# All options on the table – aligning people, politics, policy and practice for a water resilient future

2019 IWA ASPIRE Conference - Climate Change and Adaptation

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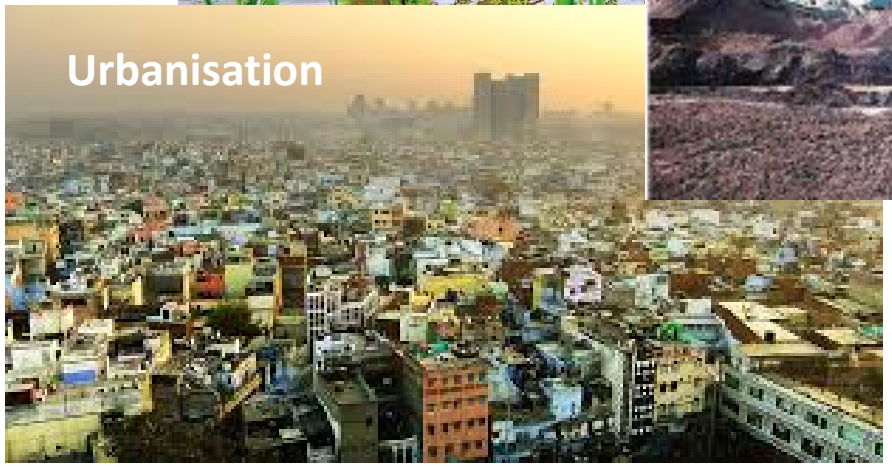
Chair, International Centre of Excellence in Water Resources Management

Member of IWA Distinguished Fellow

2019 Water Professional of the Year - Australian Water Association

# Urban solution -“One Water” – but only one of the competing demands for cities in the “basin”




# Urban solutions must also consider “One Health”….







The common factor……

# PEOPLE

# Vested interest collision space.....





MINISTER/S



# GOVERNMENTS CAN NOT SOLVE THIS ALONE!

# Tension of science and technology …..

# Critical partnerships……..

What critical partnerships need to be forged to pave way for a water resilient cities and prepare for climate change?

- Who and where are the key influencers across the sectors?
- How do we bring them together?
- What information do they need to inform thinking?
- What are the knowledge gaps and how do we bridge them?

# Political solutions ……..

What compromises can be reached by agreeing on mutual benefit – a collision of needs will only be possible if water professionals bring to the table:

Science based on respected research

Technology that is innovative, considers legacy infrastructure but can “leap frogging” traditional paradigms

Policy and regulation that is innovative, and incentivises sustainable solutions (sustainable development goals, circular economy)

# Hong Kong – Global poster child of resilience and innovation

- Catchments and reservoirs - Lantau Island
- Resilient distribution systems used flexibly for over 100 years
- Prediction of droughts, strategy for water restrictions and public communication
- Innovative toilet seawater-flushing program (30% of water demand)
- Conversion of key, deep coastal inlets to large scale drinking water storage (Plover Cove and High Island reservoirs)



# Case study – Adelaide

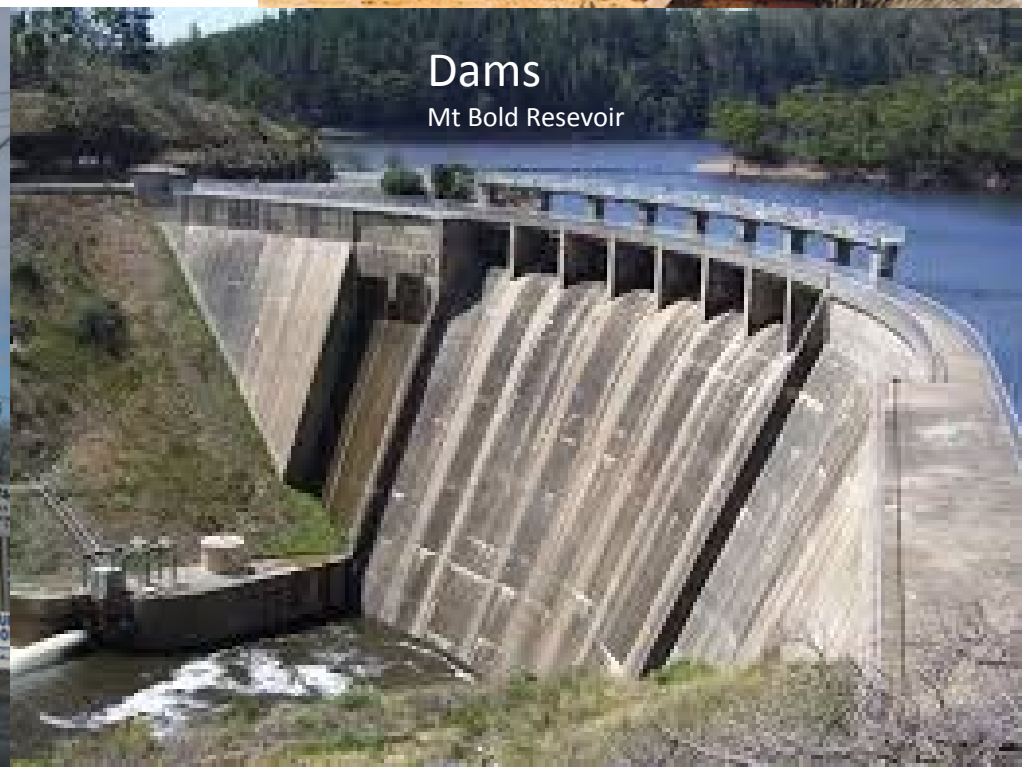
- Over-allocation of water resources in some catchments
- End of Murray-Darling Basin system




