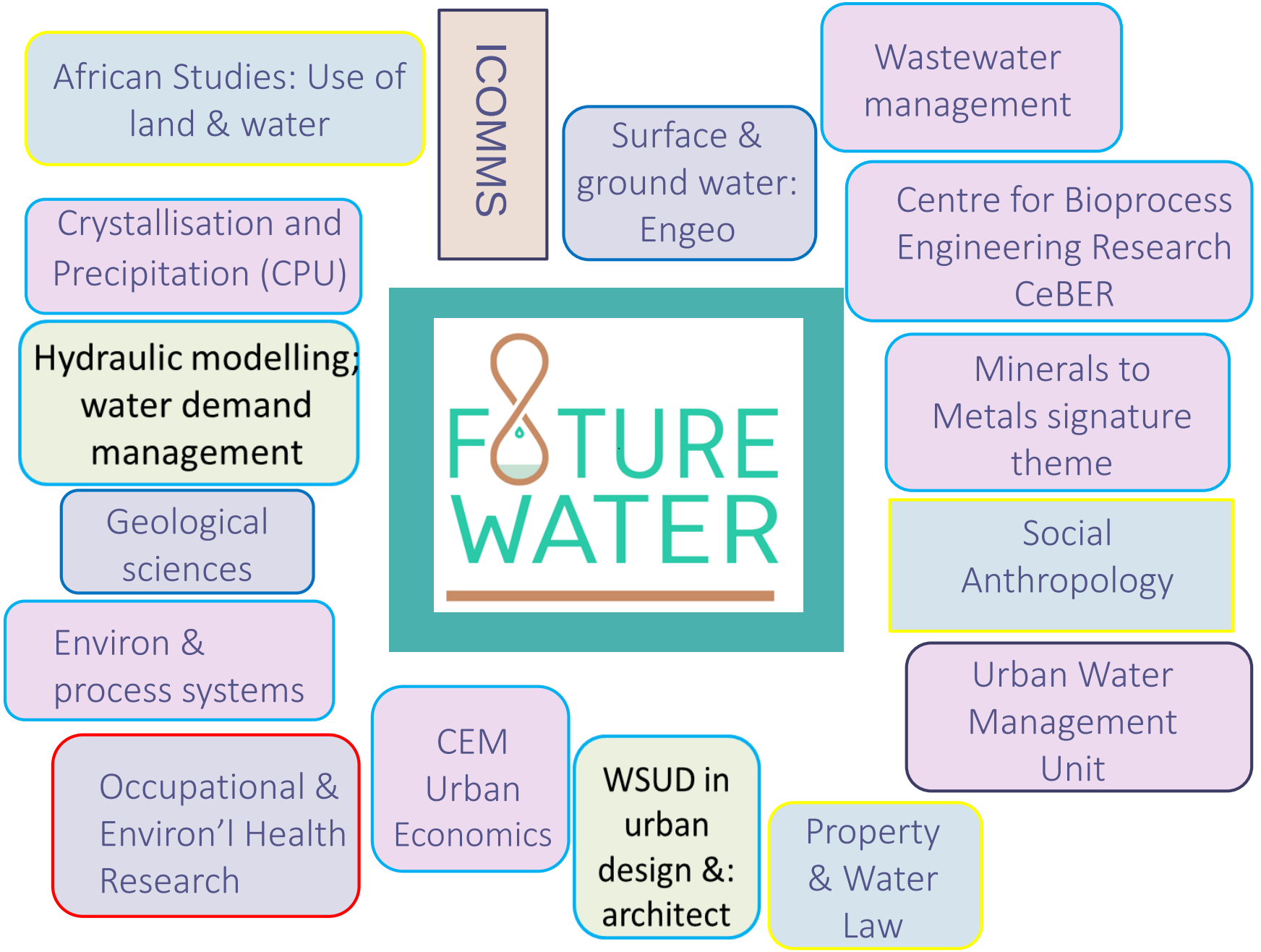
African Studies: Use of land & water
ICOMMS
Surface & ground water: Engeo
Wastewater management
Crystallisation and Precipitation (CPU)
Centre for Bioprocess Engineering Research CeBER
Hydraulic modelling; water demand management
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Minerals to Metals signature theme
Geological sciences
Social Anthropology
Environ & process systems
Urban Water Management Unit
Occupational & Environ'l Health Research
CEM Urban Economics
WSUD in urban design &: architect
Property & Water Law

