

Water alternatives for Adelaide (and SA)

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Structure



- Key issues
- History of water use in Adelaide
- Constraints on water use and adaptation in Adelaide
- Alternatives
- A framework for future decisions



Myponga Reservoir

Context...



- Brad Udall, Director, Western Water Assessment, University of Colorado & NOAA, (recent visitor to SA Department for Water) said...

“Climate change is about water”



Before we “start”



- What is the capacity of Mount Bold Reservoir?
- 45 gigalitres (GL)



Summary: Adelaide water



- 2009 water use: ~250 GL
- Groundwater (bores): 6%
- Rainwater tanks: <1%
- Desalination plant: 100 GL/year
- Average: 60% from Adelaide Hills catchments, 10% in drought years



(A brief) history of water use

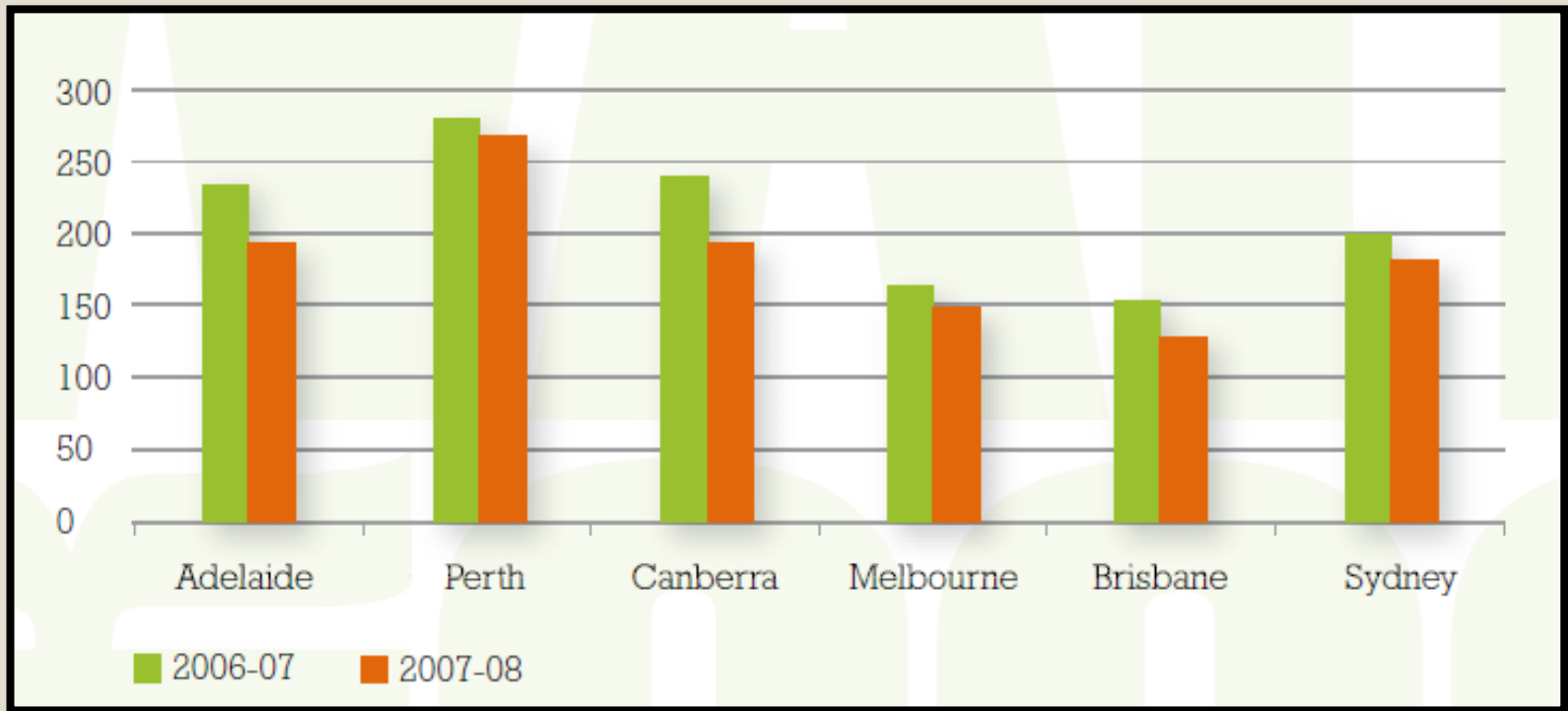


- Adelaide's water supply has been supplemented by transfers from the River Murray since 1955
 - In that year, water use rose by 20%
 - Adelaide was the only mainland city not to have water restrictions.
- Entitlement to water from the MDB derives from previous Murray Darling Basin agreements
 - Included SA funding of Dartmouth Dam in Victoria
- 2005 “Water Proofing Adelaide...” released from a widespread consultative process. Ideas included:
 - 37 GL demand reduction
 - 11 GL stormwater
 - 16 GL recycled water
 - 4 GL rainwater tanks

Adelaide: a comparison 1



- “Adelaide annual water use”