# Extended drought plus business a usual water challenges

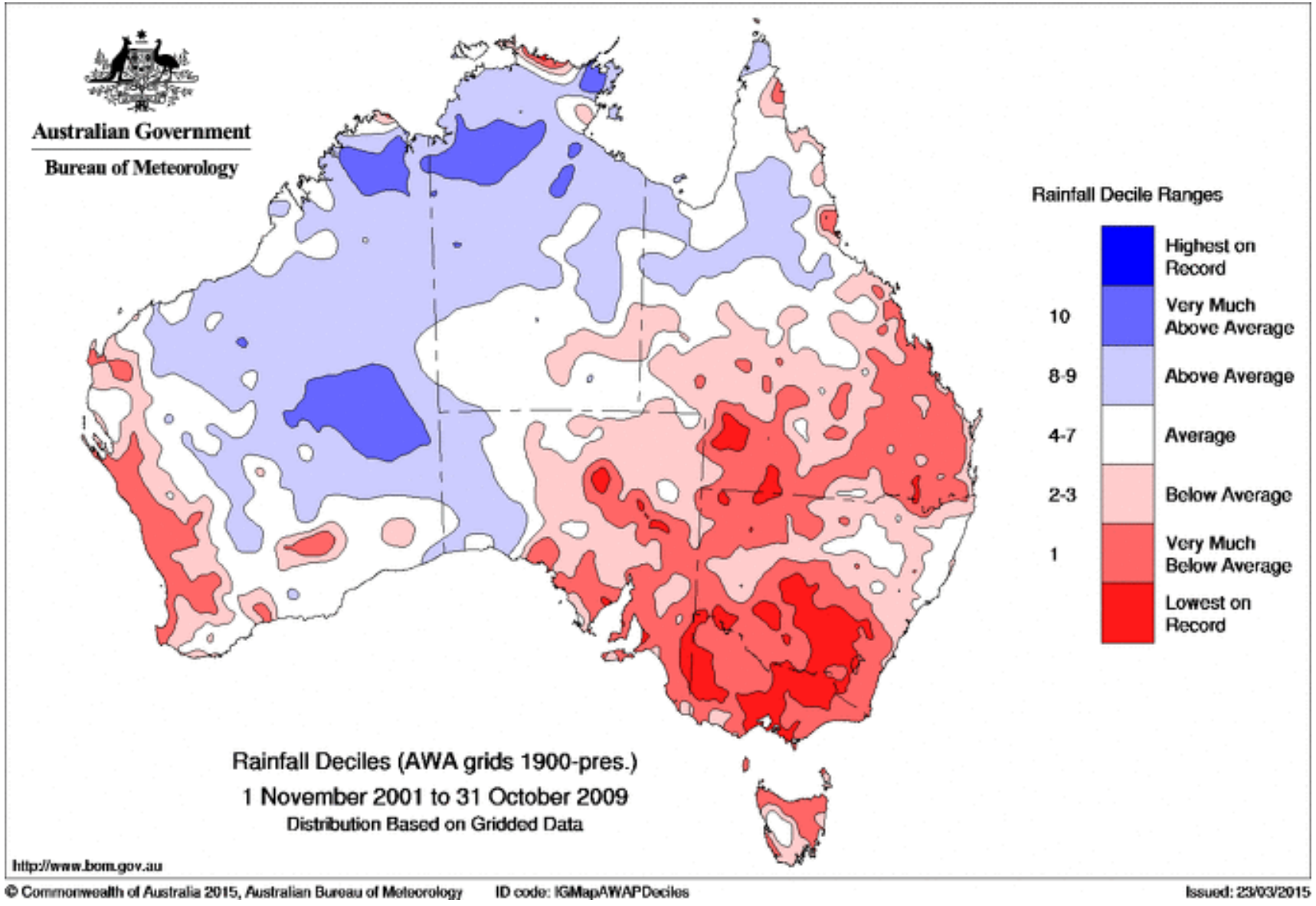
- Urban growth, industrial demand increasing
- Ageing Infrastructure, non-revenue water, inefficient systems
- Diverse range of water sources to manage – Rivers, dam catchment, groundwater stormwater/wastewater re-use





# The Millennium Drought

- Unprecedented drought period
- River Murray flows lowest in recorded history (again reaching that level)
- Potable supply threatened / Agriculture decimated
- Challenged traditional approaches and basic assumptions of our water supplies



# South Australia - Water for Good
# Water Security Management Plan to 2050

South Australia regarded as a world class leader in water recycling, aquifer storage & recovery and water trading

To view all the information in this brochure, and the latest water news and information, visit the Water for Good website at:
**www.waterforgood.sa.gov.au**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## Where do we currently get our water from?

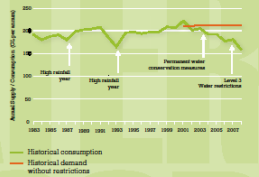
**Historically, South Australia has relied on three rain-dependent sources of water - the River Murray, Mt Lofty Ranges and groundwater. When there is lower than average rainfall, we rely much more on the River Murray. South Australia currently relies on the River to provide 85% of our mains drinking water supply. Our reservoirs provide 8% and our groundwater provides 7%.**

## How much water do we use?

**South Australia currently uses approximately 1200 gigalitres of water each year for human needs, agriculture, business, recreation, household use and industry.**

Greater Adelaide uses approximately 200 gigalitres of water each year from our mains drinking water supply when we are not on water restrictions and regional South Australia uses approximately 50 gigalitres.

**Water use for Greater Adelaide (from our mains water supply)**




## Our changing climate

**South Australia is experiencing particularly dry weather, which is most likely the result of climate change.**

Less rain means a reduction of flows into traditional water sources such as our reservoirs, rivers and groundwater.

The CSIRO believes we can anticipate an overall decline in rainfall of between 15 to 30% by 2050. How permanent this change in our climate will be is uncertain, but for the good of our state we can't simply assume that it is temporary.

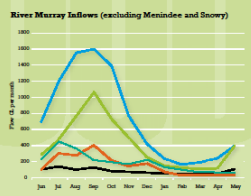
South Australia has traditionally relied on the River Murray for much of its water but that resource is under threat, not only because there has been less rain but because of a history of over-allocation and over-use.

Restoring the health of the River Murray is crucial as it will continue to be an important source of water to supply regional towns, cities and the irrigation industry.

We have also seen significantly less rain and run-off in the Mt Lofty Ranges catchment area, which feeds our reservoirs. Our groundwater supplies are also showing signs of stress.

Water use in cities and regional areas around the State is currently restricted and in summer many home gardens and community open spaces show the effects.

