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Water Availability in the Murray-Darling Basin

Murray-Darling Basin Sustainable Yields Project

24 November 2008

Australian Government
National Water Commission
Raising National Water Standards

CSIRO

Project terms of reference

- Water Summit: PM and First Ministers, Nov 2006
  - CSIRO to report progressively through to 2008 on sustainable yields of surface and groundwater systems within the MDB
- Estimate current and likely future (~2030) water availability in each catchment/aquifer and for the entire MDB considering:
  - climate change and other risks
  - surface-groundwater interactions
- Compare the estimated current and future water availability to that required to meet the current levels of extractive use

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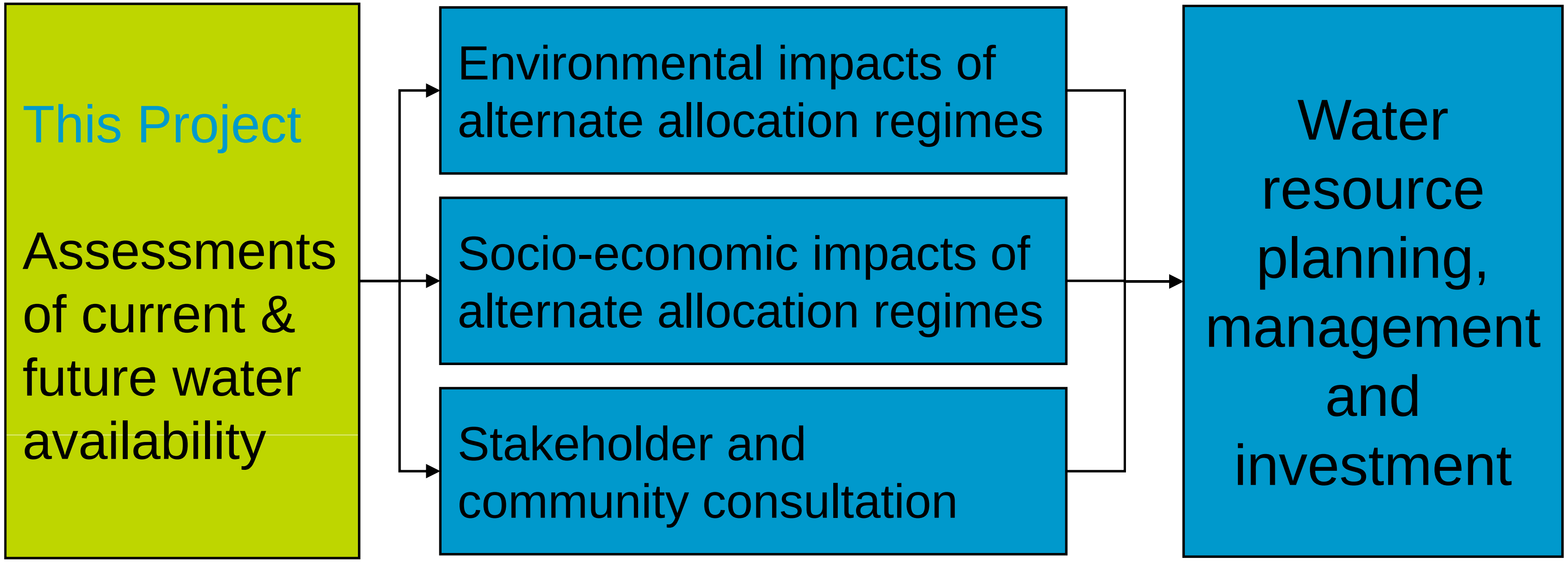
Project context



This project will not, in itself, determine sustainable yields or set a new cap on diversions

Scenarios

A: Historic climate (1895-2006) & current development

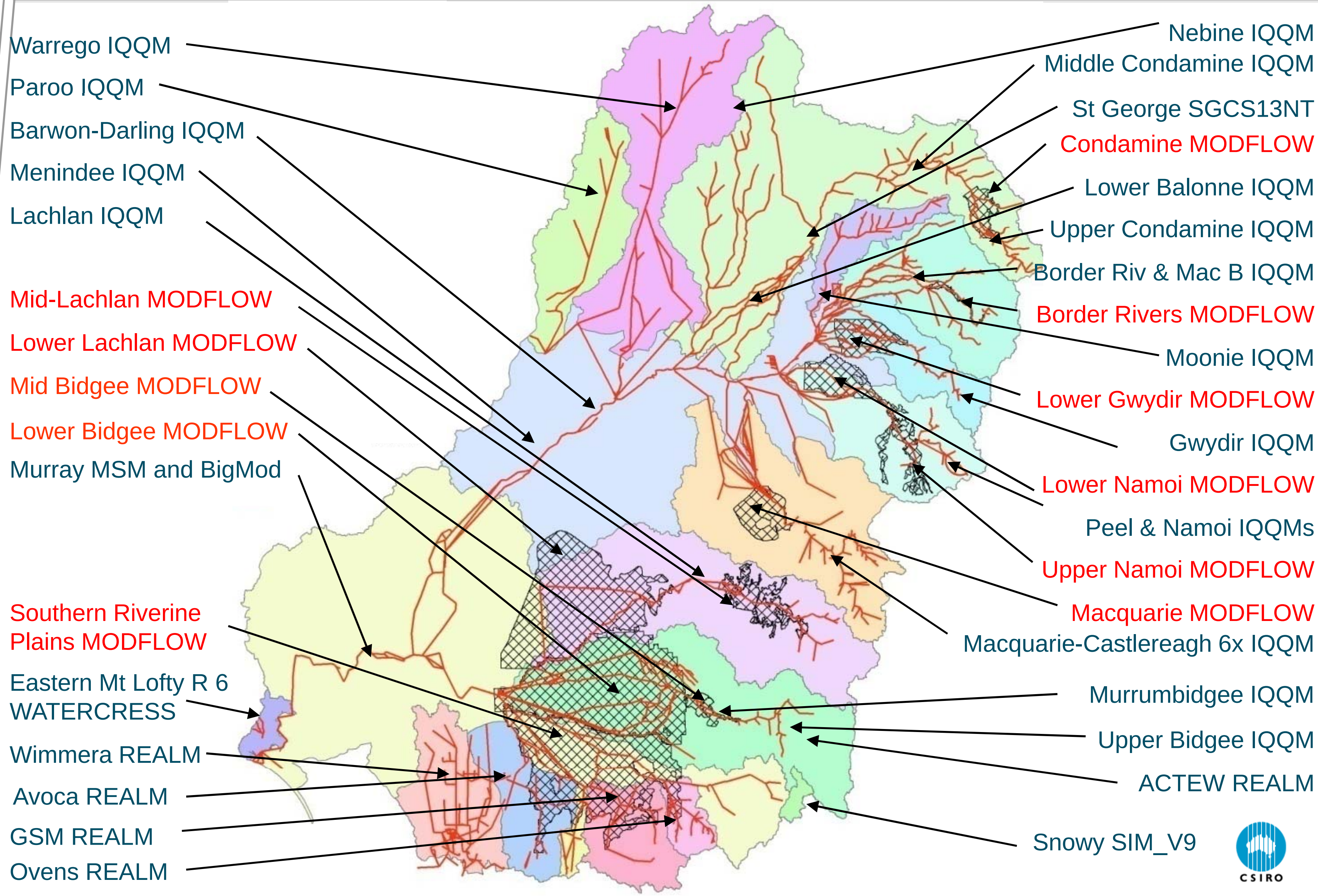
B: Recent climate (1997-2006) & current development

C: Future climate & current development

D: Future climate & future development

- Future climate
  - 2030 climate based on 4AR IPCC results
  - 3 global warming levels (low, mid, high)
  - 15 global climate models
- Future development
  - Commercial forestry plantations
  - Farm dams
  - Groundwater extractions

Linked surface-groundwater modelling for MDB



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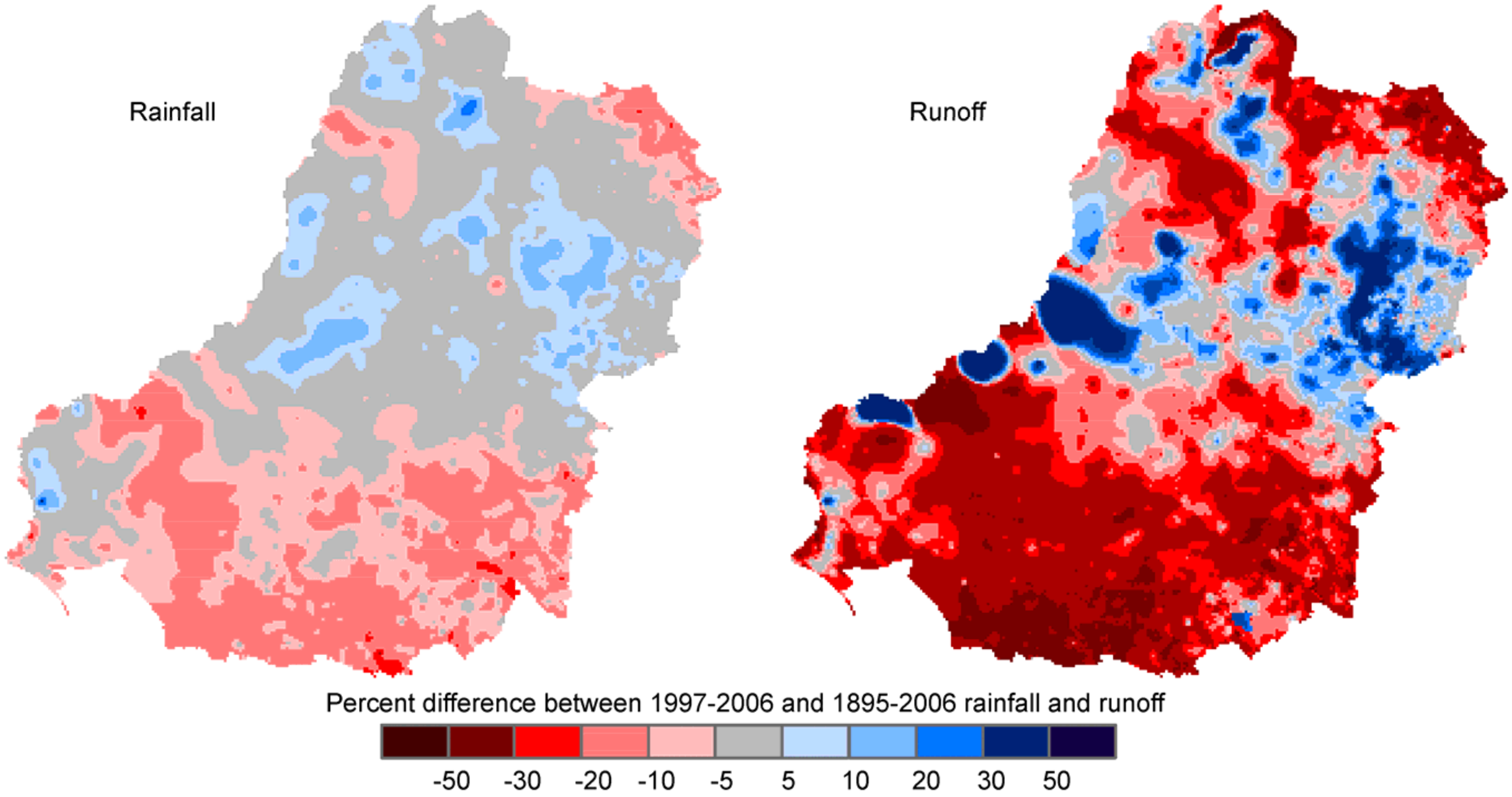
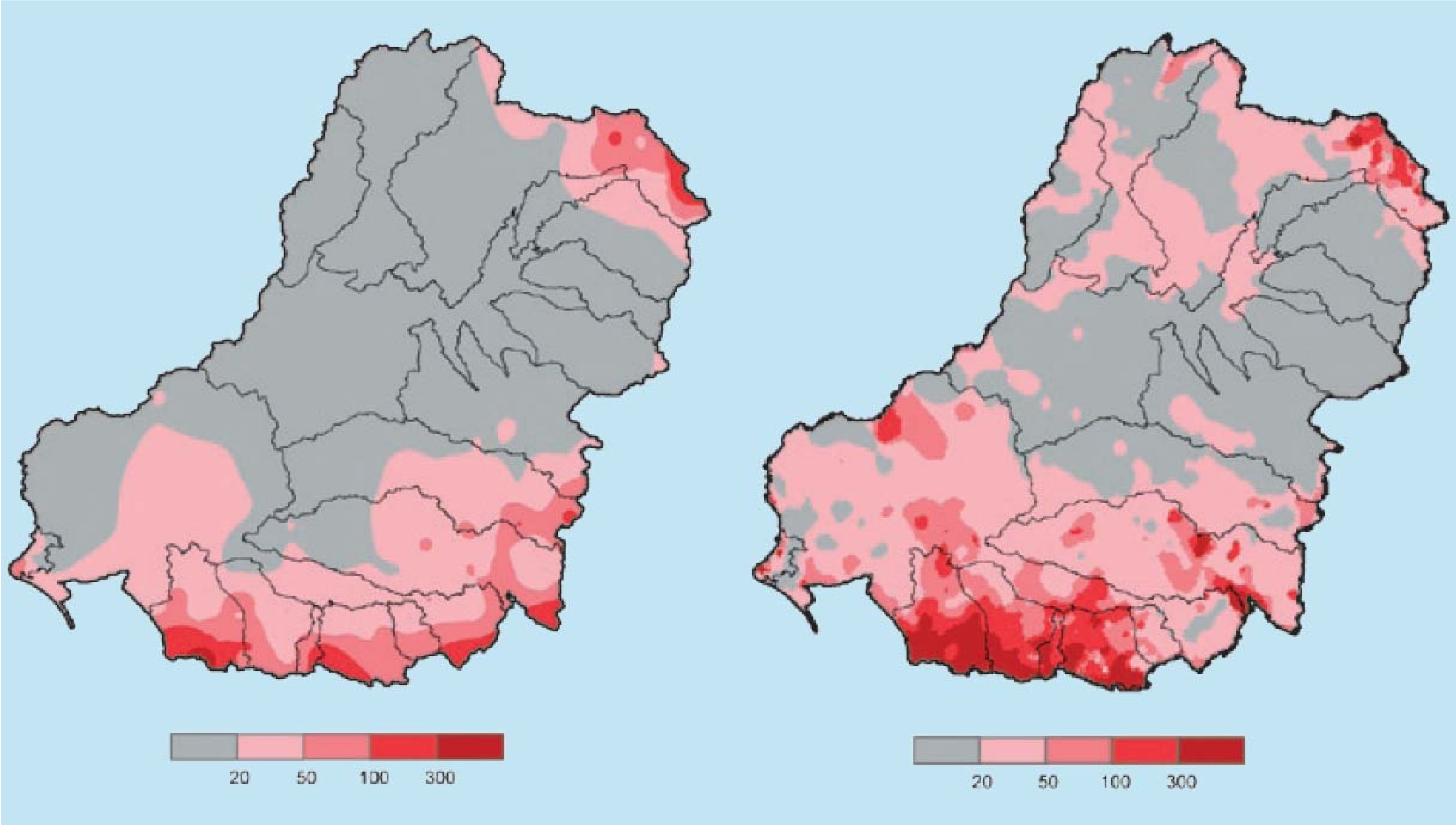
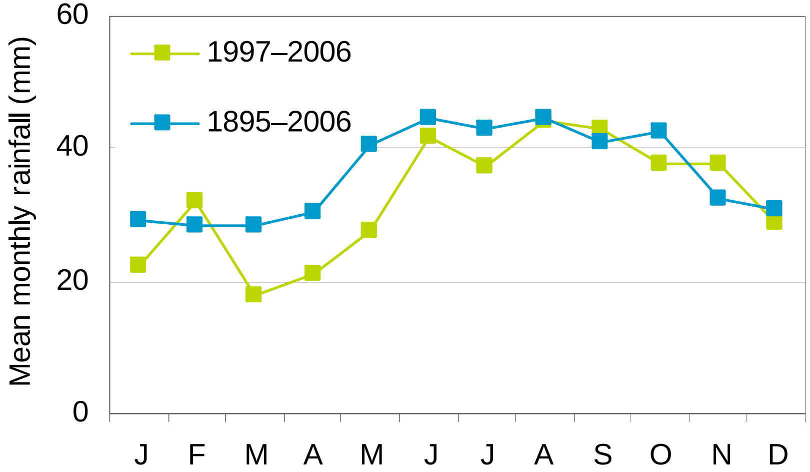
Percent difference in rainfall and runoff