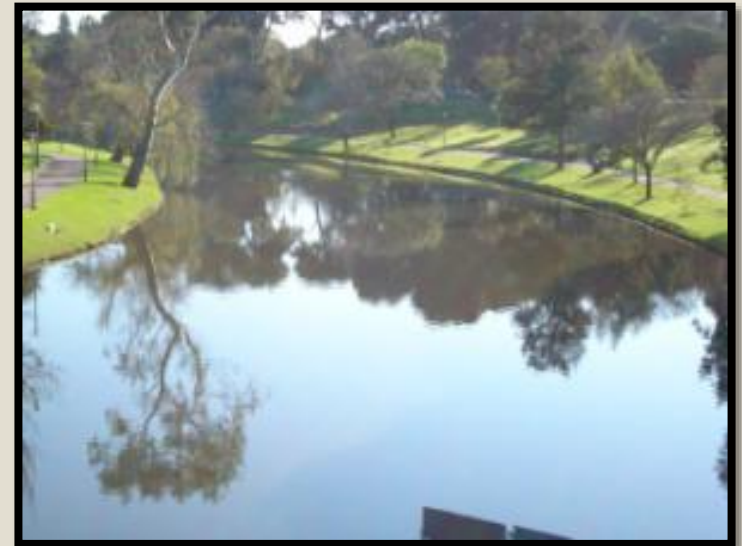


Adelaide: a comparison 2



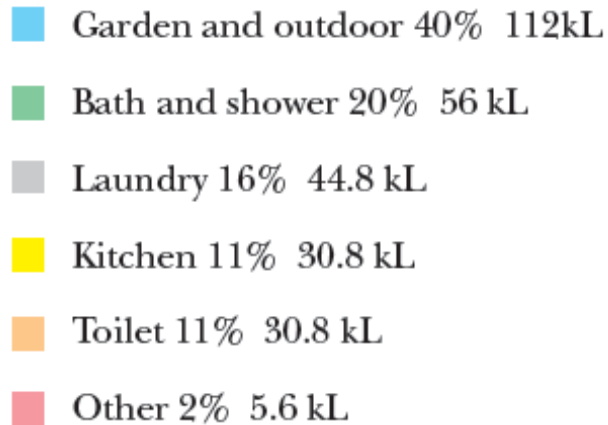
per capita water usage Kl/hd/yr 2002-2003

Melbourne	84
Sydney	92
Perth	101
Brisbane	106
Adelaide	124*



* Measured during a high use year

Where is water used?



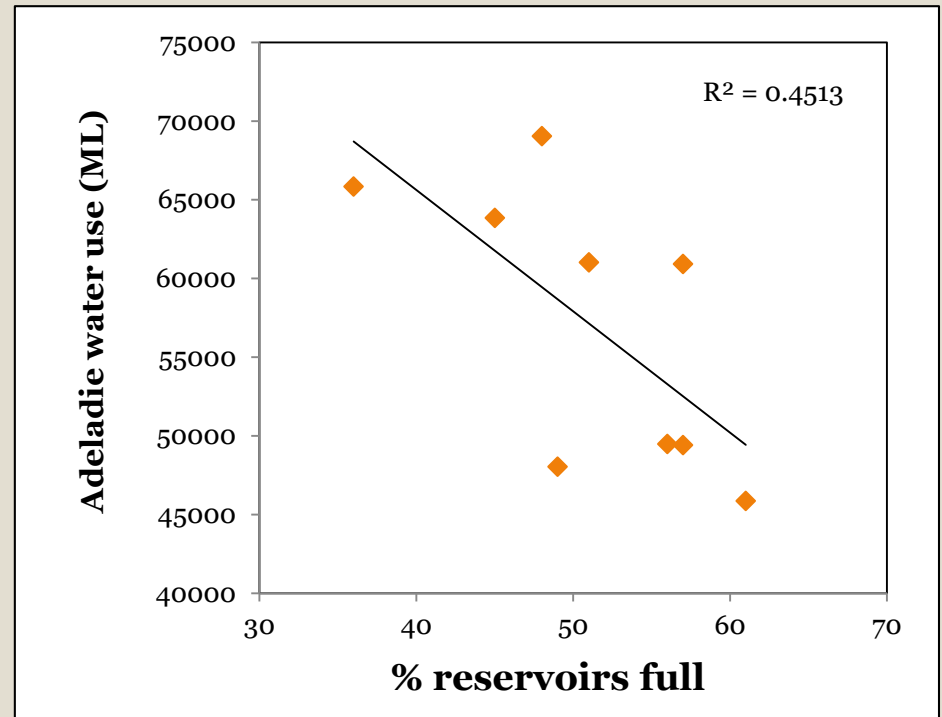
Conclusion: considerable potential
for use of non-potable water in
the city

Retrofitting is expensive

There is a fine (obvious) irony...



- Gardens need more water when it is hot!
- Graph: Annual water use vs. reservoir level (April of each year)



Challenges for future water use



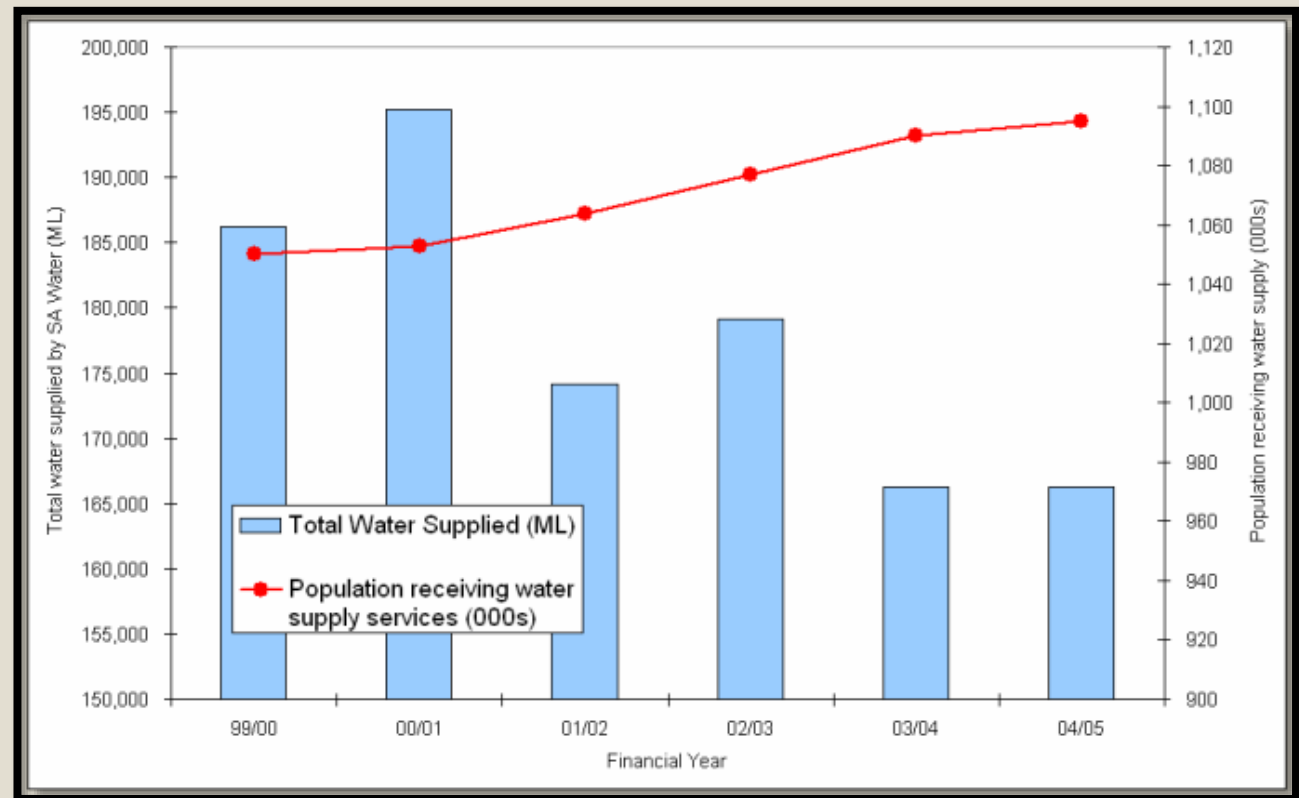
- Population growth and distribution
- Climate change
- Change in the Murray Darling Basin
- Environmental water allocations
- “Redundancy”
 - Retro-fitting a city