**River Murray Inflows (excluding Menindee and Snowy)**




## Water for our growing State

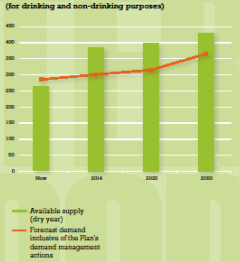
**South Australia's population is expected to reach 2 million people by 2027. A growing and diverse population helps drive prosperity and economic growth – but this growth depends on reliable water resources.**

Many new developments in mining, defence, renewable energy and other sectors are ensuring a prosperous future. Compared to the national economy, South Australia is expected to perform better than average in the years ahead.

Our sources of water must also grow to accommodate the amount of water South Australia's growing population will use in the future. We must diversify our water sources and find innovative ways to harvest and reuse water while sustaining our environment.

Currently Greater Adelaide's water supply for drinking and non-drinking purposes falls short of our demand. This shortfall is managed by water restrictions.

**Water needs for greater Adelaide (for drinking and non-drinking purposes)**




### How much water is that?

**Kilolitre (kL)**
One kilolitre is 1000 litres. Kilolitres are the units most commonly used in referring to household water use, with the average Adelaide household using between 200-250 kL each year when we are not on water restrictions.

**Megalitre (ML)**
One megalitre is 1000 kL or one million litres and is roughly the volume of most 50 metre public swimming pools. The Torrens Lake between Hackney Road and the Torrens Lake weir holds about 600 ML.

**Gigalitre (GL)**
One gigalitre is 1000 ML or 1 billion litres and represents a volume of water one square kilometre by one metre deep. When full, the Hope Valley reservoir holds about 2.8 GL and the Happy Valley reservoir holds 11.6 GL.

## Our future water sources

**Water for Good is a plan that builds on the work underway for new and diverse sources of water that are not entirely dependant on rain.**

Water for Good plans to reduce our reliance on our rivers, reservoirs and aquifers by developing new water sources and by working smarter with the water we do have.

**Desalination**
Some of these new sources have already been announced. Work on the new Adelaide Desalination plant is underway and will deliver its first water by December 2010, rising to 100 gigalitres a year by the end of 2012.

Investigations recommended by Water for Good include the potential for a desalination plant for the Eyre Peninsula, and regional townships where water quality has been identified as an issue.

**Stormwater and wastewater**
The use of stormwater for purposes other than drinking will also play a big part in South Australia's water future. By 2014, we will be capable of harvesting more than double the amount of stormwater we currently capture and reuse, with Commonwealth assistance and in partnership with local government and the private sector. The use of recycled wastewater will also be an important resource for irrigation and industry.

A further key action is an emphasis on all tiers of government and private enterprise to work together to develop further stormwater projects in the Adelaide region and across the State.

**Using and saving water**
In tandem with these short and long term goals to diversify supply is a renewed emphasis on educating everyone about the value of water and encouraging them to use water more efficiently and effectively. New information sources and education campaigns are part of the Water for Good plan, as are a range of rebates to encourage the use of water saving technologies in the home.

Improvements in irrigation and industry water use are recommended in Water for Good. Major new developments in mining and other major development or infrastructure projects will need to take into account water sourcing, prudent water use, water recycling where possible, and stormwater recycling.

Irrigation efficiencies will also be brought to open space watering, public buildings will become more water efficient, and leak detection in the water supply network will be improved.

**Our prosperous future**
As everyone becomes more responsible for water and as new water sources become available as a result of the Water for Good initiatives, South Australia will become less reliant on the issues of 'water supply' and more focussed on the benefits of being 'water-sensitive'. This will not only ensure our water future, but make us true world leaders in dry-region water management.

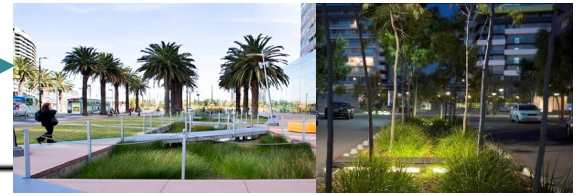
WATER FOR GOOD

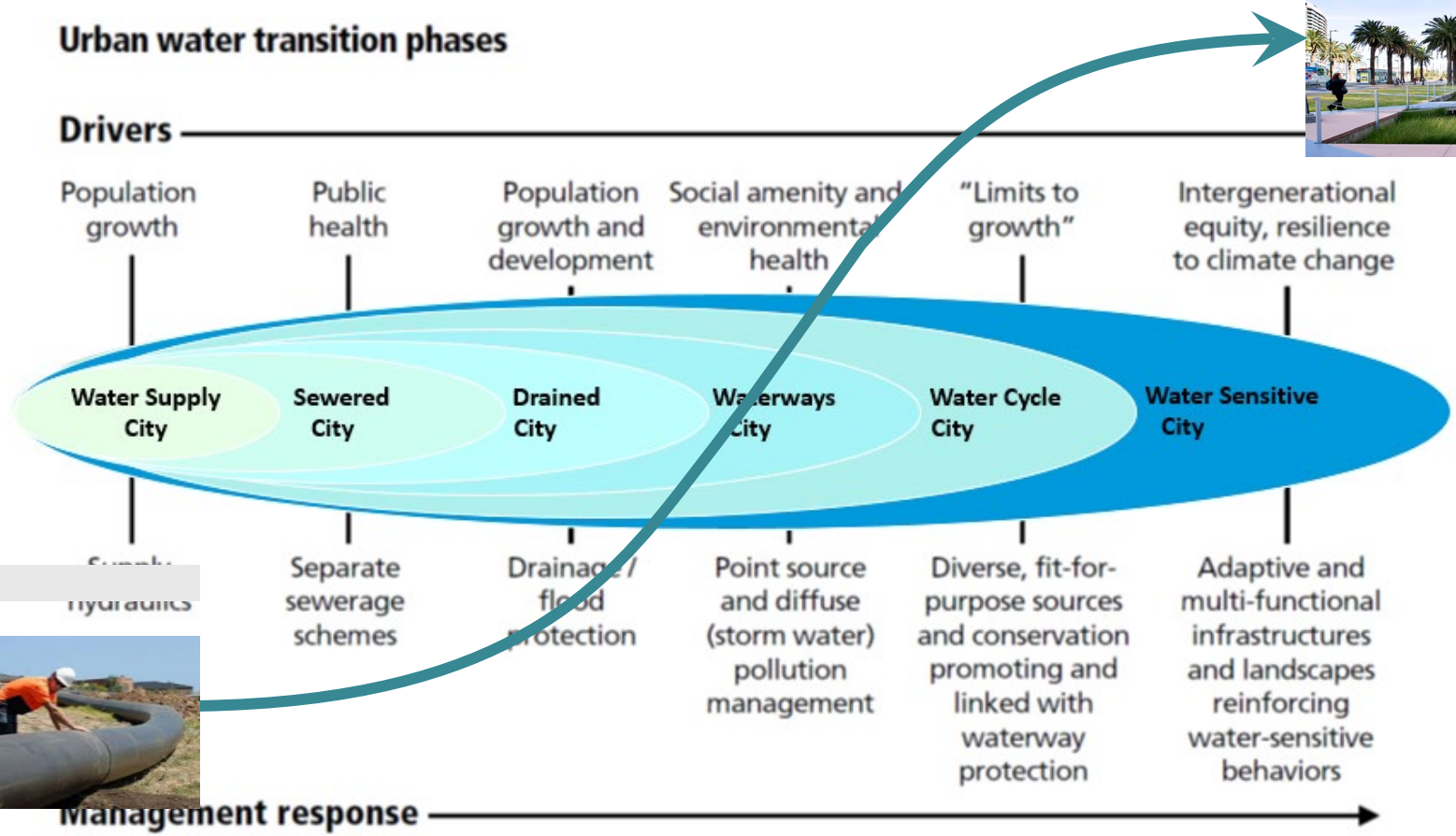
A plan to ensure our water future to 2050