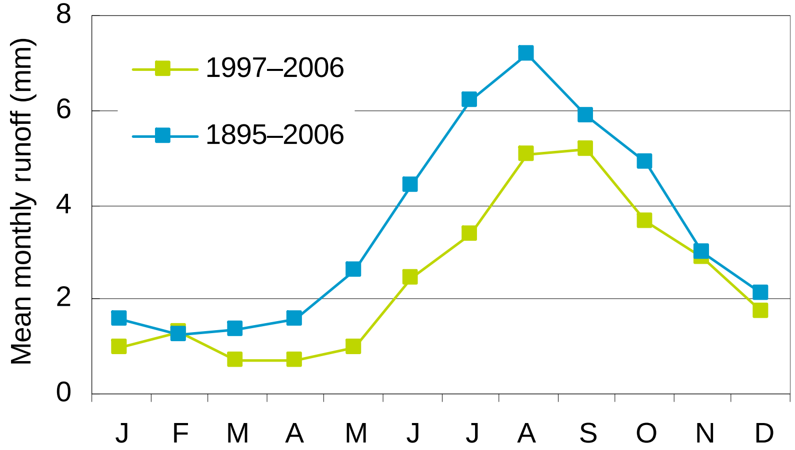


ARI of 1997 to 2006 rainfall and runoff



Recent climate: reduced autumn rainfall





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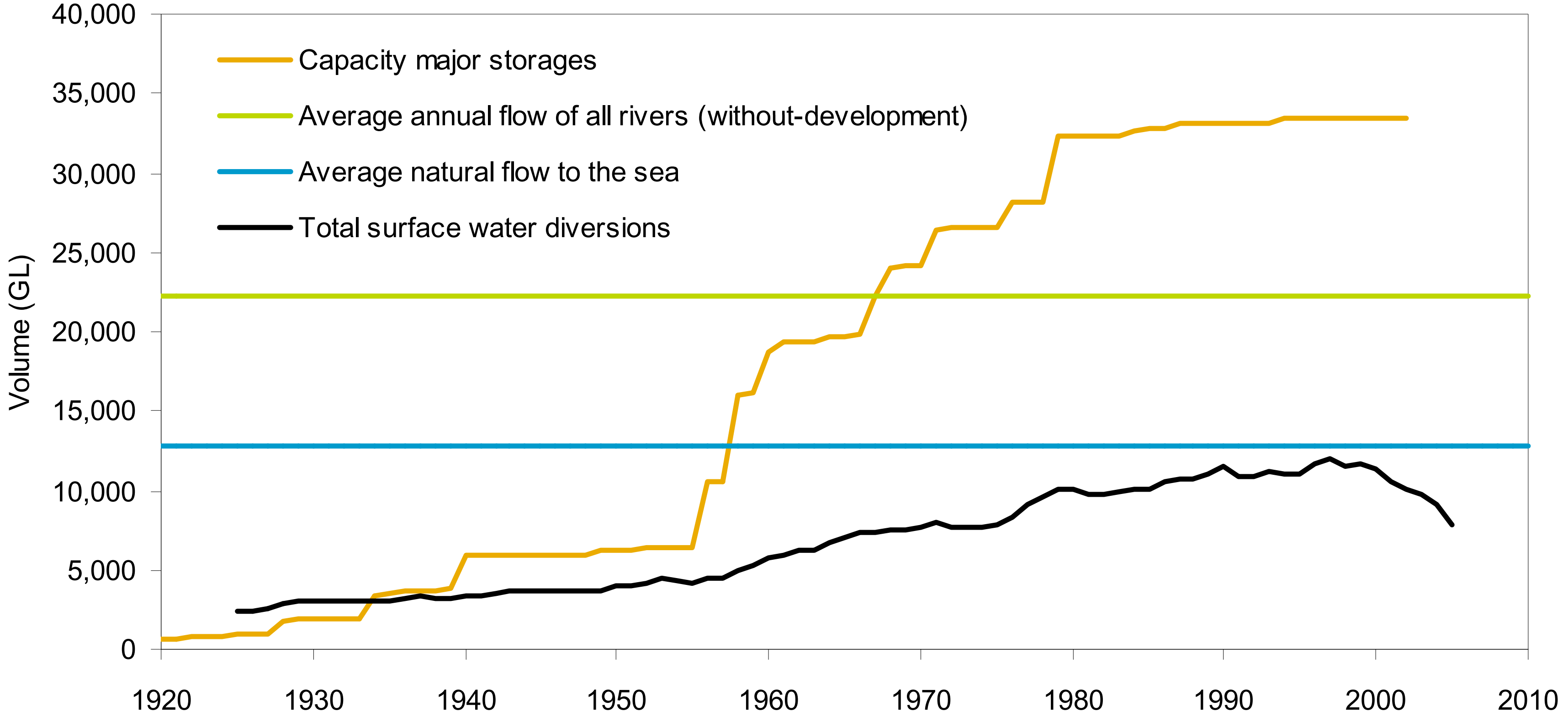
Growth in storage capacity & diversions



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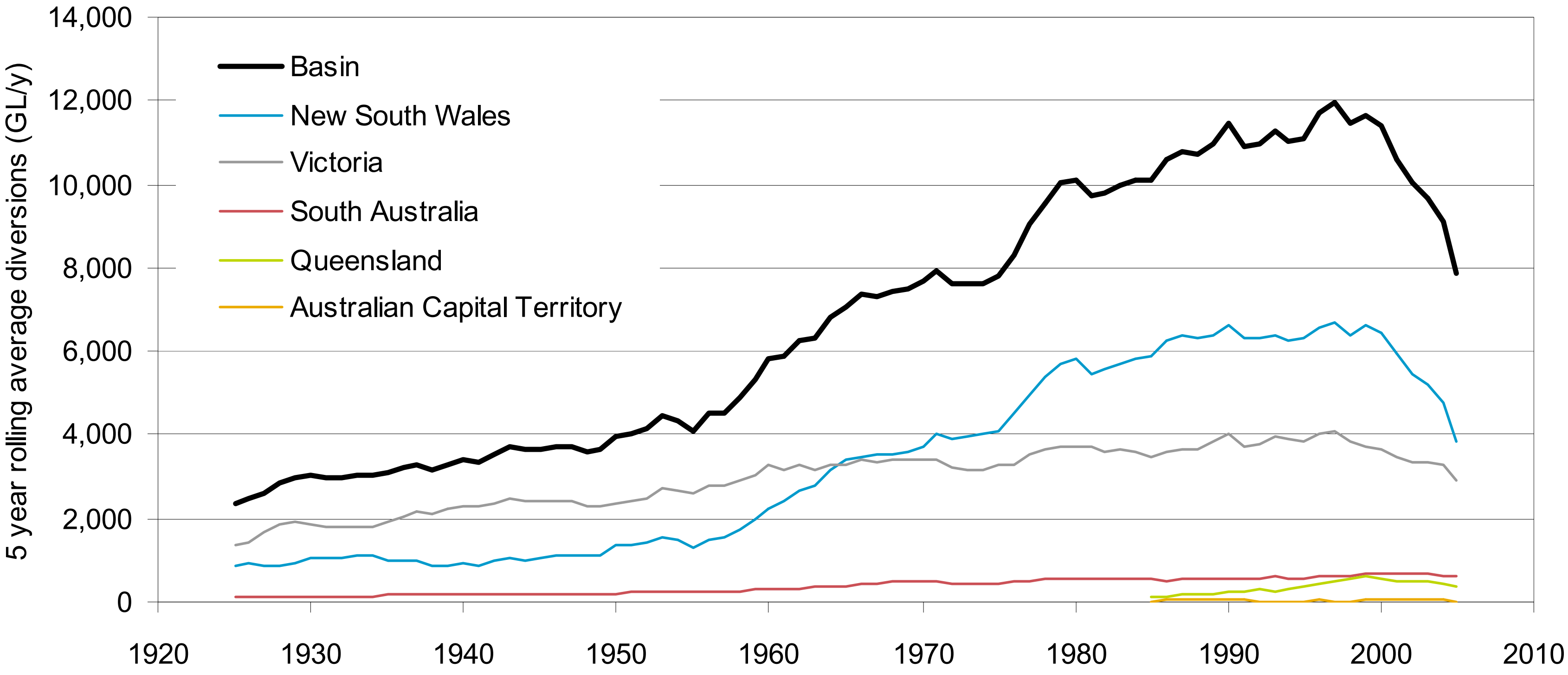
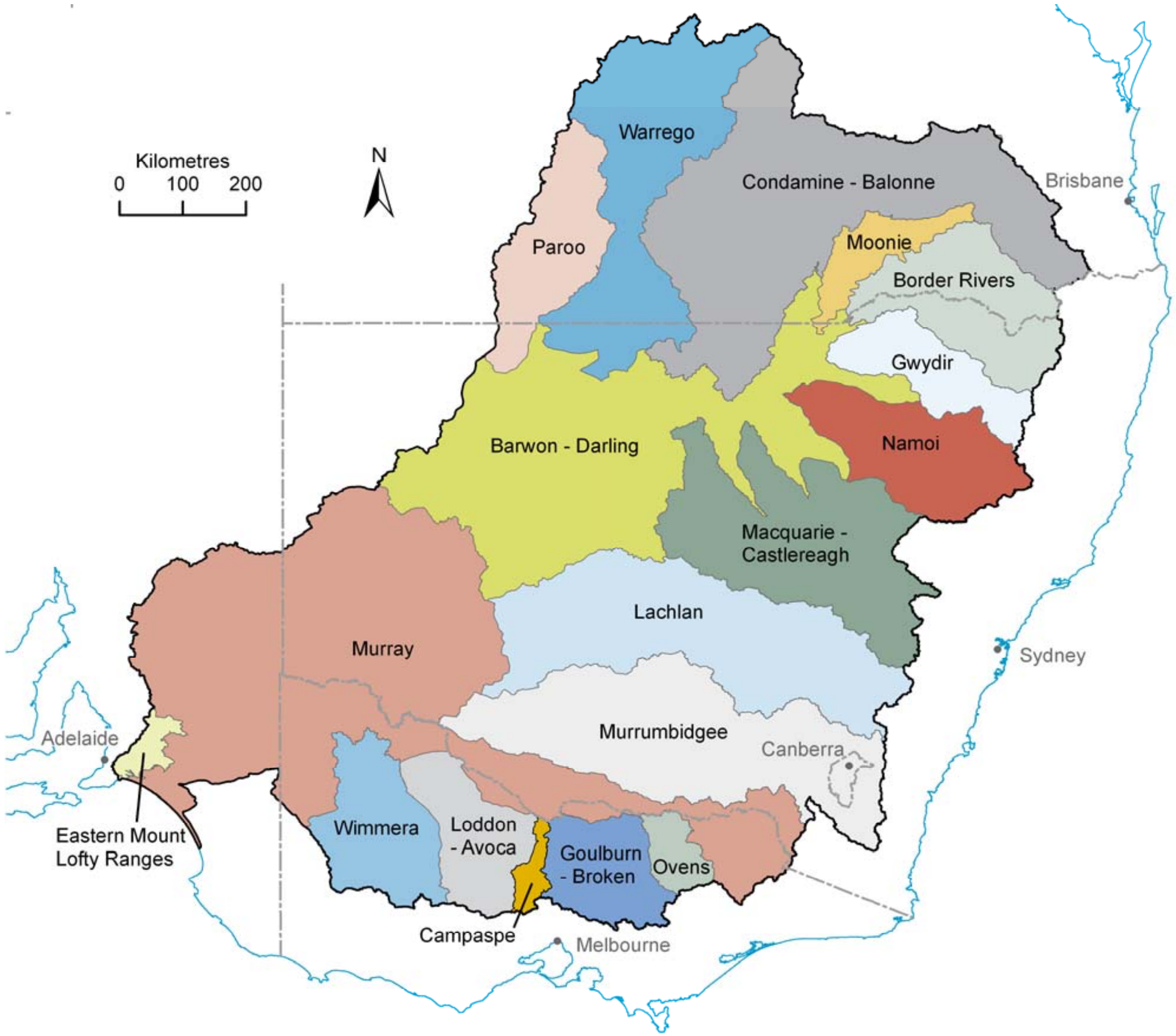
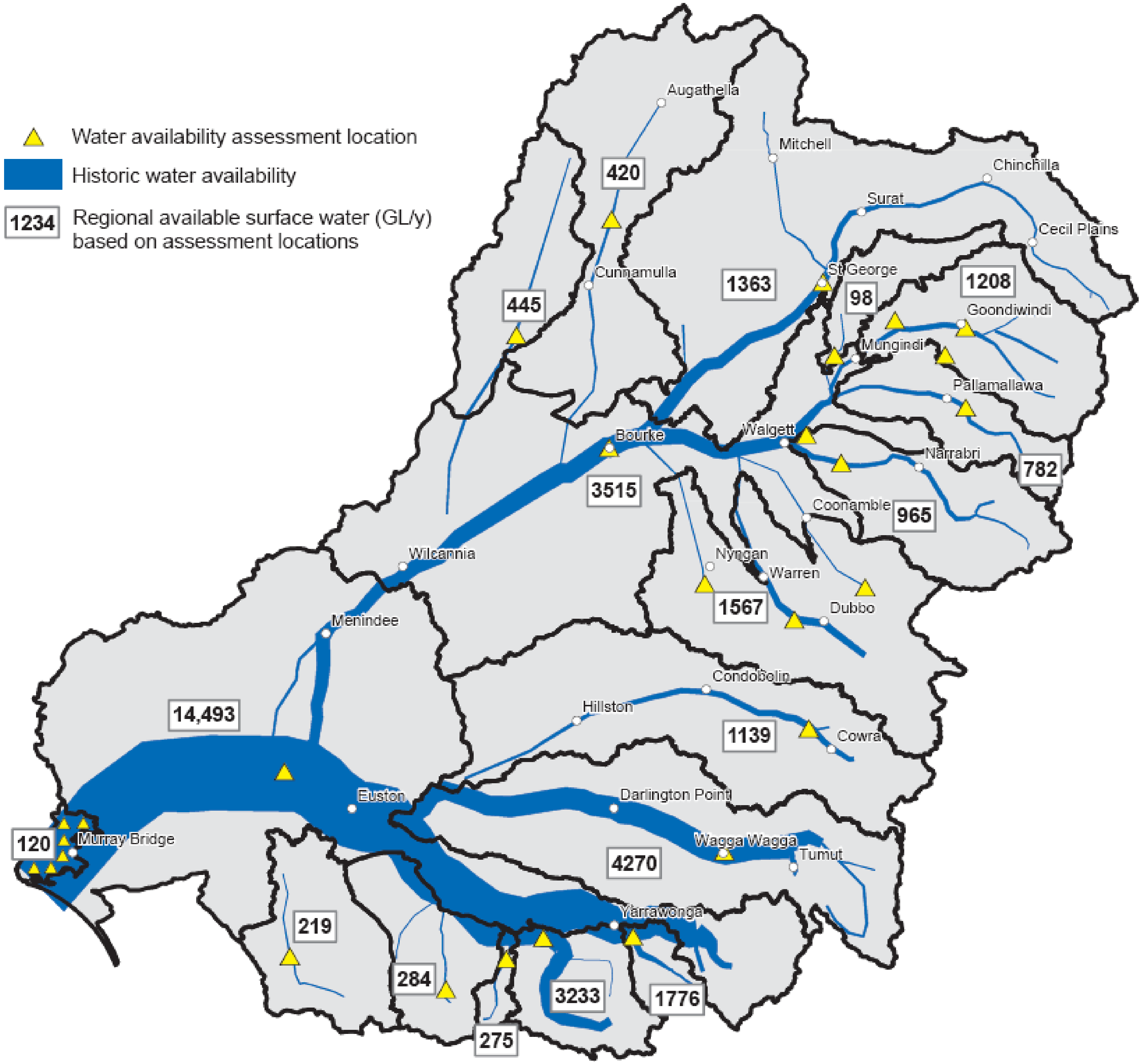
Growth in surface water diversions