**Constraints interact
and are both
human and
environmental**

Challenges 1: population growth



- Population policies have succeeded in increasing Adelaide's growth



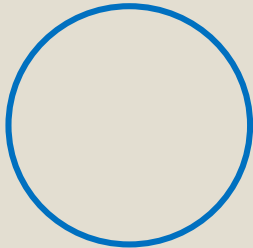
Data source: Water for Good (2009)

Population growth: effects...

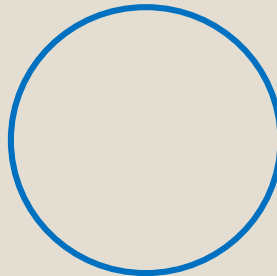


- Expanding population, expanding water use...

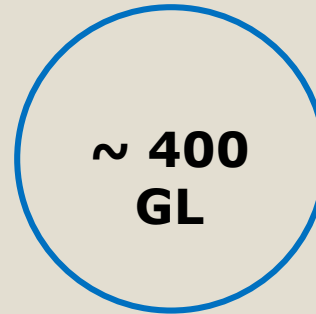
2010



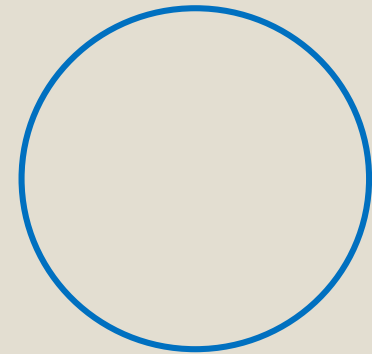
2014



2025



2050

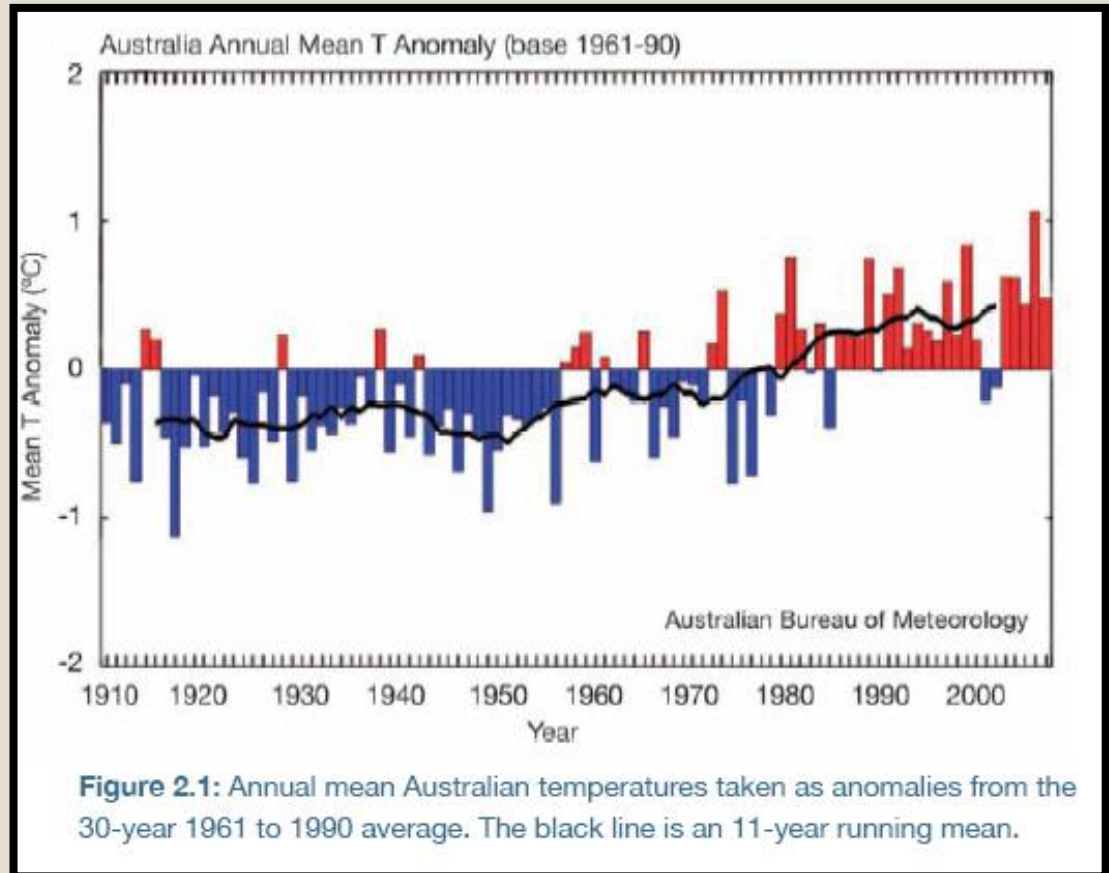


- Question...How to “fill” the circles?