Government of South Australia

# Water Sensitive Cities Framework

Water Sensitive City






Current System

*Source: Based on T. Wong and R. R. Brown. 2009. The Water Sensitive City: Principles for Practice.* Water Science and Technology *60(3):673–682.*

CRC for
Water Sensitive Cities

# Primary objectives

- diversification of water supplies (build infrastructure)
- improving the way we use water (water conservation)
- improving governance (more efficient investment)
- modernise water industry (increased productivity (urban and agriculture)
- water managed for economy and liveability

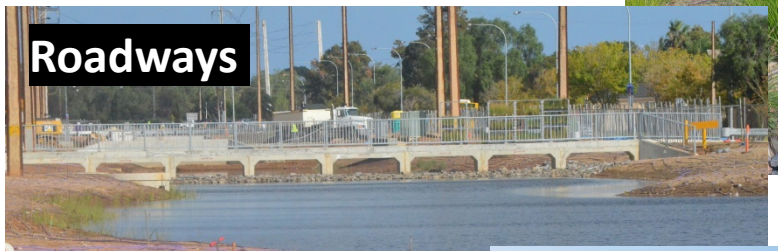
# Diversifying Water Supplies

**Desalination**

Climate independent source of drinking water supply (up to 50% of Adelaide's supplies)

# Diversifying Water Supplies

## Storm water capture and re-use (over 200 sites across Adelaide)




# Diversifying Water Supplies

## Wastewater recycling (30 GL)




# Urban Waterway Rejuvenation – River Torrens


# Improving the Way Water is Used


# Improving the Way Water is Used

- Permanent water conservation measures
- Mandated use and plumbing of rainwater tanks on new houses (highest in Australia)
- Irrigated Public Open Space program
- Urban waterway rejuvenation
- **Integration of Water Sensitive Urban Design**
- National Water Efficiency Labelling and Standards Scheme (WELS)
- Water use information on water bills
- Community “Water” aware

# Improving Governance

- Accountability and reporting against actions
- Separating water policy, regulation and supply
- Ongoing demand and supply planning and management
- Streamlining water allocation planning
- Managing water across boundaries through the Murray-Darling Basin Agreement
- **Evidence based decision making**

# Modern water policy

- Independent economic regulation of water and wastewater service providers (pricing)
- Improved technical regulation and compliance
- Third-party (private) access to infrastructure
- Increased competition in supply
- **Focus on Water Quality (Health)**


# Lessons Learnt and Future Directions

- Government and community commitment essential
- Clear accountability for delivery (including who pays)
- Evidenced based decision making (investment in science and monitoring)
- **Extensive engagement with the water sector**
- On-going governance reforms
- Build community acceptance of major supply augmentation and need for reforms
- More integrated management of water (across both jurisdictions and sources)