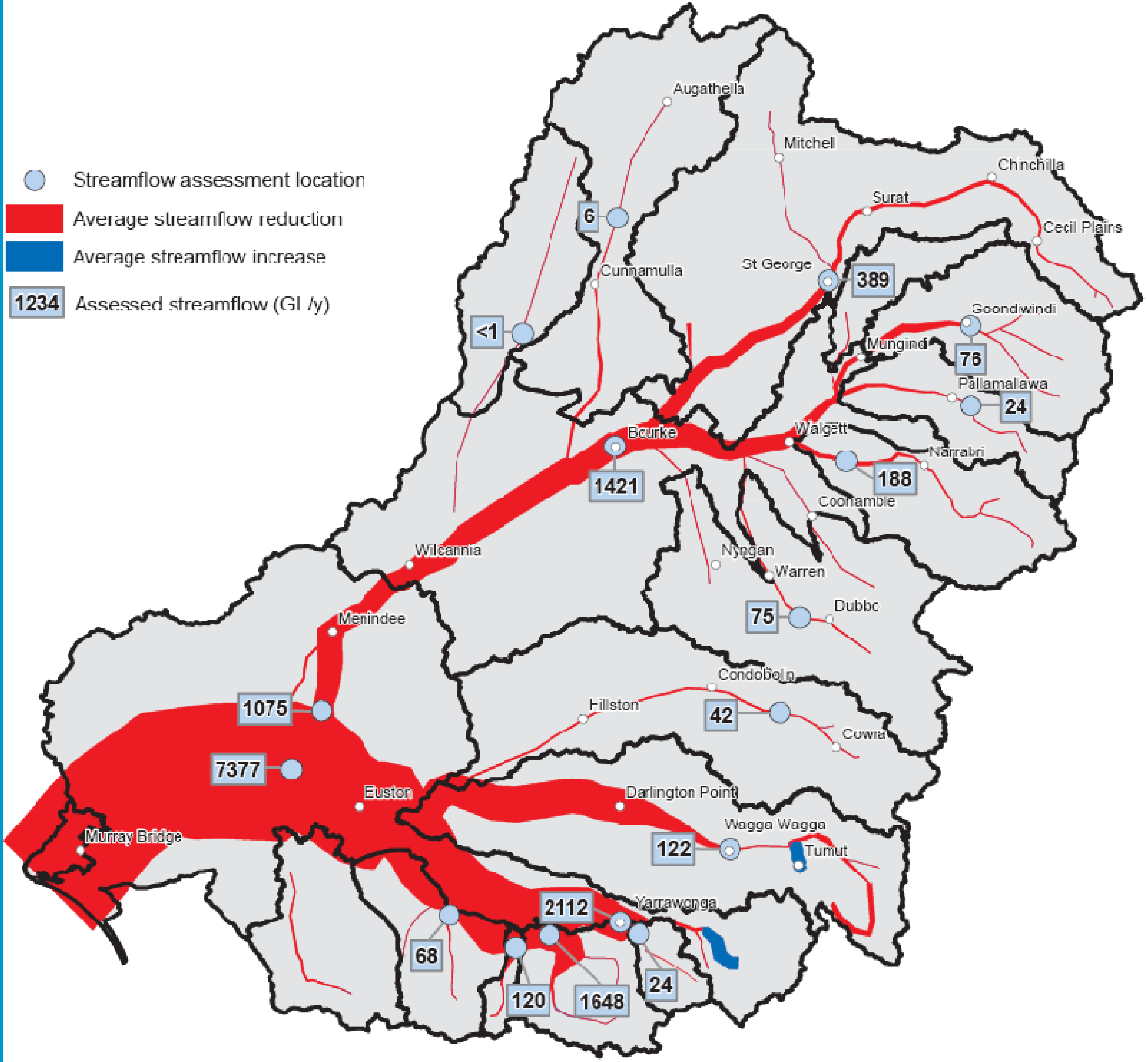
18 major regions



The pattern of water availability

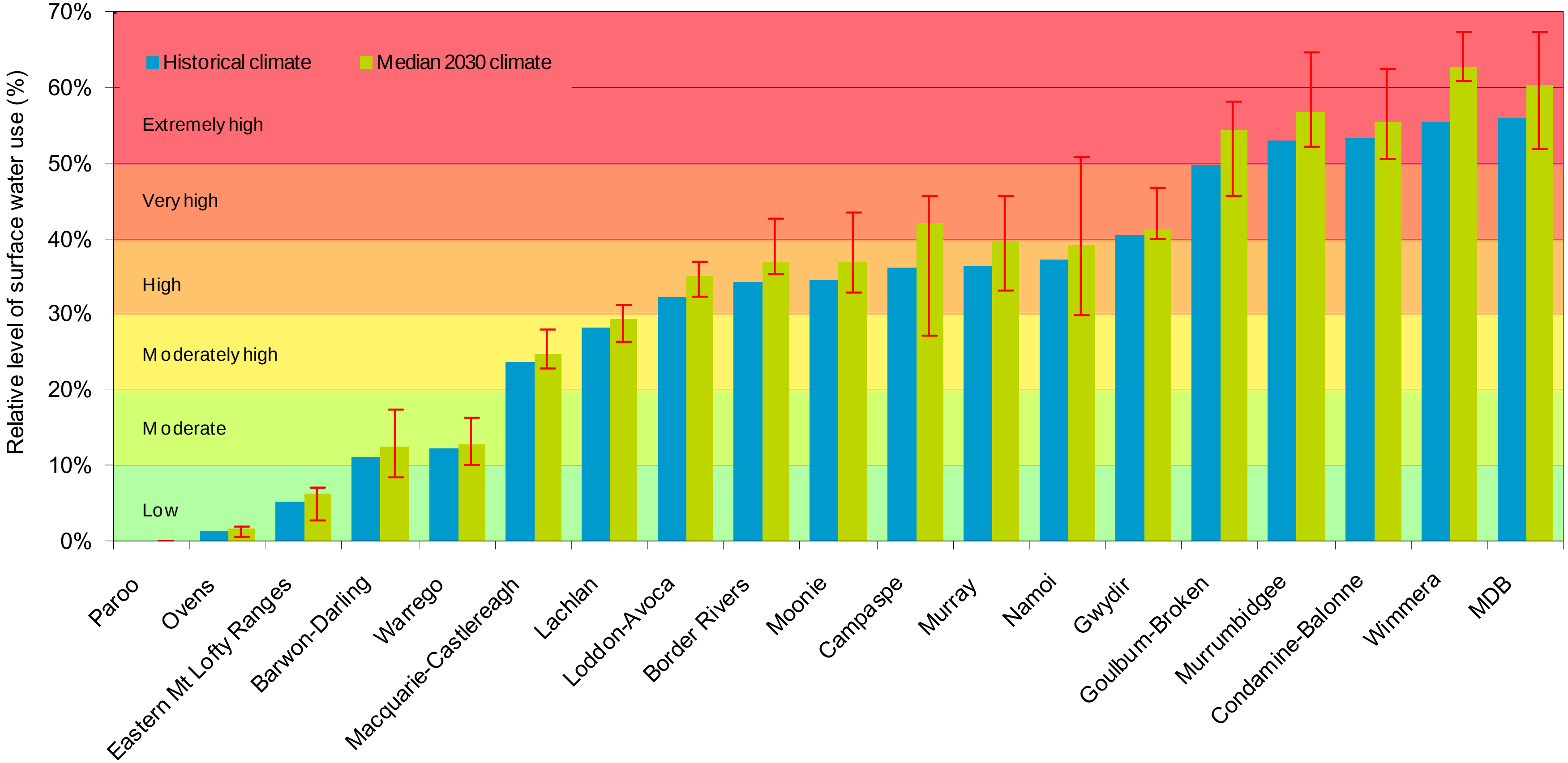


The pattern of streamflow reduction



Relative level of surface water use

- MDB: 48 percent of available surface water is diverted for use
  - ~11,300 GL/year on average; from ~23,400 GL/year