Future Water focus areas

- Addressing water scarcity:
  - diversifying supply
  - reducing demand
- Urban water issues:
  - water sensitive design
  - wastewater
  - re-charging aquifers
  - stormwater
- Food security
- Food – water – energy nexus
- Water in mining and industrial sectors

Future Water – transdisciplinary thematic areas

1. *'New taps'* (New water resources)

- Water demand management and conservation
- Stormwater / rainwater harvesting
- Treated effluent
- Groundwater / MAR
- Desalinated water

2. *'Blue-green infrastructure'* (Water sensitive management)

- Planning & design
- Economic value
- Health impacts
- Ecosystems services
- Social development
- Waterscapes / urban rivers
- Urban agriculture

3. *'Adapting to change'* (Building resilience / governance)

- Resilience
- Strengthening governance
- Learning alliances
- Policy and law
- Communication / Social acceptance
- Management
- Cultural understanding

4. *'Maximising value'* (Maximum value minimum resource)

- Source separation
- Centralised *vs* decentralised
- Towards zero emissions
- Fit for purpose
- AMD treatment *vs* prevention / recovery
- Integrated treatment
- Resource recovery
- Wastewater biorefineries

Civil Engineering - Environmental Science - Planning – (Construction) Economics - Biological Science - Chemistry Political Science - Geohydrology - Health Science - Sociology - Chemical Engineering - Public Administration - Anthropology

SDGs as key drivers

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SDG impacts related to water sensitivity

Goal	Focus area	Impact assessment
6	Availability and management of water and sanitation	• Access to water • Access to sanitation • Improved water quality, increased recycling and safe reuse • Increased water-use efficiency • Expanded capacity-building in developing countries • Strengthened participation of local communities
8	Sustainable economic growth	• Development-oriented policies, increased job creation • Improved resource efficiency
9	Resilient infrastructure	• Sustainable infrastructure • Increased resource-use efficiency, clean technologies
11	Cities and human settlements	• Inclusive and sustainable urbanisation • Access to green public spaces • Increased adoption of integrated policies iro resilience to disasters, climate change

Founding principles of Future Water

- Urgency in providing capacity for the management of water infrastructure and scarcity
- Adaptation to water scarcity and building resilience through effective governance
- Necessity for innovation in water management to meet growing demands
- The imperative for management of water that is technically sound, socially acceptable and sustainable

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Flagship projects

Actively incorporate transdisciplinary themes, and include industry and public involvement:

- Managing the Cape Flats Aquifer
- Integrated Mine Water Management
- Water, food, energy and the resilient city
- The Water Hub
- SALGA project
- Liesbeek Life Plan
- Sustainable sanitation
- Water Sensitive Design
- Wastewater biorefineries

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SUSTAINABLE WATER MANAGEMENT IN AFRICA

IARU Global Summer Programme 2017

17 – 28 July 2017

WWF water future scenarios 2017

1 WATER-CONSCIOUS COUNTRY

Become a water-conscious country with sufficient knowledge and skills in the water sector

2 STRONG WATER GOVERNANCE

Implement strong water governance with resilient stakeholder partnerships that advance the more explicit second phase of the National Development Plan to achieve water security under climate change

3 WATER SUPPLY AND DEMAND

Manage water supply and demand regulations more rigorously and protect water resources

4 WATER-SMART ECONOMY

Become a water-smart economy and a leader in Africa in commercializing low-water technologies for industry and agriculture

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Thank you

www.futurewater.uct.ac.za