# Science-Policy Research Collaboration

The Goyder Institute for Water Research

# Collaborative Partnership

Government of South Australia
Department for Environment and Water

Flinders University

The University of Adelaide

University of South Australia

CSIRO

ICE WaRM

National Centre for Groundwater Research and Training

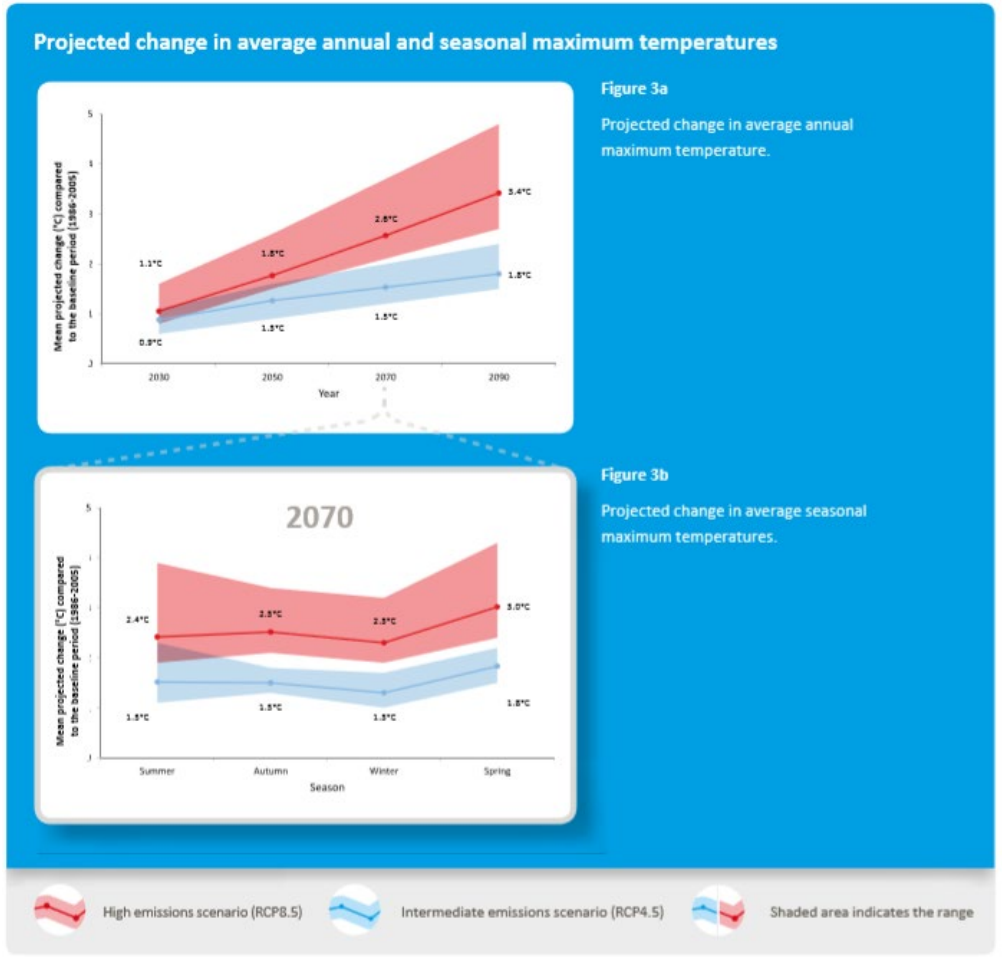
SA Water

SARDI
South Australian Research and Development Institute

*The Goyder Institute enhances the South Australian Government's capacity to develop and deliver science-based policy solutions in water management. It brings together the best scientists to provide expert and independent research and scientific advice to inform Government water policy and identify future threats and opportunities to water security.*

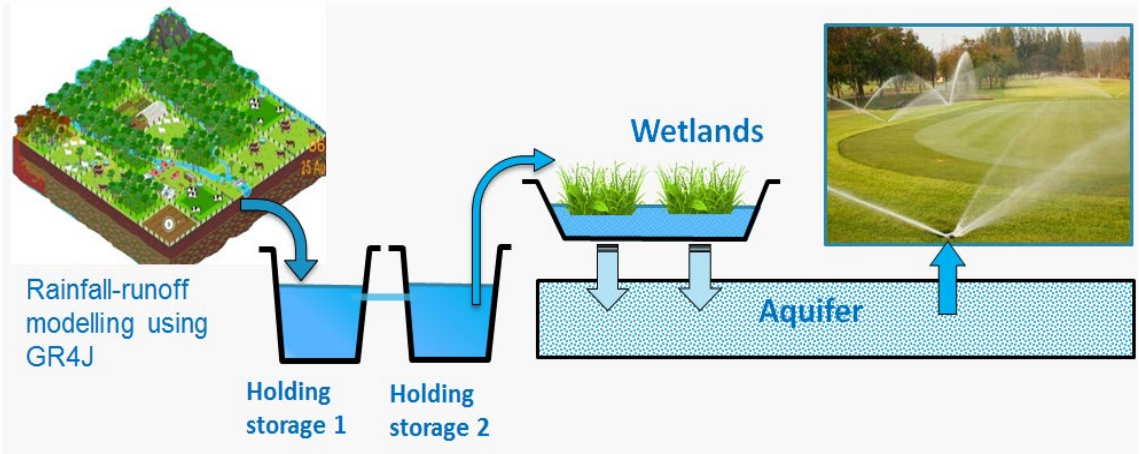
# Climate change in SA

- *SA Climate Ready* - Downscaled climate projections
  - All NRM regions across SA & impact case studies
  - Reduced rainfall across SA, particularly spring
  - Increased maximum and minimum temperatures
  - More extreme events
  - AMLR by end of 21st Century:
    - Average rainfall could decline by 7.8-17.4%
    - Average annual max temp could increase by 1.8-3.4°C
    - Up to 50% decrease in inflows to local reservoirs by 2100
- Compound effects
- Evidence suggests impacts are occurring
- The challenge is enormous, but with challenge comes opportunity



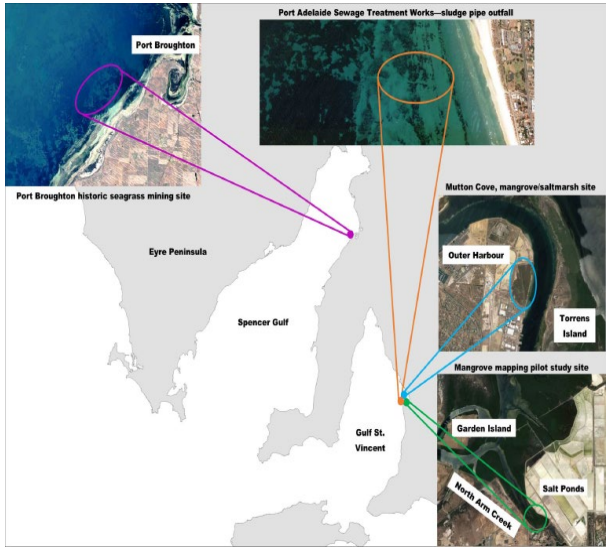
# The Climate Resilience Analysis Framework

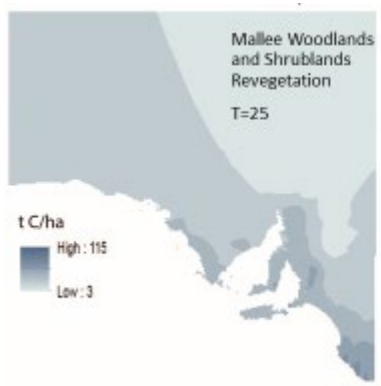
- An emerging approach to assessing impacts to and resilience of ‘systems’ to climate change
- Development of a system model that maps hydroclimate variables to ‘system’ performance
- Identifies those design features that are climate sensitive – potential to change operations or improve design/operations
- Case Study - Managed Aquifer Recharge
- Application to use of recycled water for horticulture on the Northern Adelaide Plains