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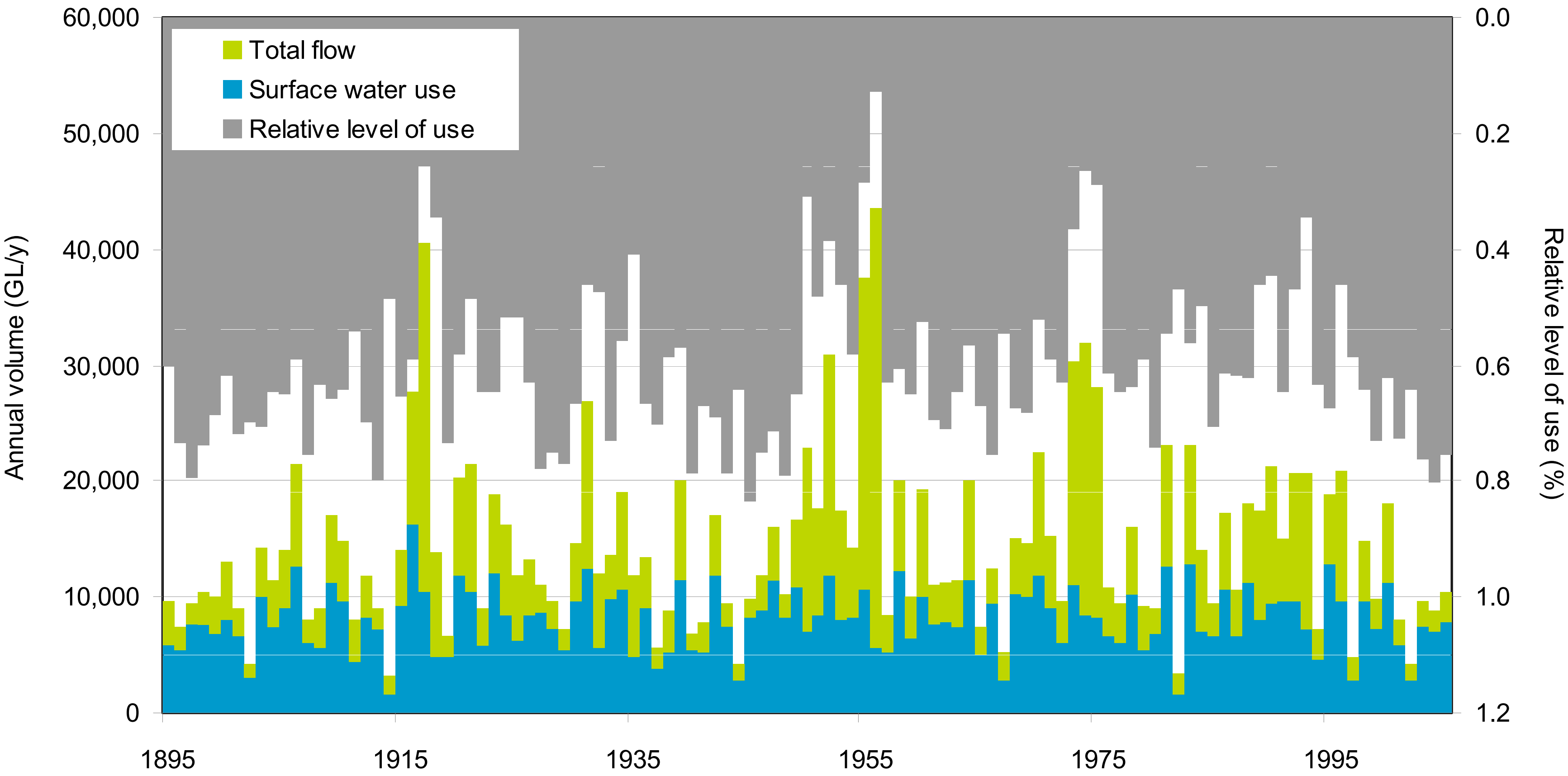
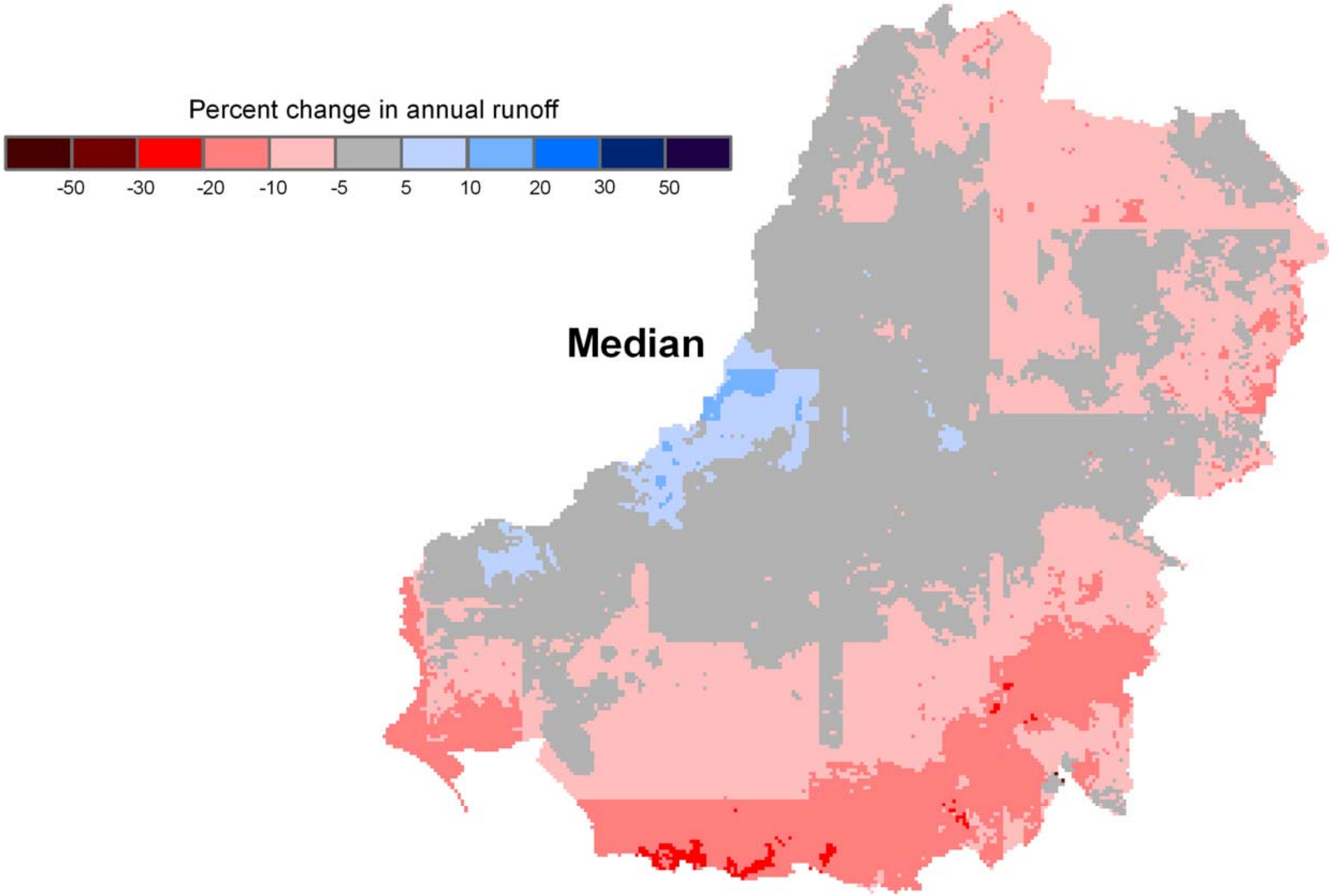
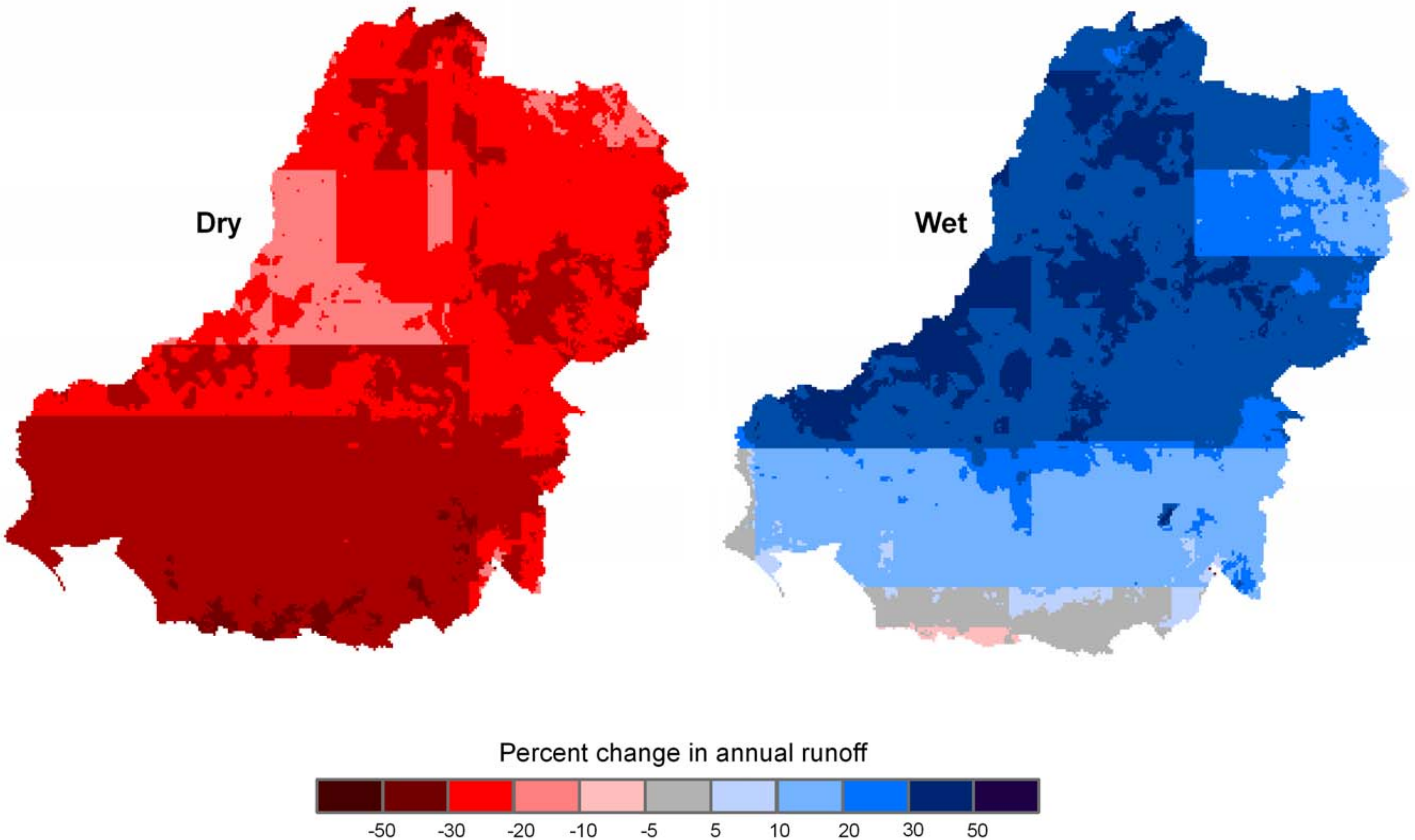
Changing relative level of use