Challenges 2: Climate change



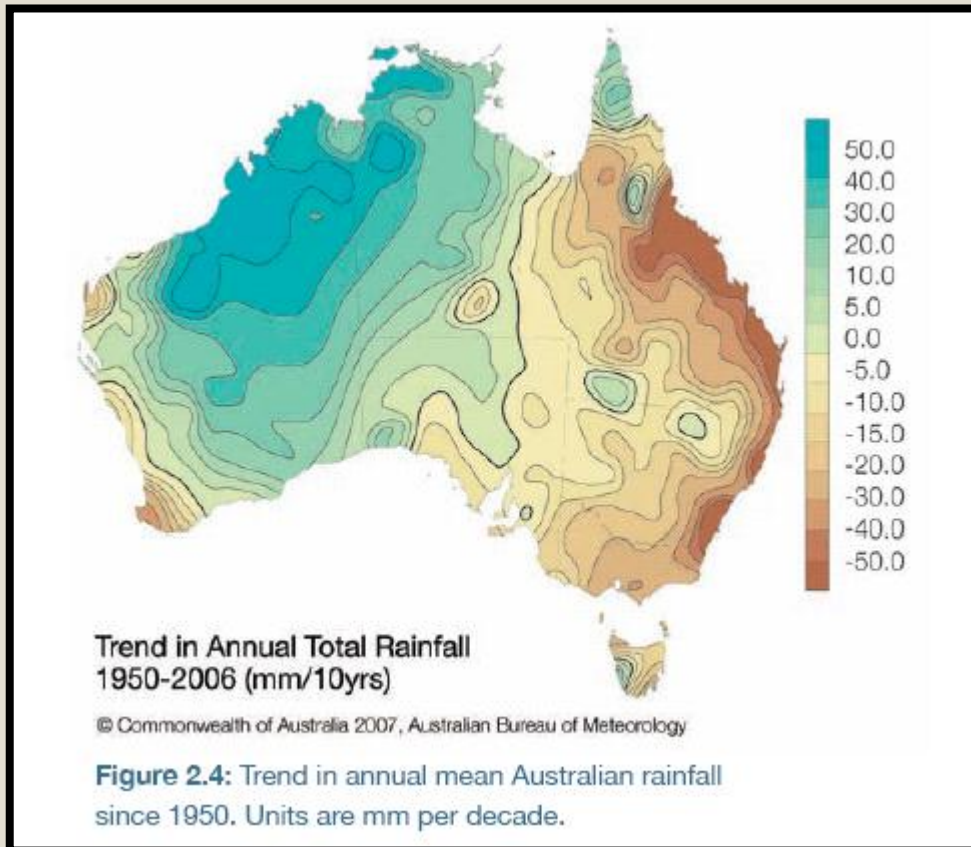
- Most of the last 20 years have been warmer than average...



Climate change...



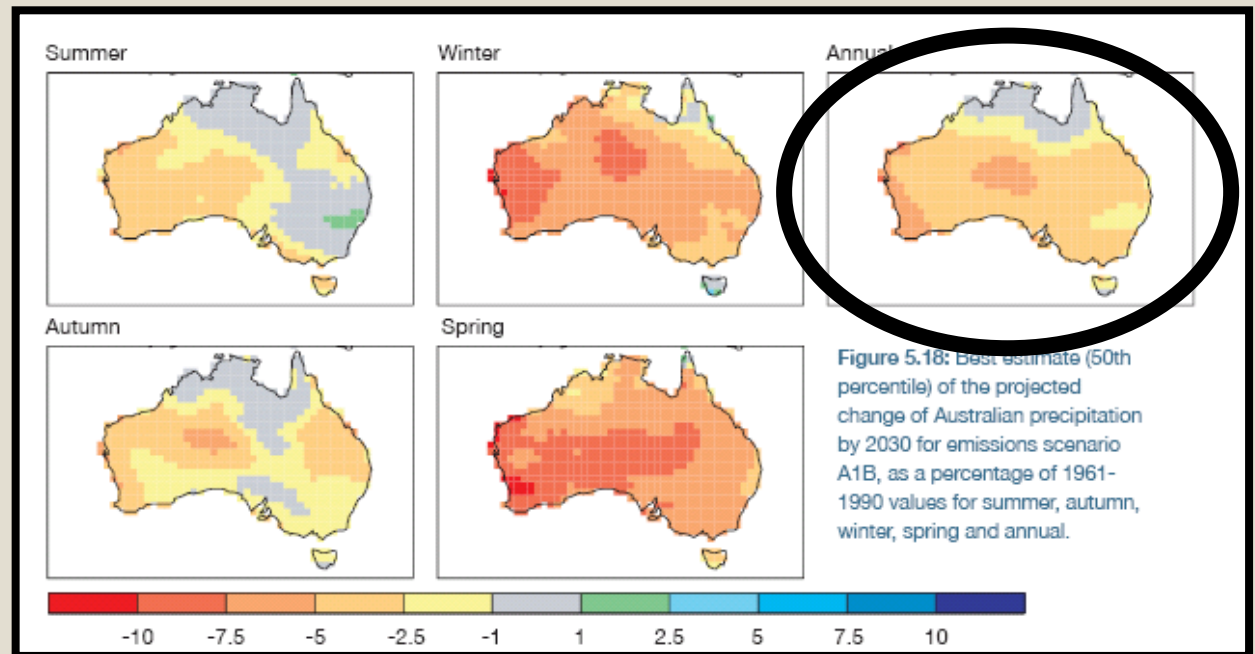
- Drying trend for last ~ 50 years



Predicted to get worse...