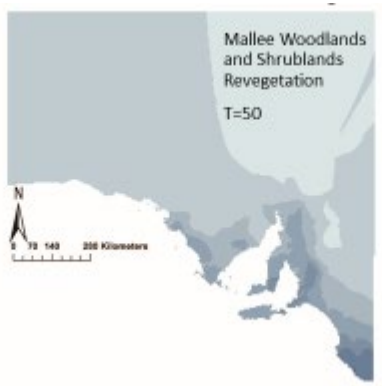


# Carbon sequestration

- Coastal Carbon – C sequestration potential of various coastal wetland habitats
- Salt to C – C sequestration potential and co-benefits through reconnection and restoration of the Dry Creek Salt Field
- Soil carbon – C sequestration potential through addition of subsoil clay to sandy topsoil
- Carbon co-benefits – economic assessment of management practices for C sequestration with consideration of co-benefits



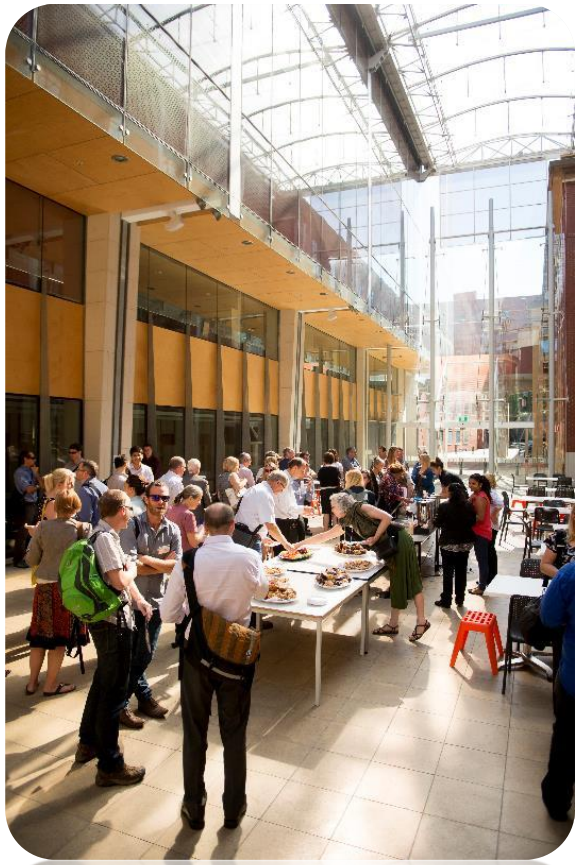




# The Goyder Institute & climate change workshops

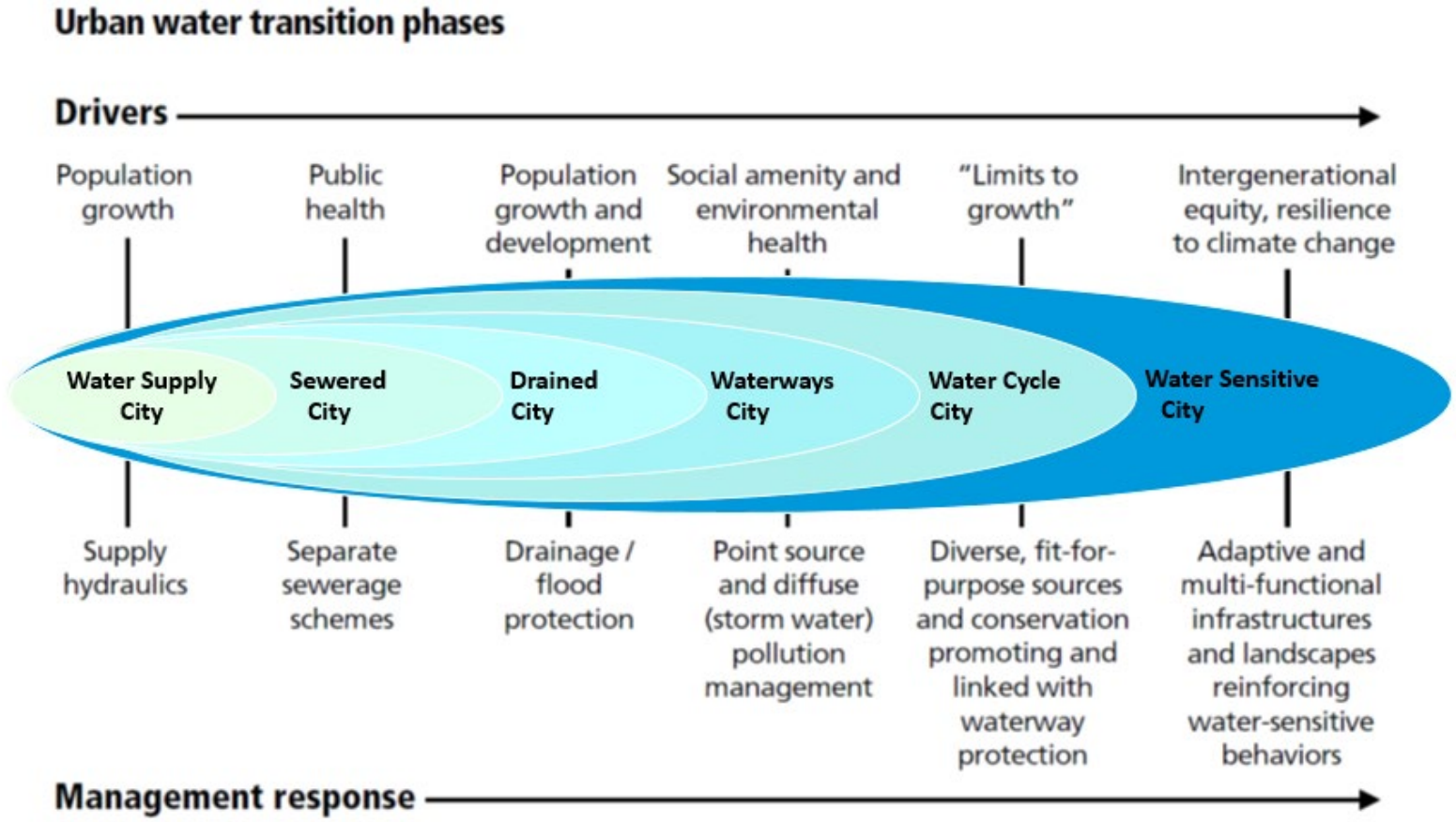
- A collaborative approach to develop and deliver science-based solutions for South Australian water management