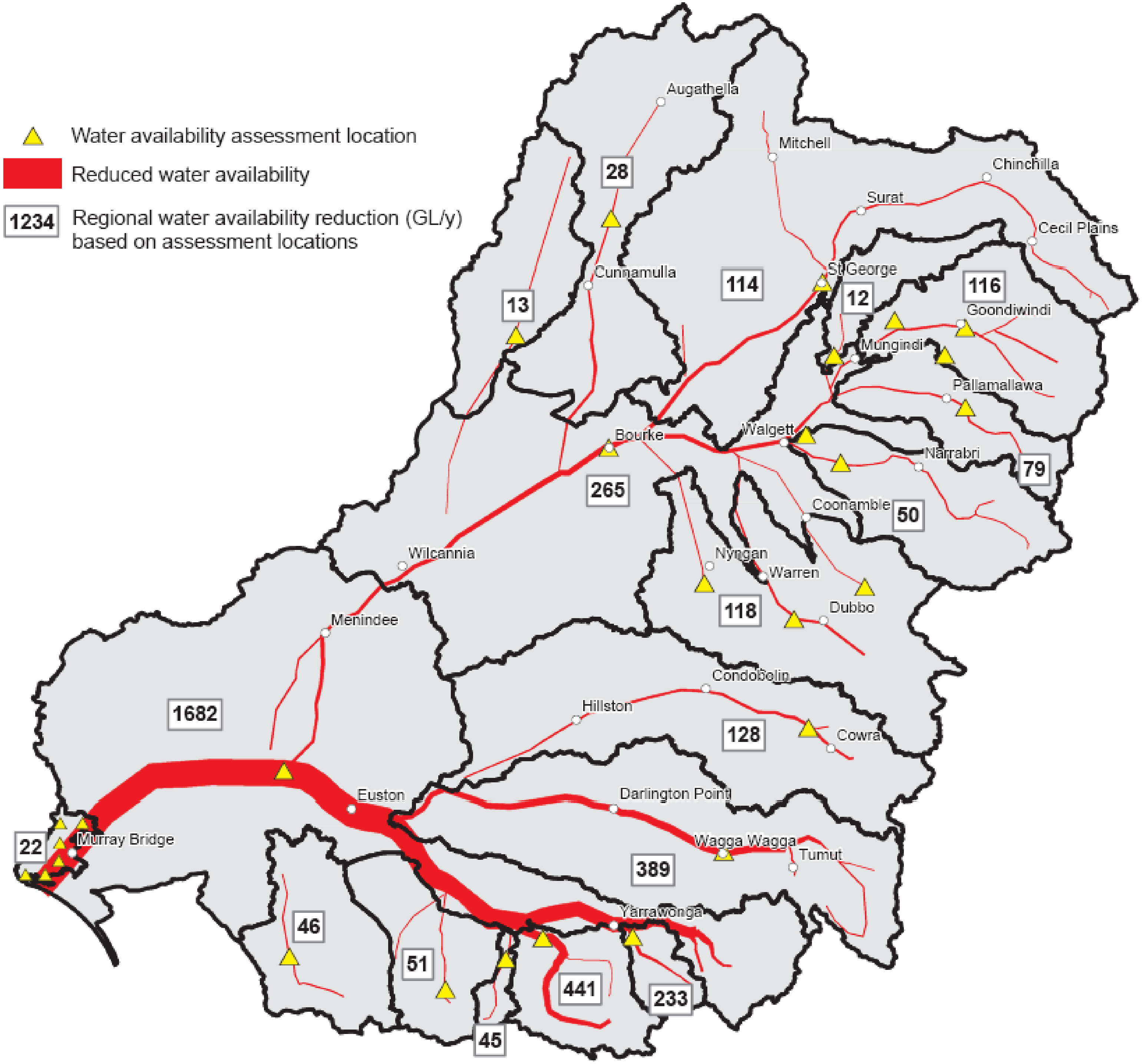
Percent changes in runoff by 2030



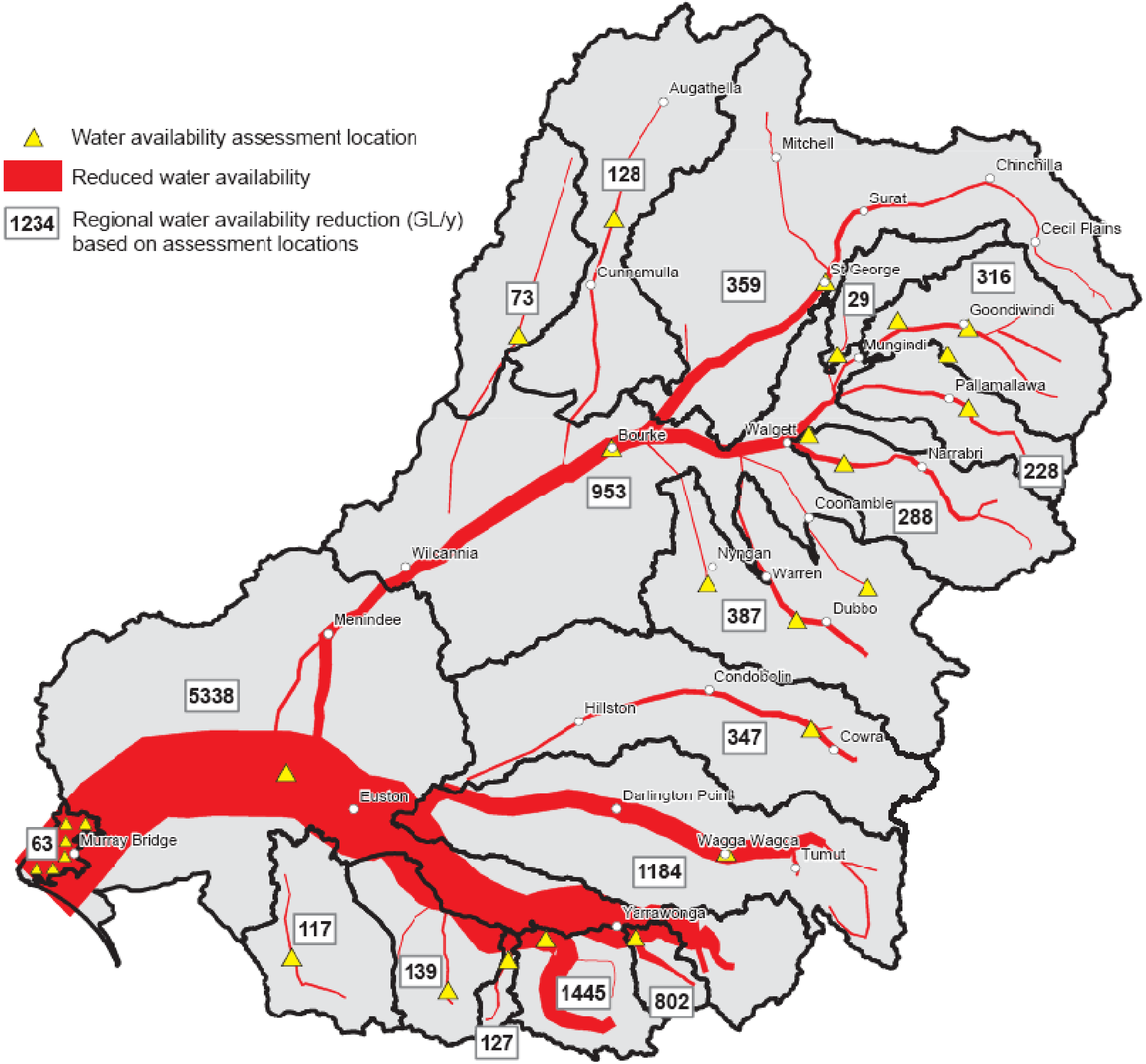
Percent changes in runoff by 2030



Median climate change impact

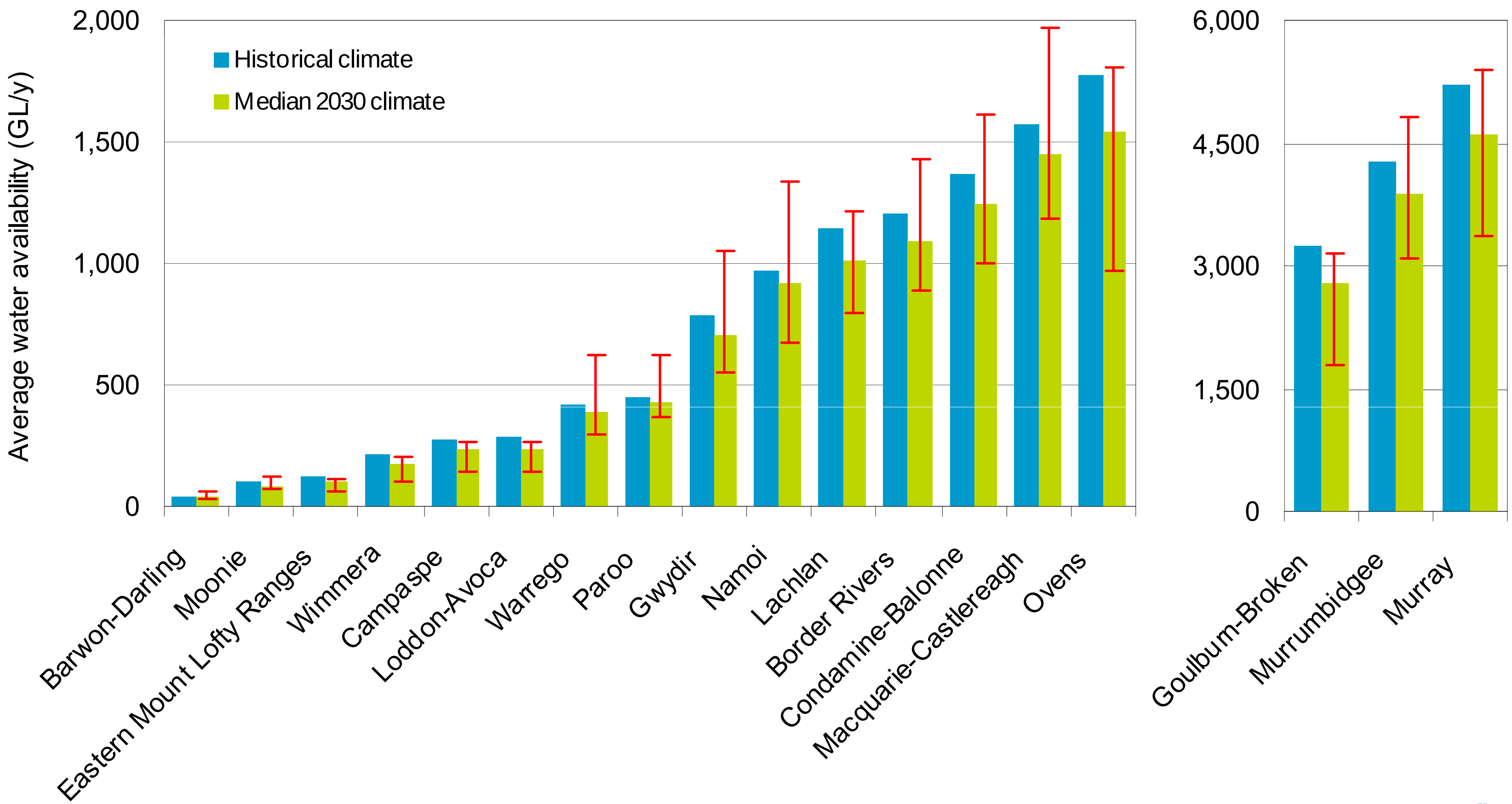


Extreme climate change impact



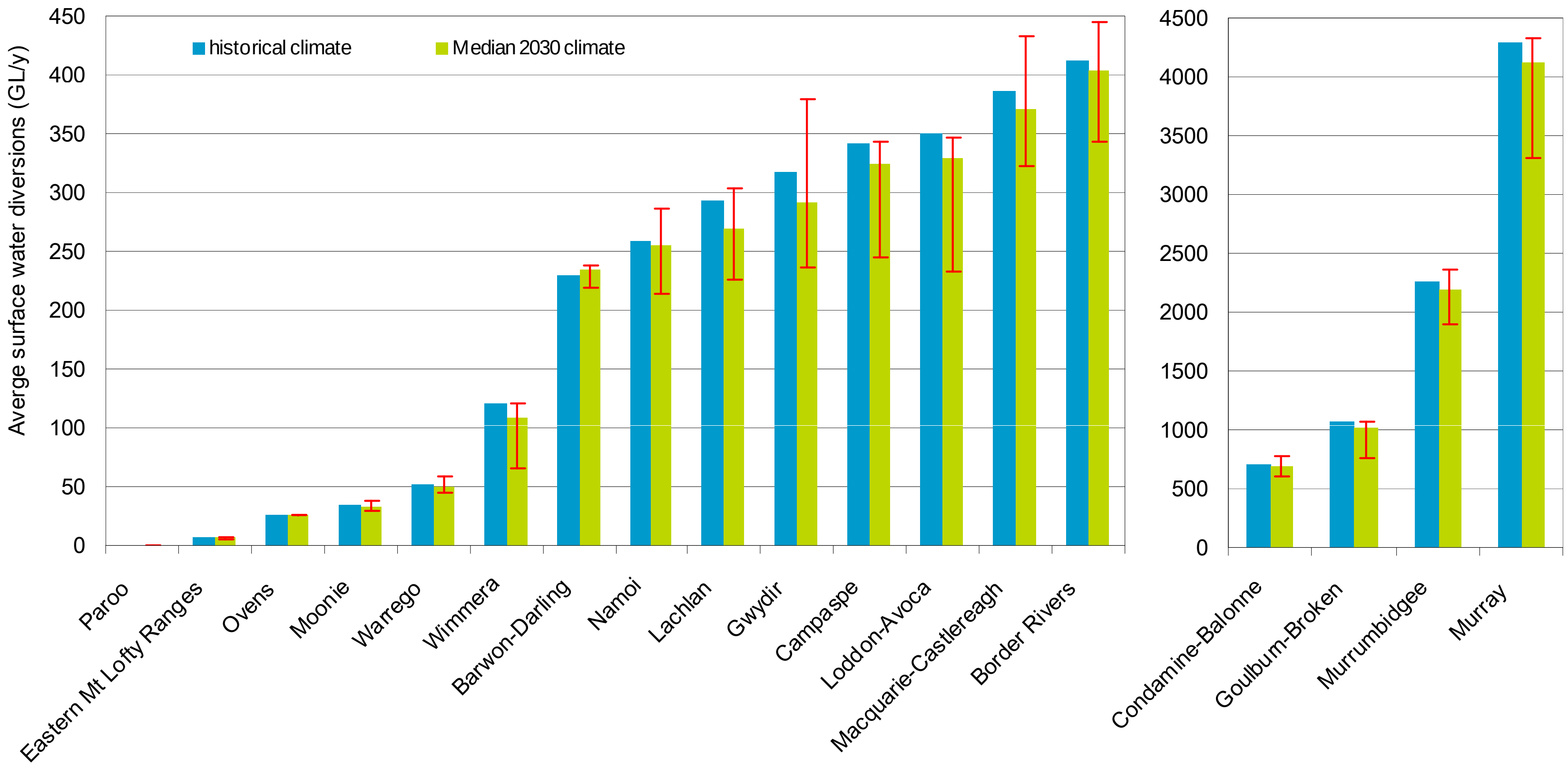
Impact of climate by region

- MDB: median impact is an 11% reduction in available water
  - ~2500 GL/year on average

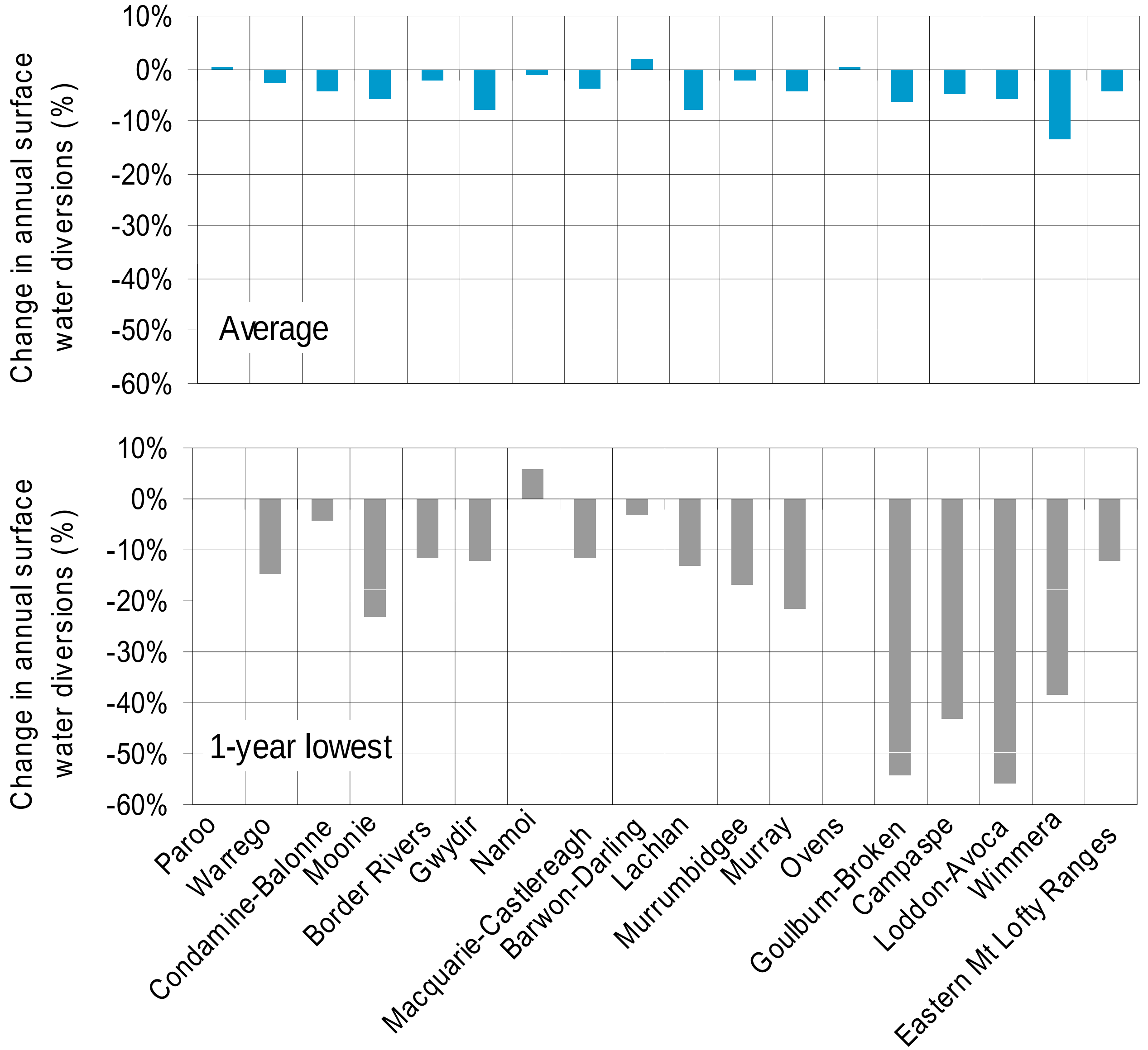


Change in volumes diverted for use

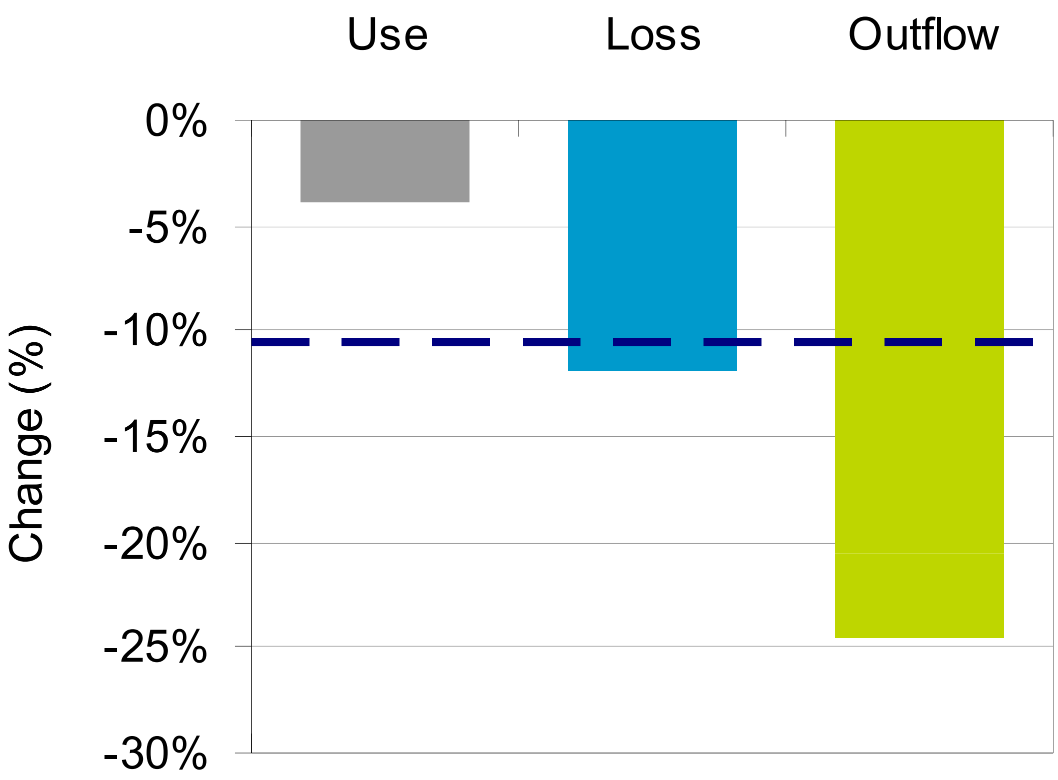
- MDB: 4% reduction in total diversions ~450 GL/year