- 50% chance of 5% rainfall decline by 2030
- Perhaps a 25% reduction in stream flow

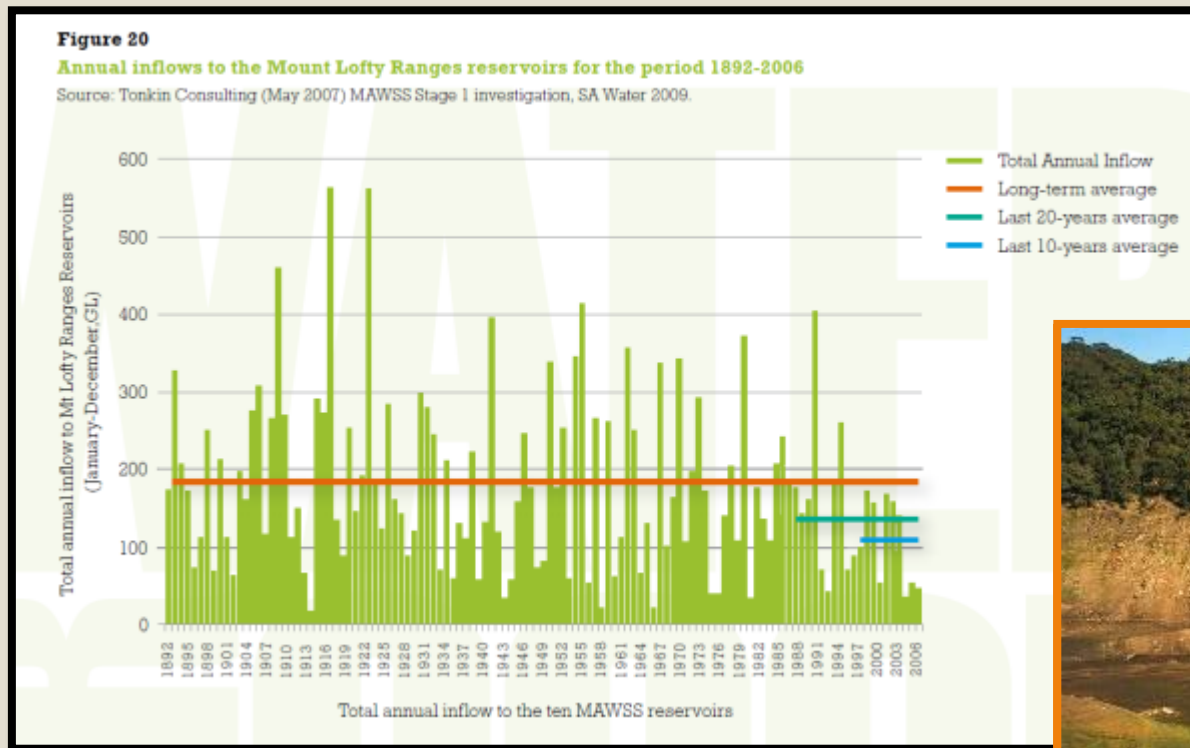


% change

Climate change: summary



- Water for Good strategy plans for a 41% reduction in next 40 years from Mount Lofty Ranges



Data source: Water for Good (2009)

Challenges 3: The (changing) Murray



- Murray-Darling Basin is Australia's largest river basin, accounting for about 70% of irrigated crops and pastures (MDBC, 2006).
- Average natural discharge to the sea: 14,000 GL
- Average irrigation extraction: 11,000 GL



Open channel cotton irrigation near St George, southern Queensland

South Australian use of Murray



- Have a “guaranteed” allocation of 1850 GL
 - 570 GL: irrigation
 - 170 GL: domestic water (mainly Adelaide)
 - 1110 GL: “environment” (complex)
- **Total storage volume in Basin: 19000 GL (6th Aug, 2014)**



MDB beyond 2030



- Discharge likely to fall 10-25% by 2050 (A1 scenario)
- From the Garnaut Review (quoted in Govt's green paper):
 - By 2100 a 92% decline in irrigated agricultural production in the Murray-Darling Basin
- Conclusion: reduced reliance on MDB needed in Adelaide.