- Functions and value
  - Research, advice & knowledge adoption
  - Demand-driven - informing decision-making
  - “One-stop shop” to access SA’s expertise - multidisciplinary and collaborative
  - Independent, expert, credible and quality research and advice

- Climate change science and knowledge workshops
  - Identify priority research and information knowledge gaps of demand from different climate-dependant sectors
  - Identify climate expertise within Partners
  - Identify opportunities for future research, advice and knowledge adoption



# Water Sensitive Cities Framework

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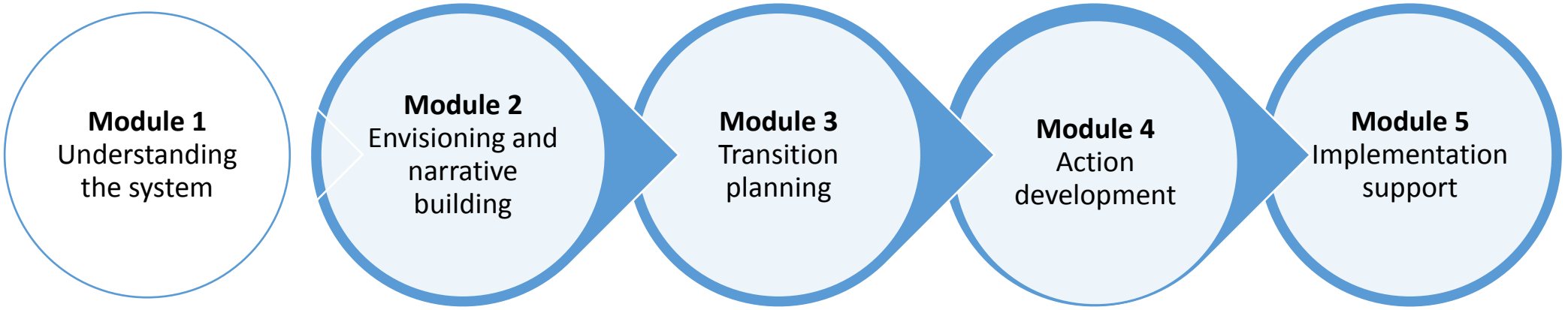
Water Sensitive Cities

# City Transition Strategy Development

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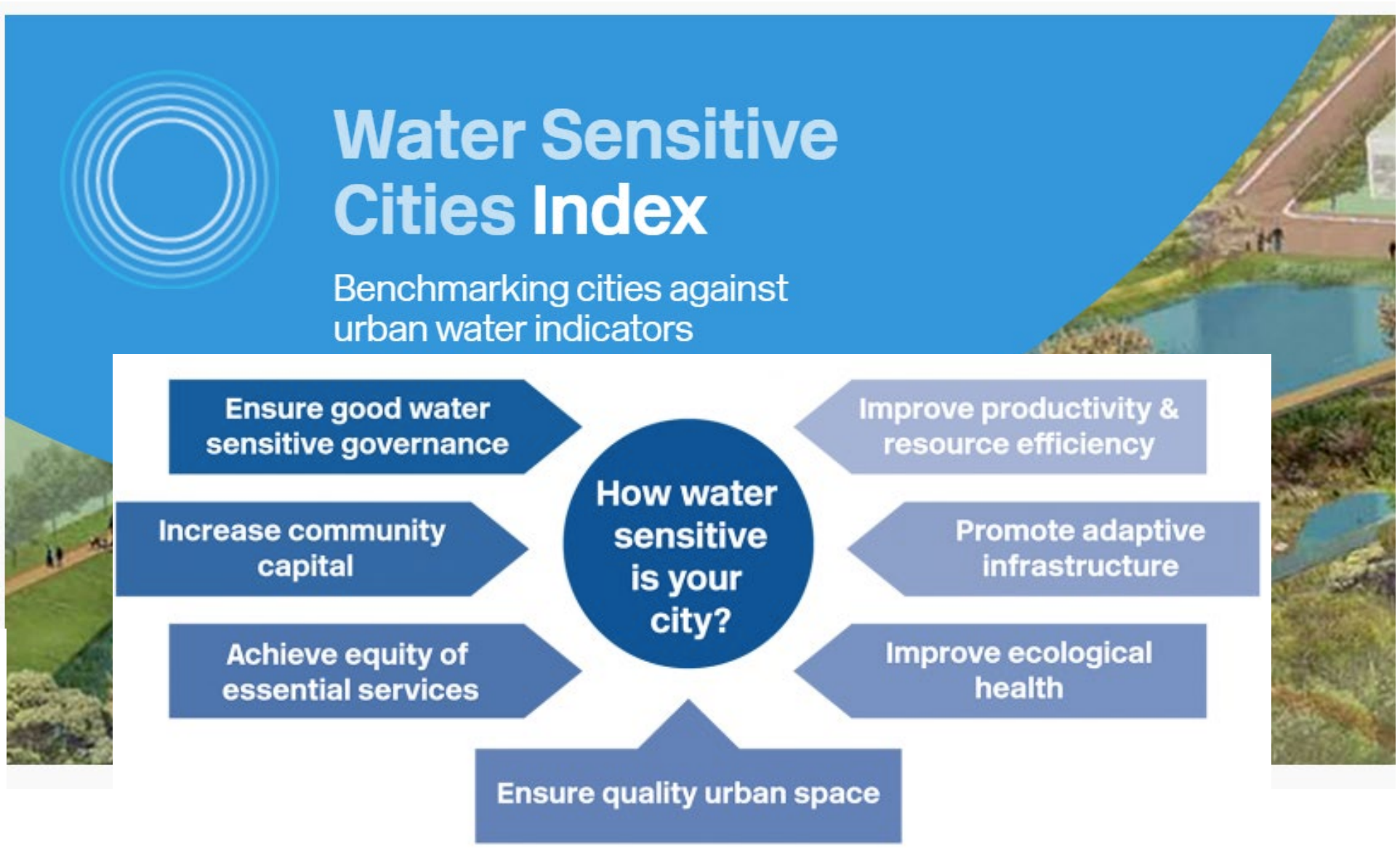
# The Water Sensitive Cities Index