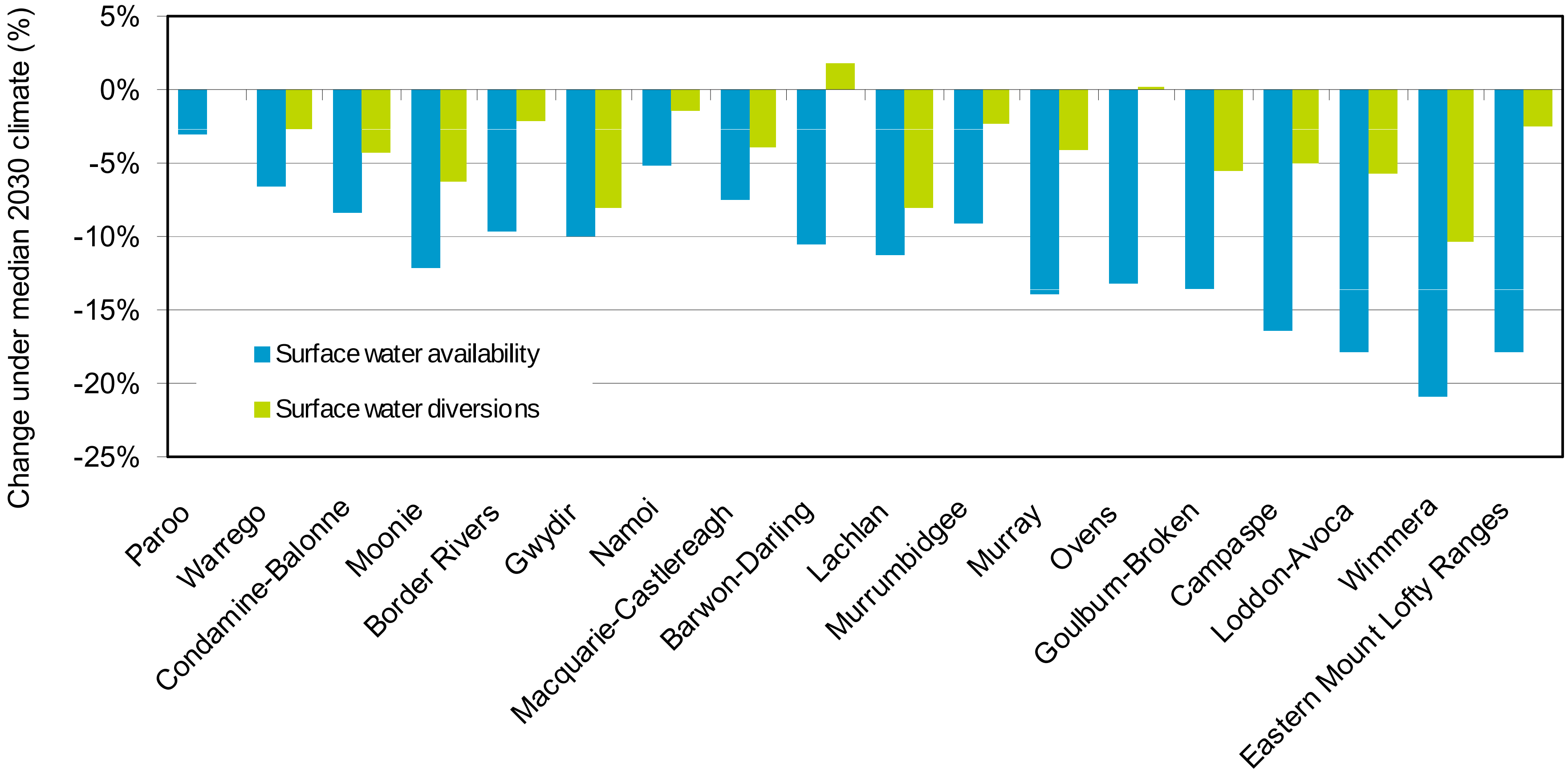
Change in diversions in dry years



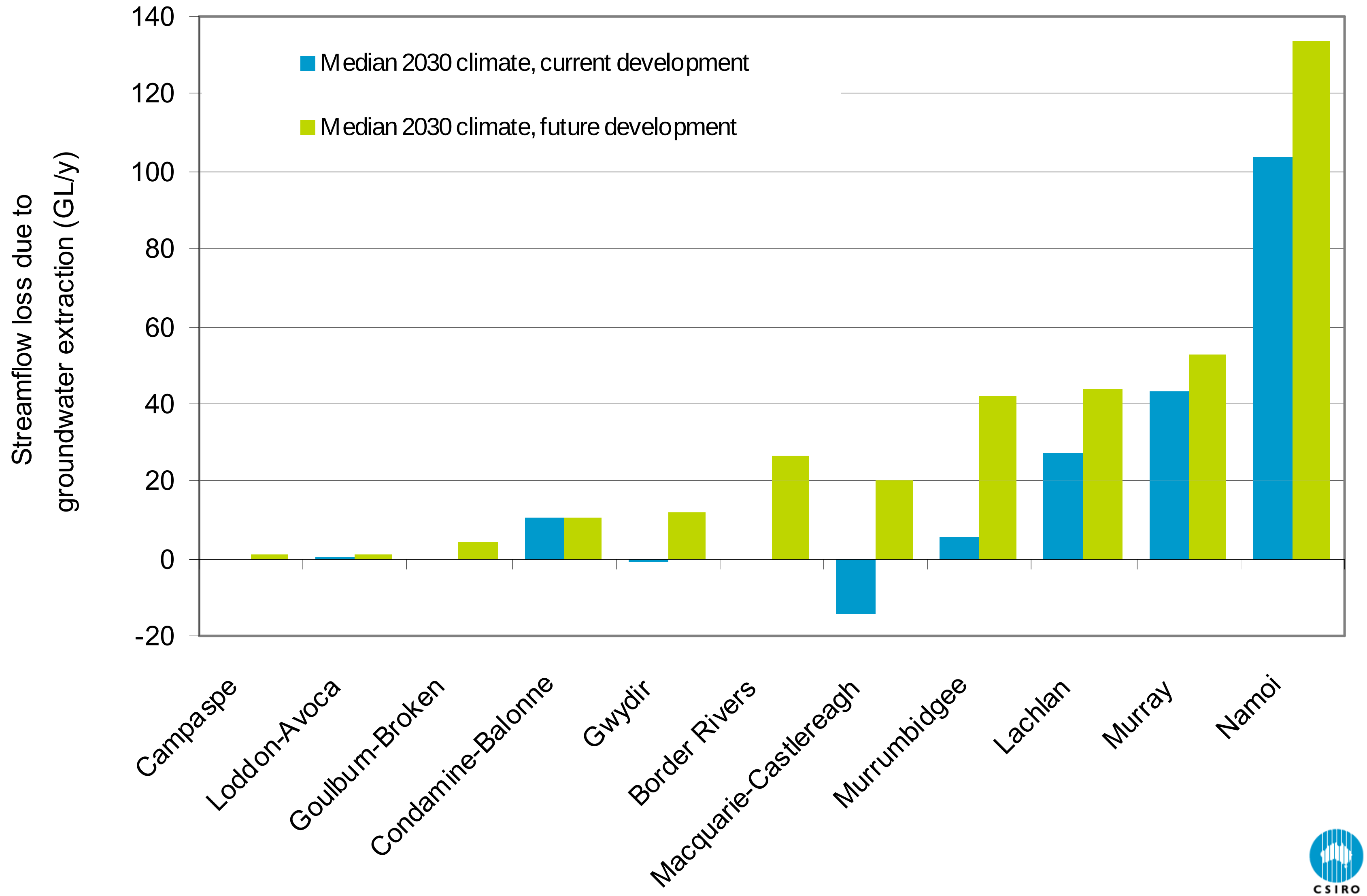
Impact sharing – median 2030 climate



Impact sharing – median 2030 climate



Streamflow impacts of groundwater use



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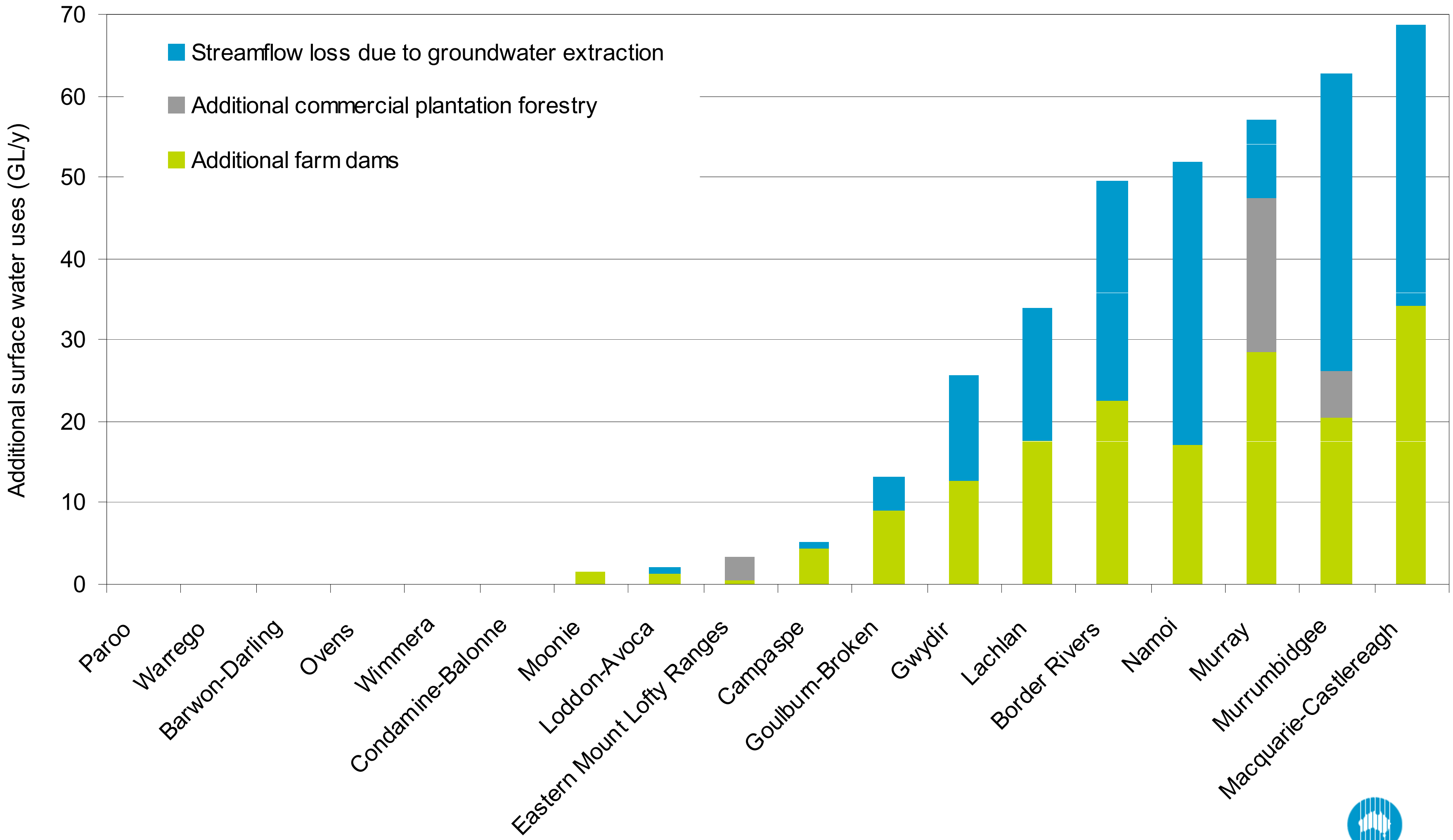
Additional future surface water uses



Surface water use summary – median climate

- Diversions: down by ~450 GL/yr
- Additional use up by ~370 GL/yr
- Net result: little change in SW use
- But, availability down by 2500 GL/yr
- Thus, relative level of use up from 48% to 53%

Groundwater

- 20 major GMUs represent 75% of groundwater use in the Basin
- In seven GMUs, current levels of extraction are unsustainable
  - Condamine, Border Rivers, Lower Namoi, parts of Lower Macquarie, parts of Lower Lachlan, Upper Lachlan, Mid-Murrumbidgee
- Current groundwater use is 16% of total water use. Under current groundwater sharing arrangements, groundwater use could double to be 25% of total water use
- One-quarter of all groundwater use will eventually be directly sourced via induced streamflow leakage. Of the induced leakage, 40% will occur in the Namoi, Lachlan, Murrumbidgee and Murray regions