Water “users” in MDB in 2020

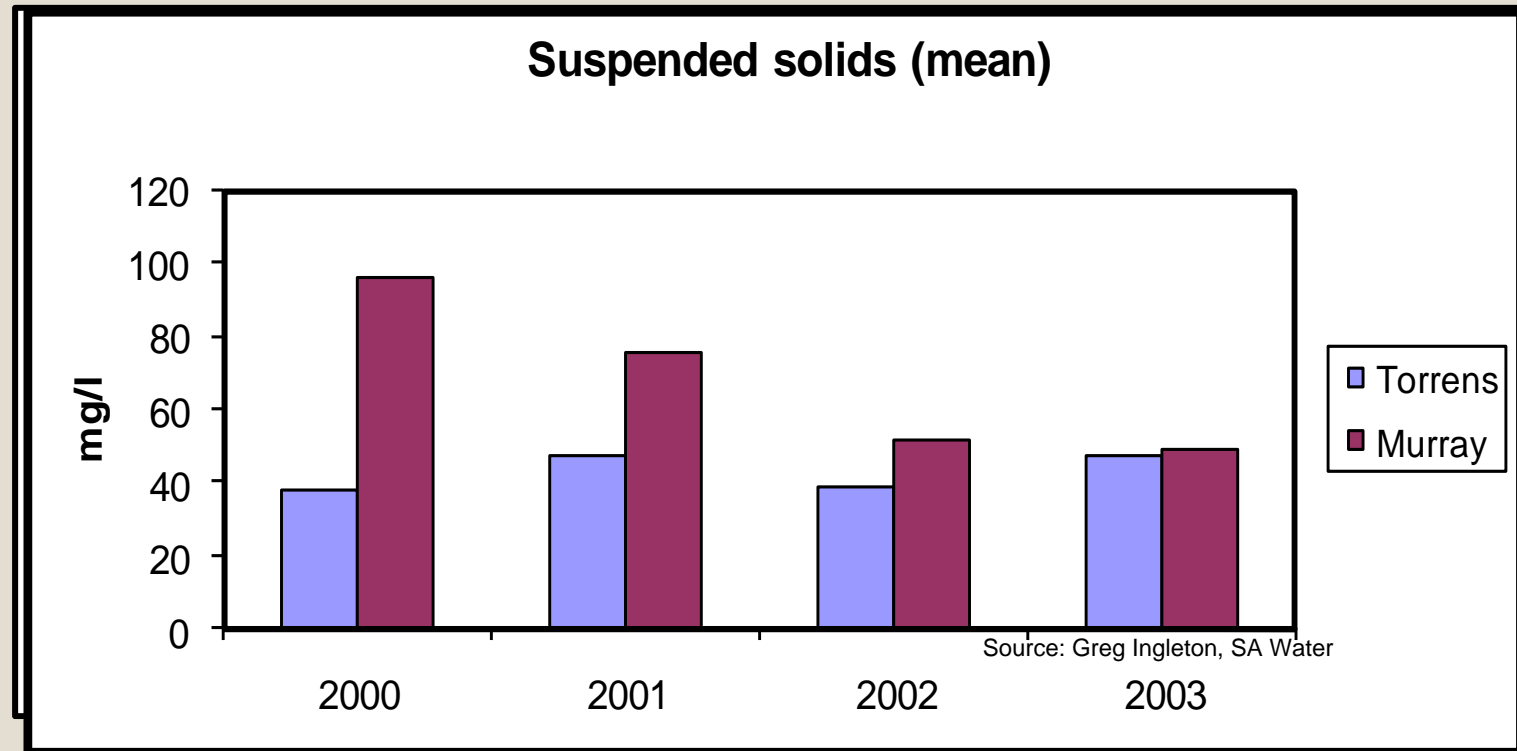


- Canberra bushfire regrowth: 130 GL/yr
- Revegetation: 550-700 GL/yr
- Climate change: 1100 GL/yr
- Living Murray Initiative: 500 GL/year?

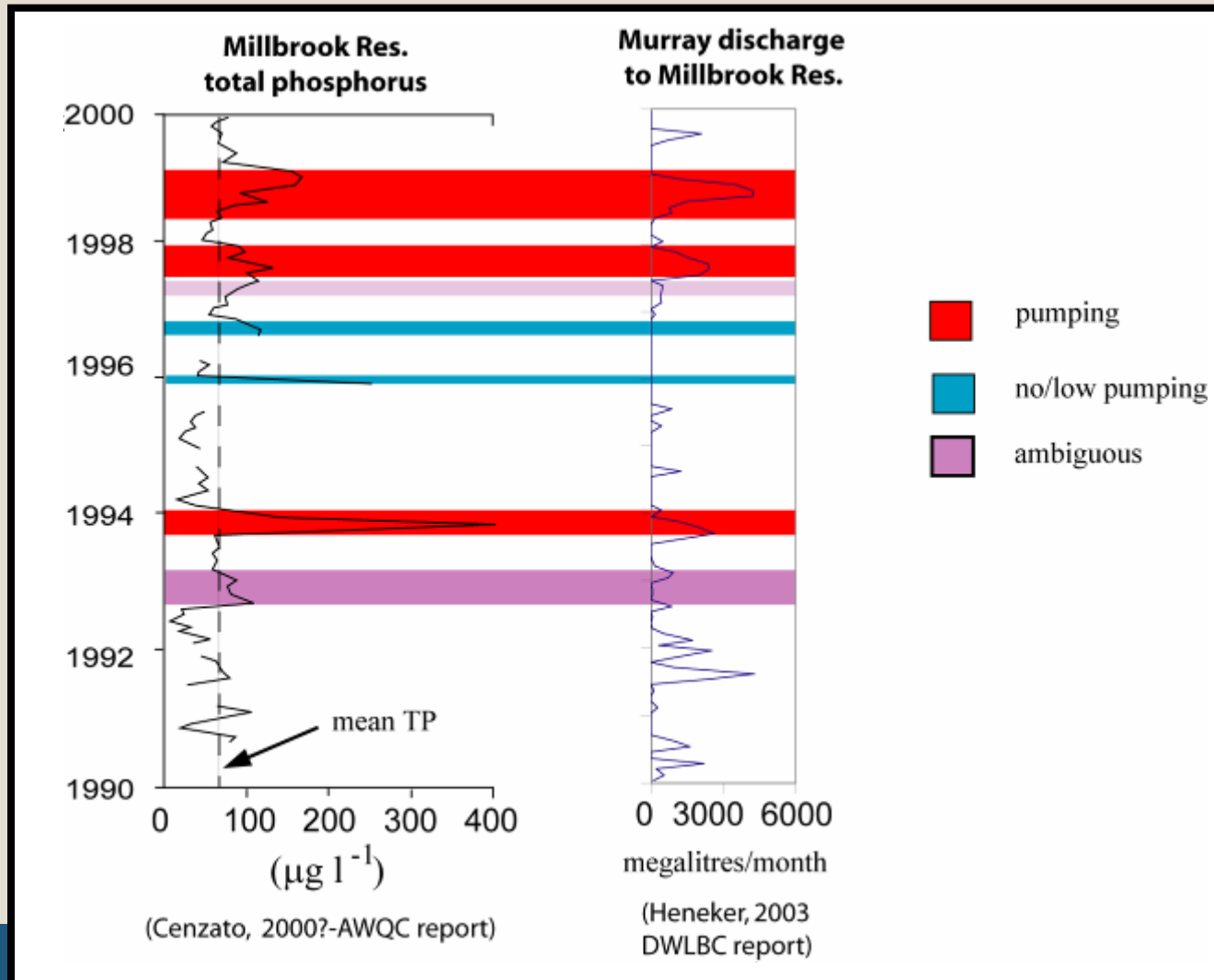


Revegetation near Myponga Reservoir, southern Fleurieu

Murray vs. Torrens water quality 1



Murray vs. Torrens water quality 2



Over to you...



- What are the options?