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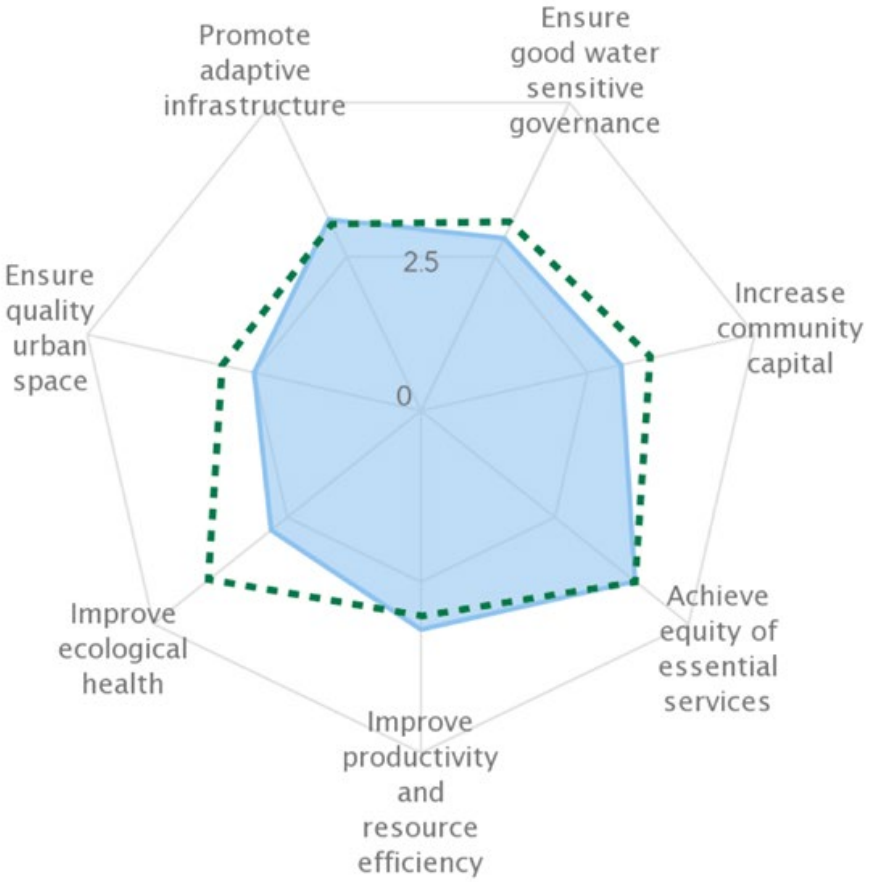
# Benchmarking Adelaide Water Sensitive City Transition




Adelaide's performance (blue area) compared to the water sensitive goals and the idealised Water Cycle City benchmark (dashed green line).

**Source: CRC for Water Sensitive Cities**

CRC for
Water Sensitive Cities

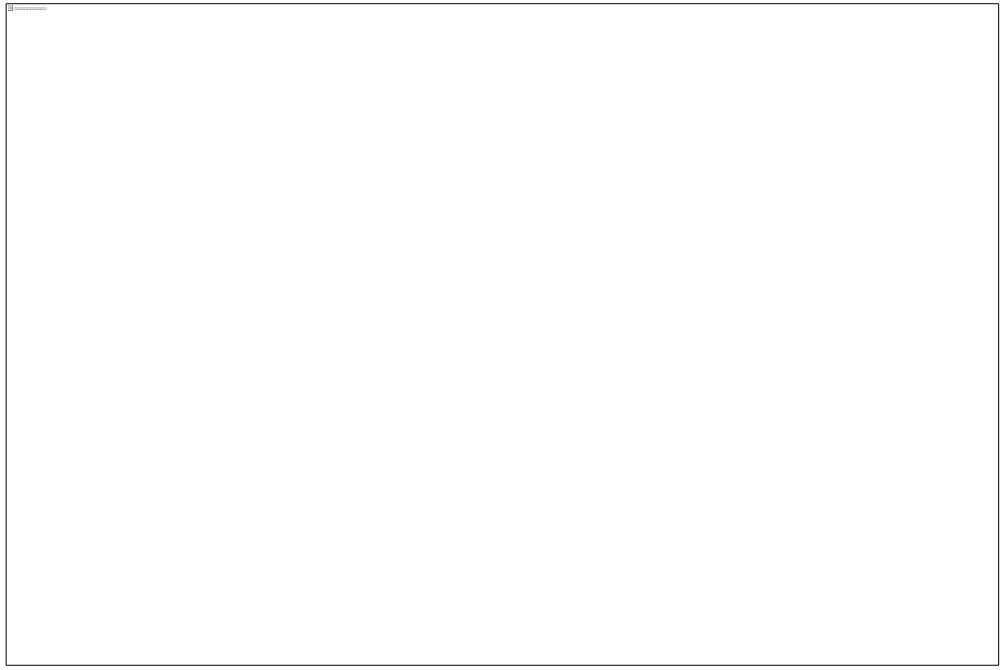
AUSTRALIAN WATER ASSOCIATION


5-7 May 2020
Adelaide Convention Centre

The biggest international water conference and exhibition in the Southern Hemisphere

www.ozwater.org

# We look forward to seeing you in Australia….



1st - 5th December 2019, **Perth**, 16th International Specialised Conferences on Small Water and Wastewater Systems

5th – 7th May 2020, **Adelaide**, Australian Water Association, Ozwater

19th-23rd September 2021, **Darwin**, 21st International Symposium on Health Related Water Microbiology (WaterMicro2021)

25th-28th October 2021, **Adelaide**, 20th IWA Diffuse Pollution and Eutrophication SG (DIPCON-2021)