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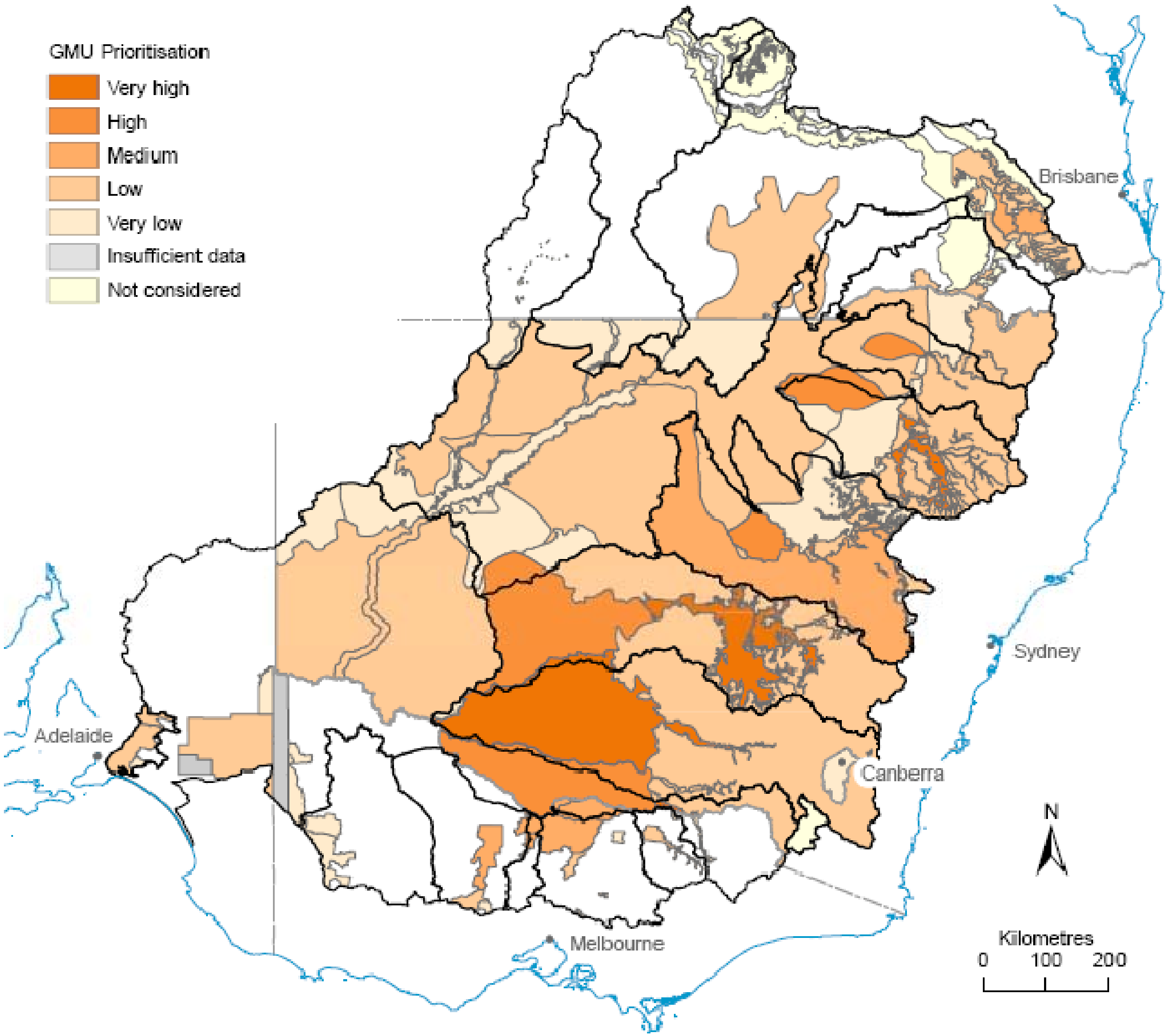
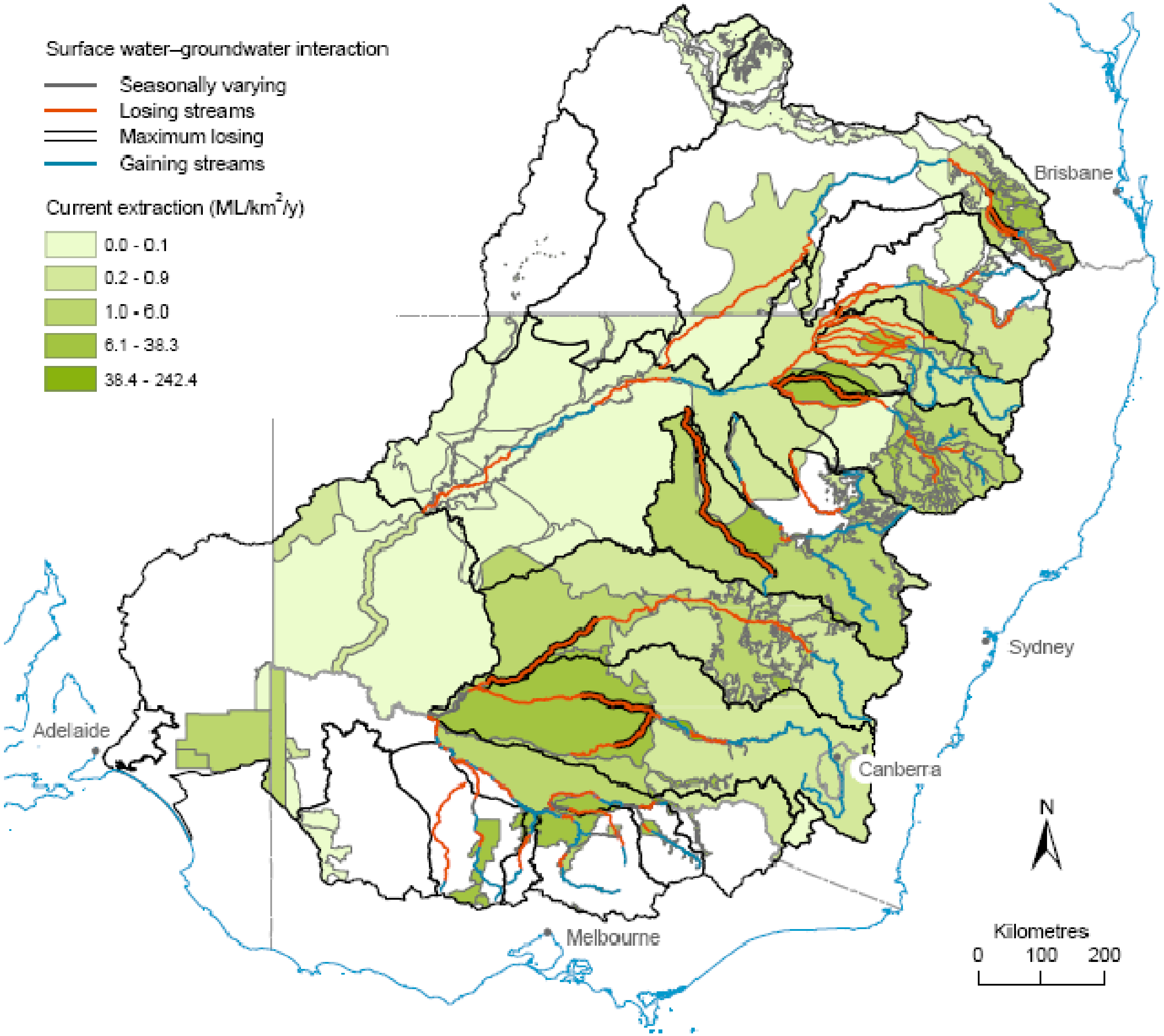
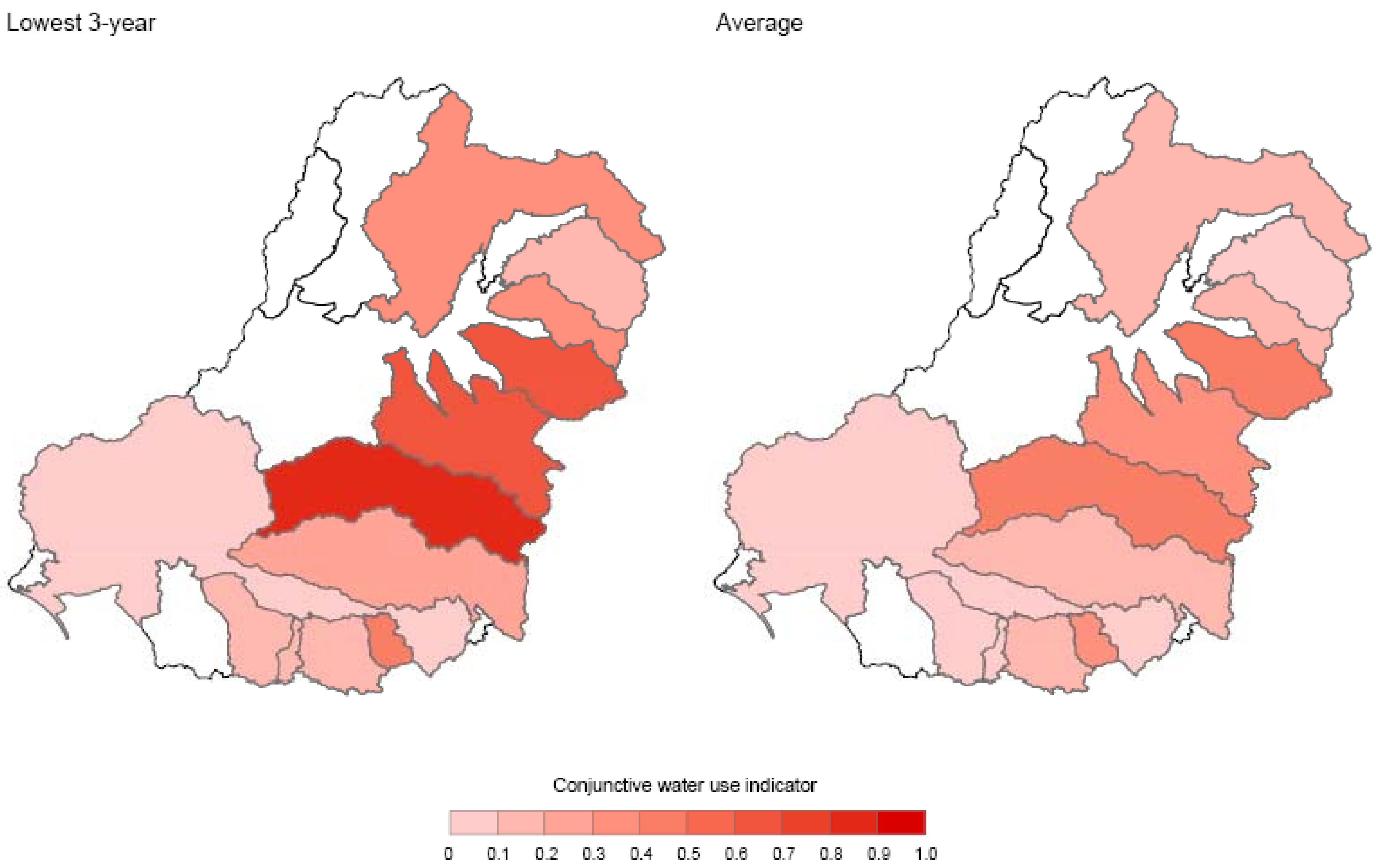
GMU Prioritisation