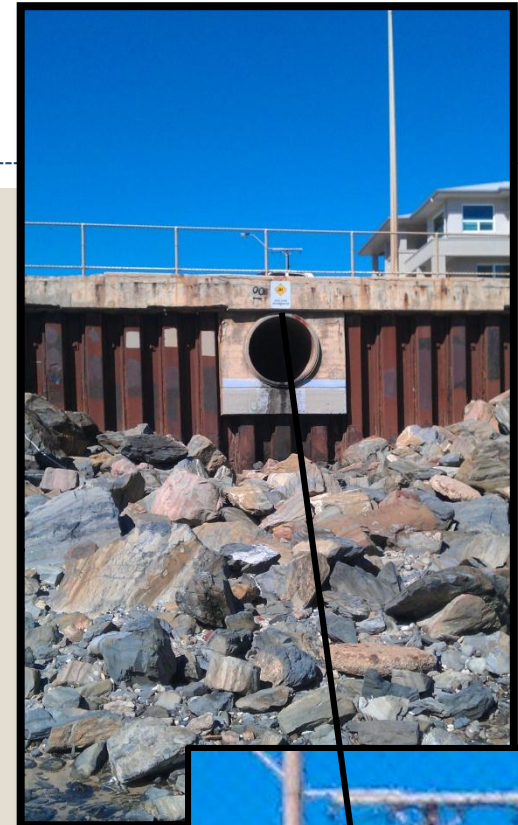


Stormwater



- Positives:
- Currently there is excess stormwater discharge from Adelaide
- Builds on success: Adelaide has highest amount of stormwater harvest of any state
- Approximately 6 GL/yr
- Negatives:
- Volume of water is not particularly large:
 - ✦ 20 GL/yr by 2013
 - ✦ 60 GL/yr by 2050

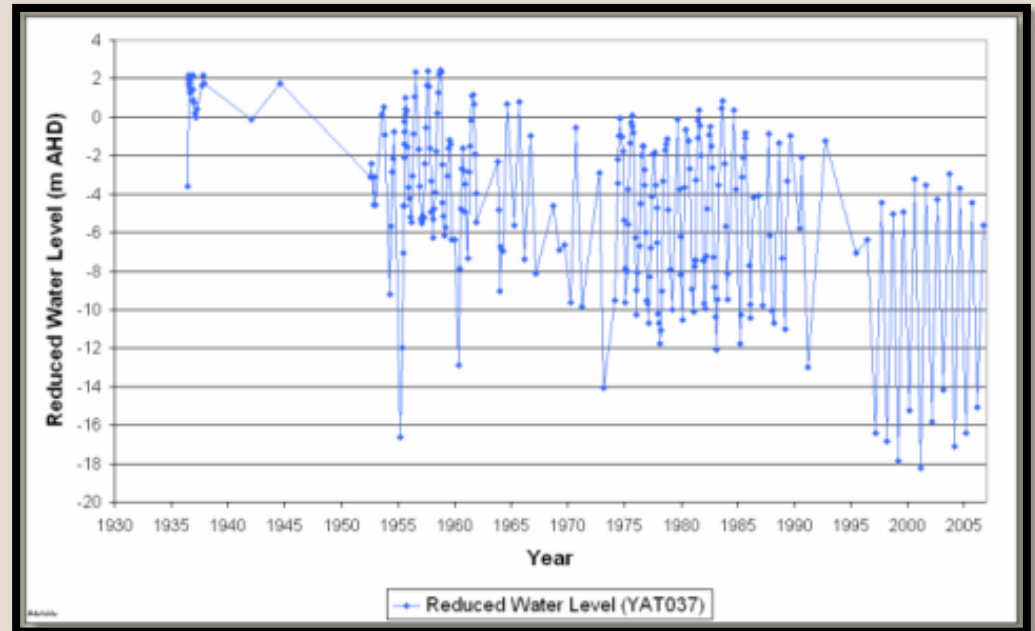
**Stormwater outflow
near Brighton,
Adelaide**



Groundwater



- Positives:
- (perceived) ability to draw on limitless supply
- In 2007 there were 500 applications for the drilling of domestic water bores in Adelaide...
 - Increased from 85 in 2005
- Negatives
 - Also vulnerable to climate change



Re-use



- Positives:

- A large resource available
- Reduced pollution to marine environment

- Negatives:

- Retrofitting is a challenge
- There are unknowns associated with long-term usage

Desalination



- Positives :
 - “Limitless” supply
 - Delivers a large amount of water

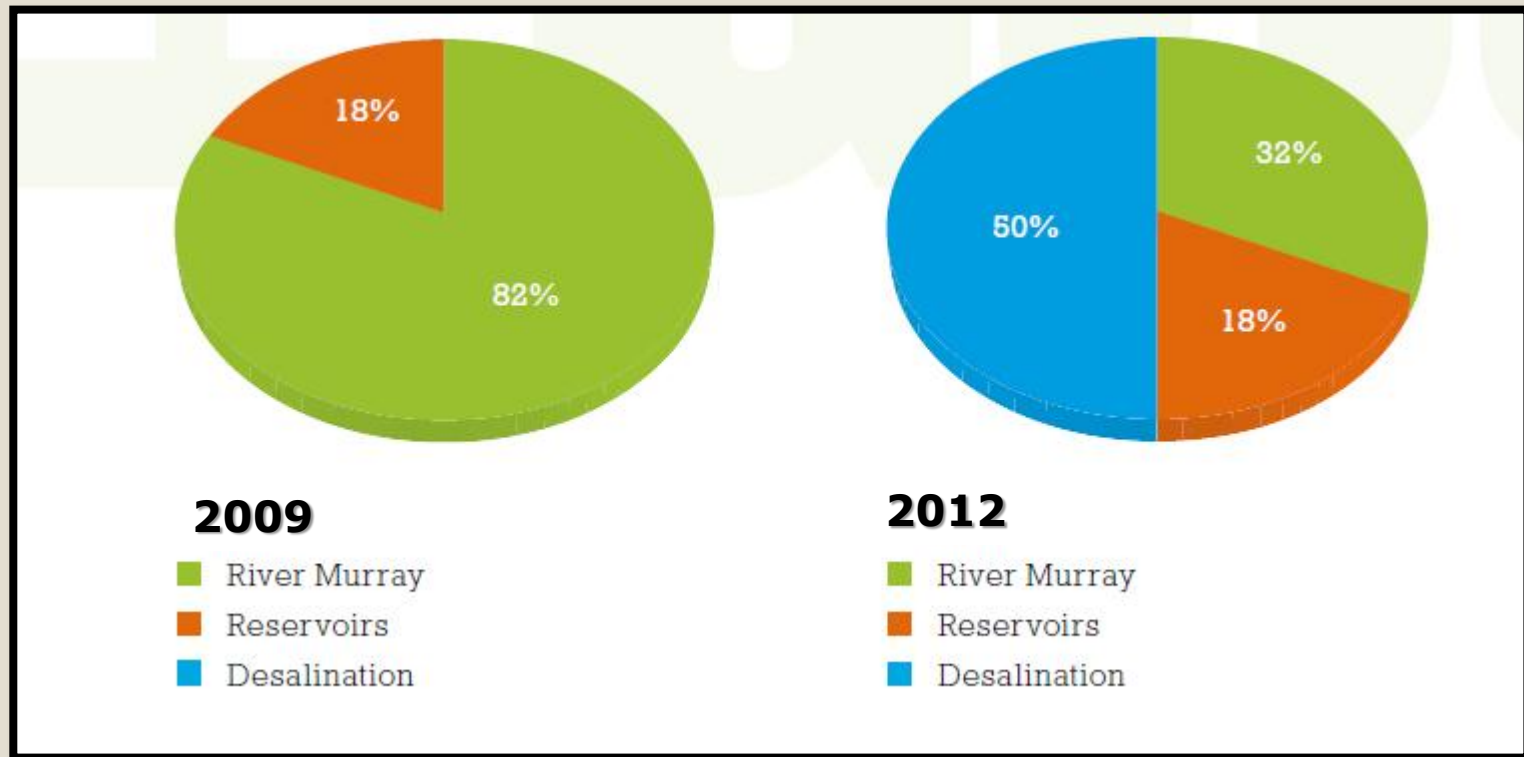
- Negatives :
 - Massive cost
 - ✦ Construction: \$1.83 Billion
 - ✦ Ongoing increased water cost
 - Environmental impact
 - ✦ Greenhouse emissions



“Water for Good” vision



- Water supply in a dry year...

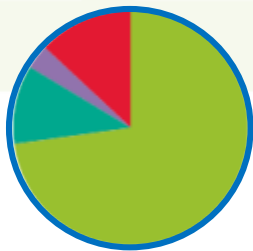


“Water for Good” vision

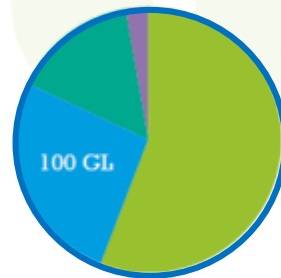


Greater Adelaide's water supply from all sources for both drinking and non-drinking purposes

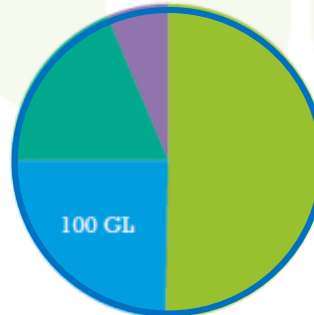
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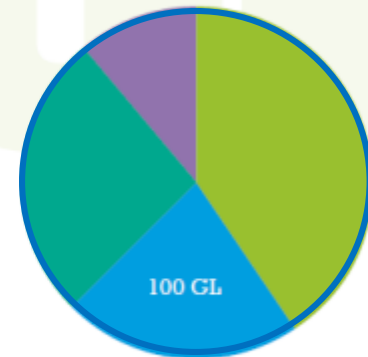
2014



2025



2050



- Rivers, reservoirs and aquifers
- Desalination
- Recycled stormwater & wastewater
- Saving water
- Water restrictions

Conclusion (almost)



- There has been a “stepping away” from demand management and a focus on desalination
 - Are there different more radical ways to re-configure a city?
- Federal Government contribution means lower demand on River Murray
- Being able to “flick a switch” and supply 1/3 our water needs could reduce innovation in other areas...

How to assess?



Adaptation

Actions taken in response to climate change which
“...moderate harm or exploit beneficial opportunities.”
(Klein *et al.*, 2007)

Maladaptation

“...an adaptation that does not succeed in reducing vulnerability but increases it instead.” (IPCC, 2001)



Source: csiro.com.au

Maladaptation “indicators”



- 1. Increase greenhouse gas emissions**
- 2. Disproportionately burden the most vulnerable**
- 3. Produce high opportunity costs**
Compared to alternate options
- 4. Reduce other incentives to adapt**
By undermining alternative adaptation actions
- 5. Create “path dependency”**
Scale of investment creates “locked-in” commitment to a specific adaptation pathway

(Barnett and O’neill, 2010)

Concluding statement



- Challenges experienced by Adelaide (and SA more broadly) reflect those experienced in other parts of the world
- There may be more than one precautionary principle which needs to be applied
- Maladaptation framework MAY help you to assess the desirability of future adaptation strategies

Information sources



- Barnett, J. and O'Neill, S. (2010) Maladaptation, *Global Environmental Change*, 20(2), 211-213.
- Daniels, C. B. (2010). *Adelaide: water of a city*. Wakefield Press, Adelaide.
- Cullen, P. (2004). *Water Challenges for South Australia in the 21st Century*:
<http://www.thinkers.sa.gov.au/thinkers/Cullen/challenge.aspx>
- Water for Good:
<http://www.waterforgood.sa.gov.au/water-planning/the-plan/>
- Water Proofing Adelaide: Water Proofing Adelaide A thirst for change 2005 – 2025

Unused but potential useful slides follow



Adelaide consumption

- Dry vs. wet years...