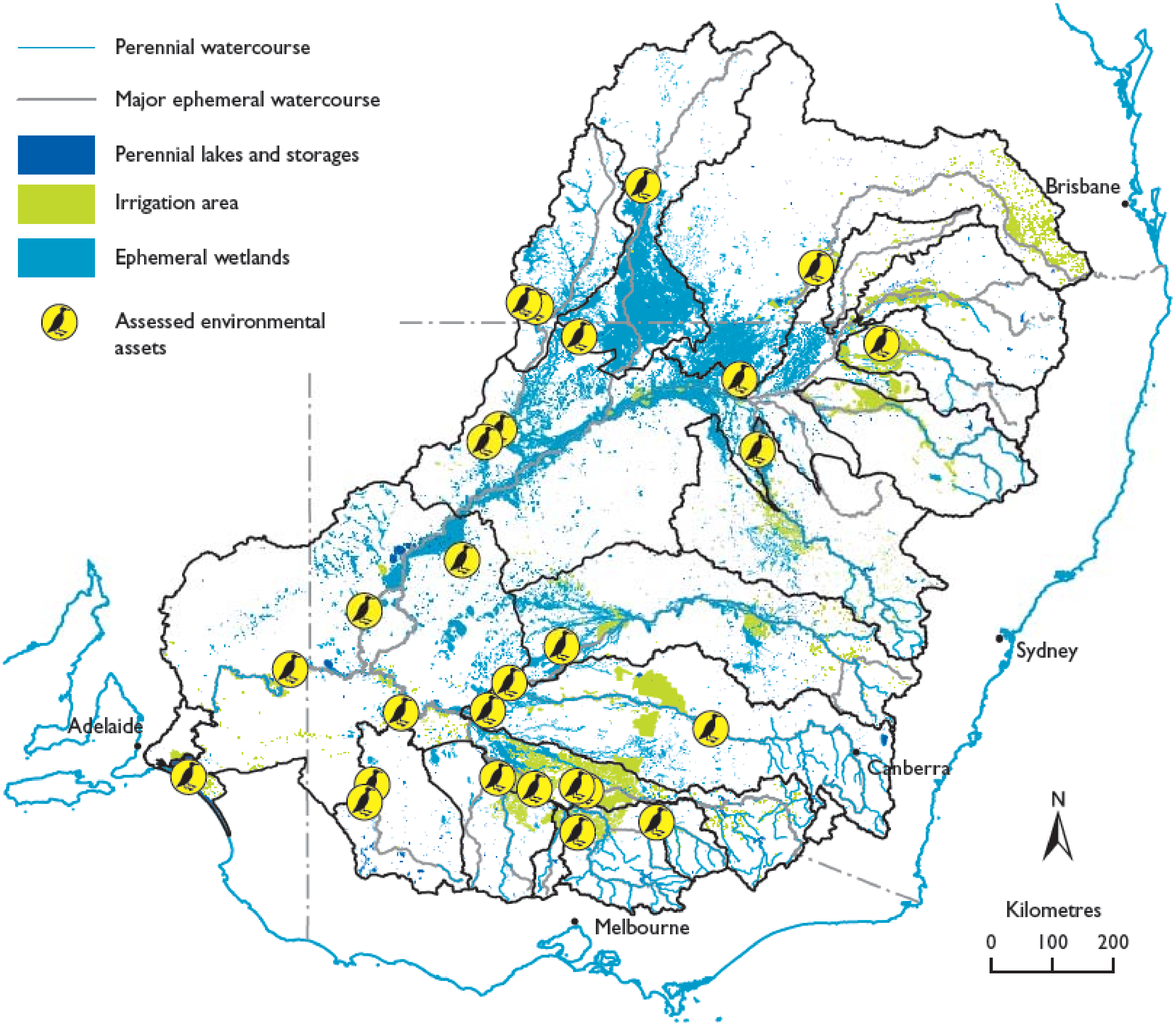
Connectivity and current use



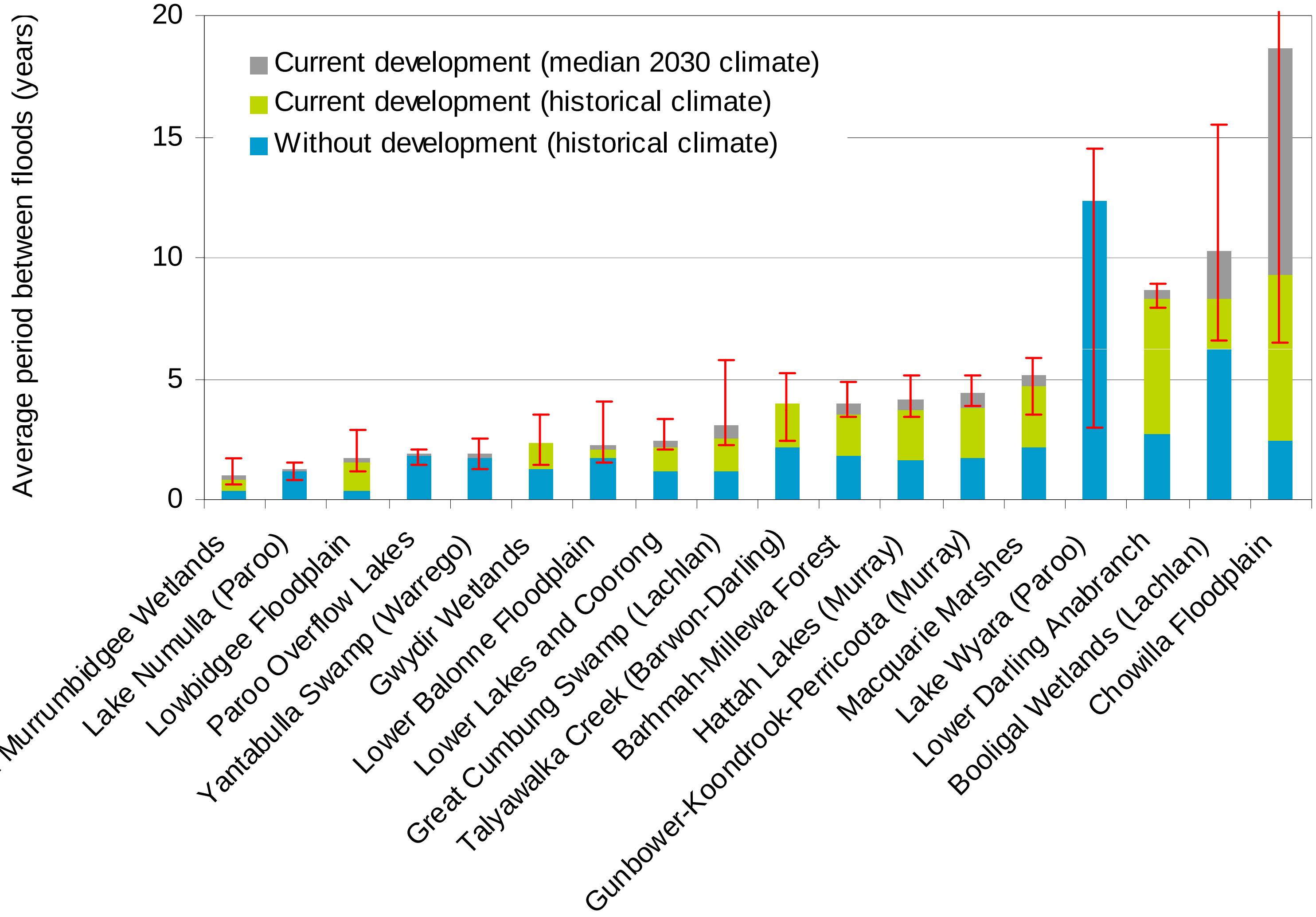
Conjunction use indicator by region



Major floodplain wetlands



Changes in average period between floods



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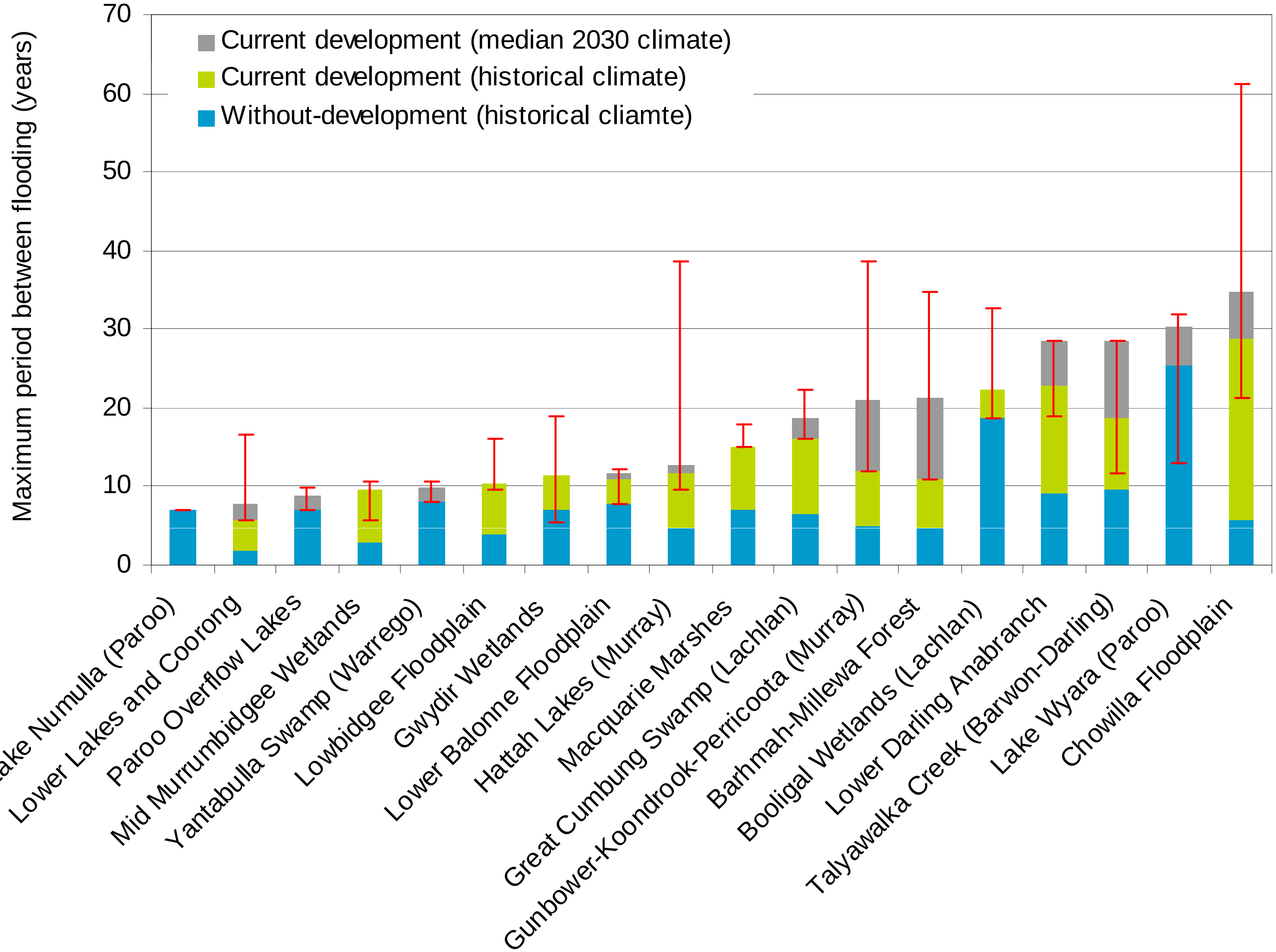
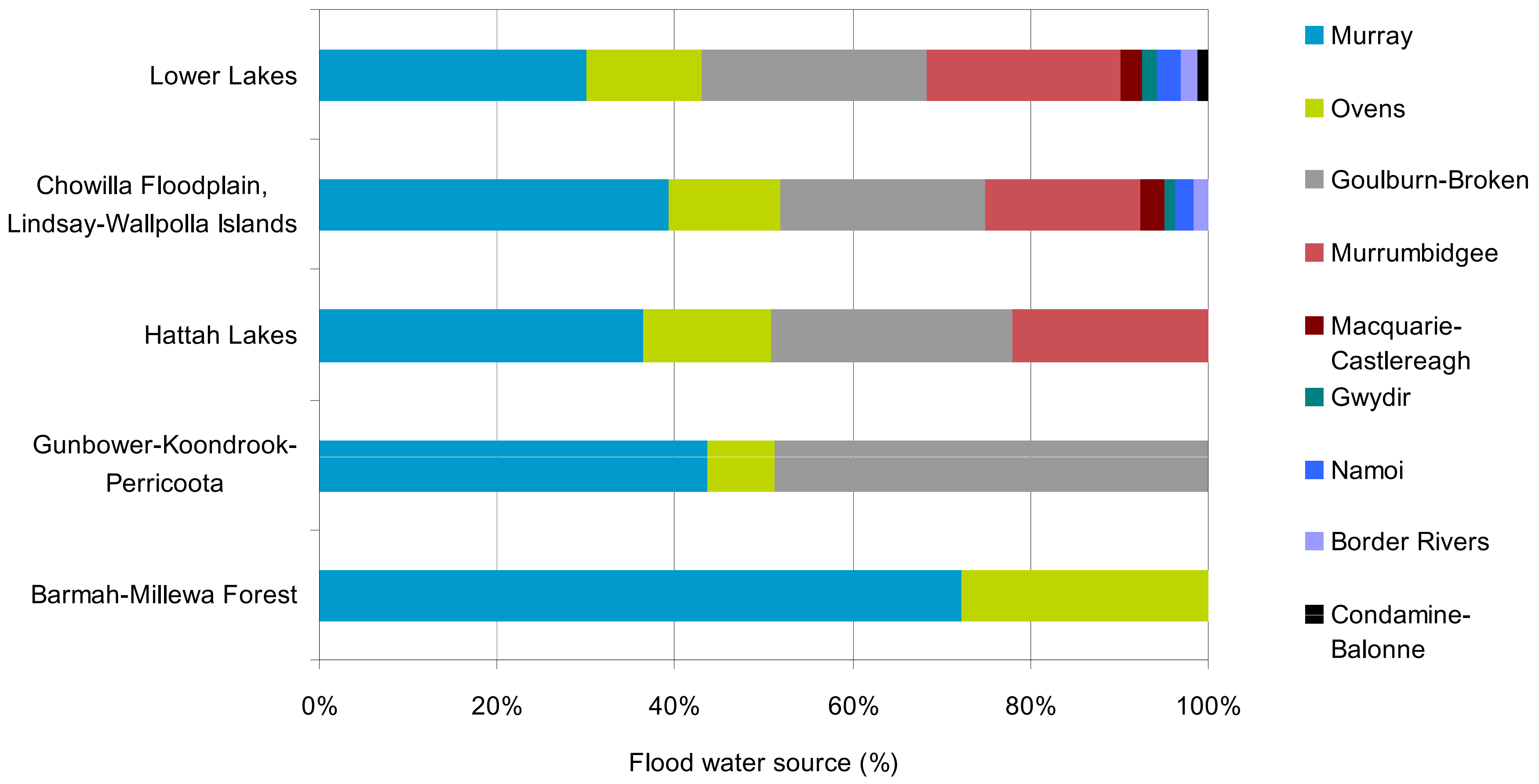
Changes in maximum period between floods

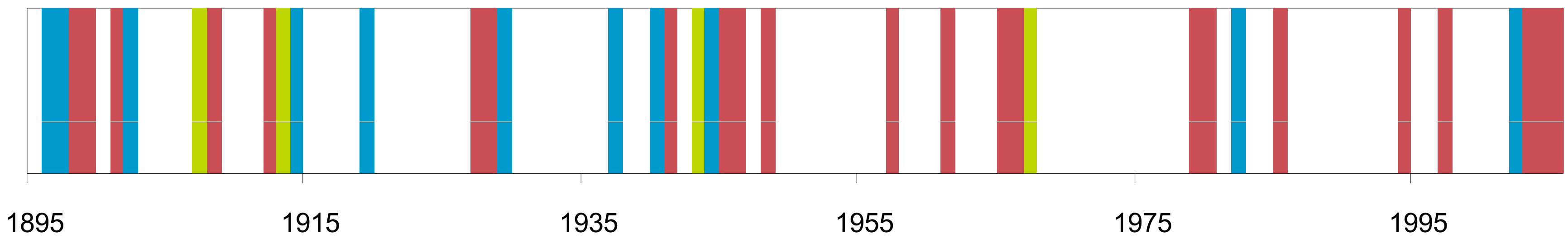


Water sources for Murray Icon Sites



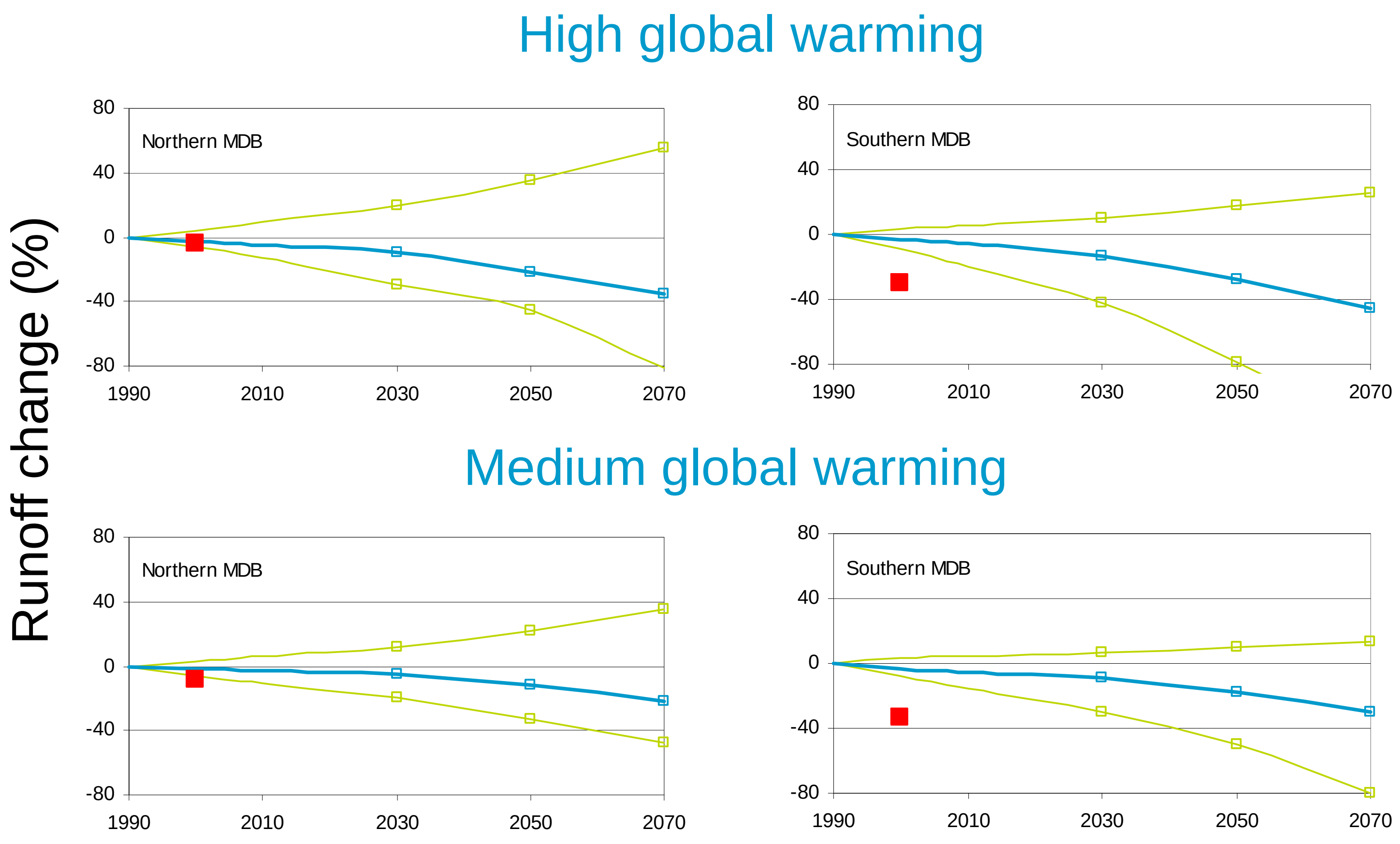
End of Basin flows

- Total flow at the Murray mouth reduced by 61 percent
- Flow ceases 40 percent of the time compared to 1 percent of the time in the absence of consumptive use
- Severe drought inflows to Lower Lakes (<1500 GL/year)
  - Never under without-development conditions
  - 9 percent of years at current development with historical climate
  - 13 percent of years under median 2030 climate
  - 33 percent of years under dry extreme 2030 climate



Longer-term climate change prospects

- Dry extreme at 2030, is broadly similar to median by 2070
- In the south, the recent past is more severe than the 2030 dry extreme



Key messages

1. Water resource development has caused major changes in the flood regimes that support important lakes and wetlands
2. The south of the MDB was in severe drought from 1997 to 2006 – in places a 1 in 300 year event without climate change. The drought has continued in 2007 and 2008
3. Under the median 2030 climate water availability would fall by 11% – 9% in the north and 13% in the south
4. The range of possible climate outcomes is wide due to the uncertainty inherent in current climate models
5. Under current arrangements 11% less water would only reduce average use by 4%; the majority of the impact would be borne by the environment
6. Water use impacts would be greatest in dry years – up to 50% less in the south
7. Groundwater extraction cannot be maintained at current levels in seven GMUs
8. Groundwater could increase to be over 25% of total water use
9. 25% of all groundwater use will eventually be sourced directly from induced streamflow leakage
10. Additional forestry and new farm dams are expected to represent fairly minor additional water uses – although these are uses outside the entitlement regime

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Murray-Darling Basin Sustainable Yields Project

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