

# Water: Risks, Opportunities & Public Policy

Professor Quentin Grafton FASSA  
([Quentin.Grafton@anu.edu.au](mailto:Quentin.Grafton@anu.edu.au))

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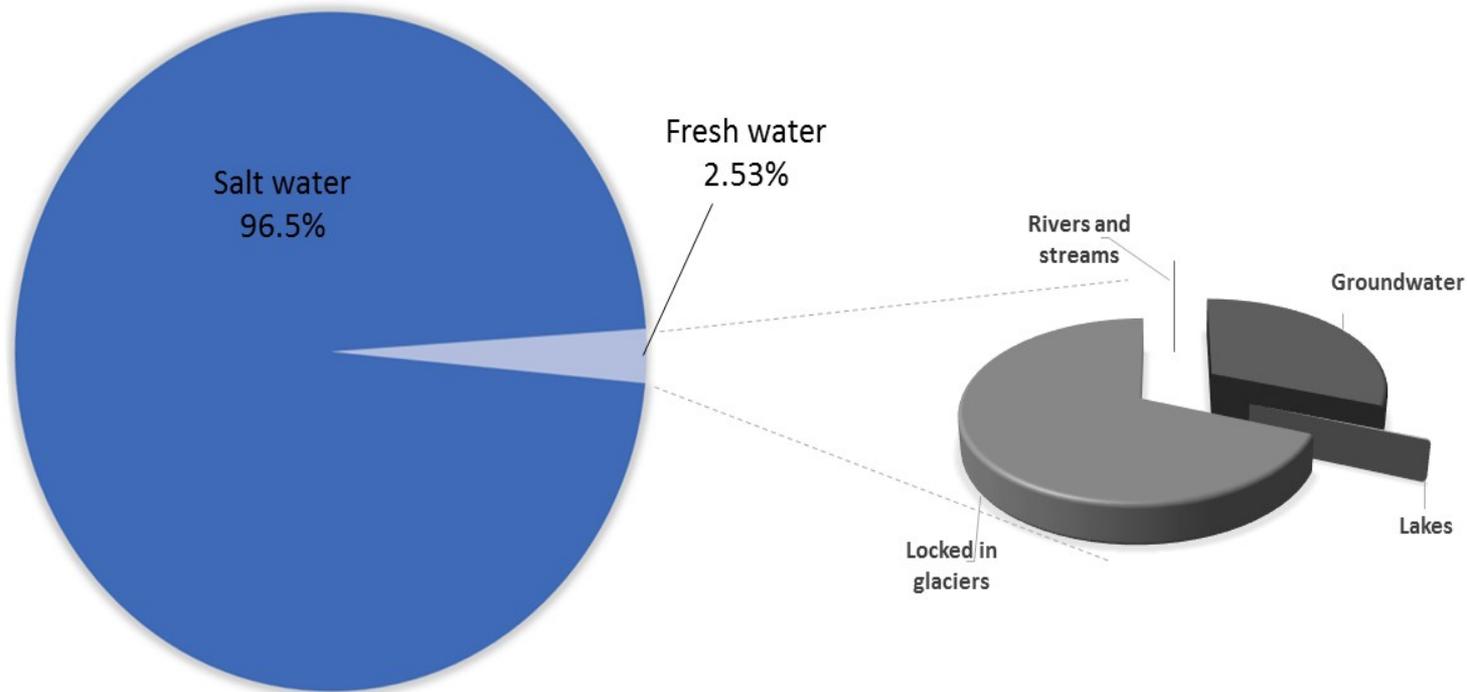
# Outline

1. Global Water Resources
2. Risks and Opportunities
3. Water and Public Policy

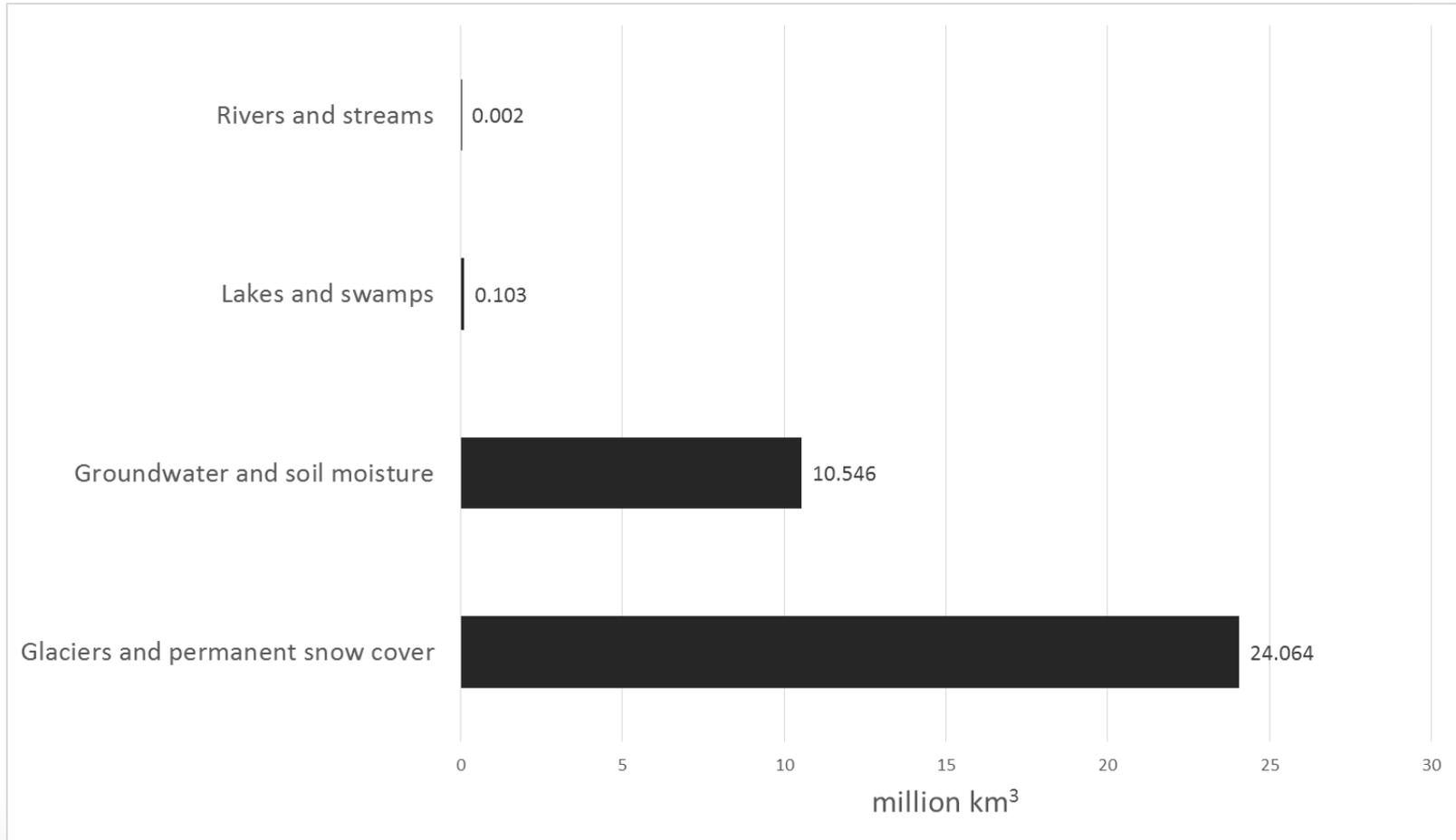
# 1. Global Water Resources



# How Much Water is There?

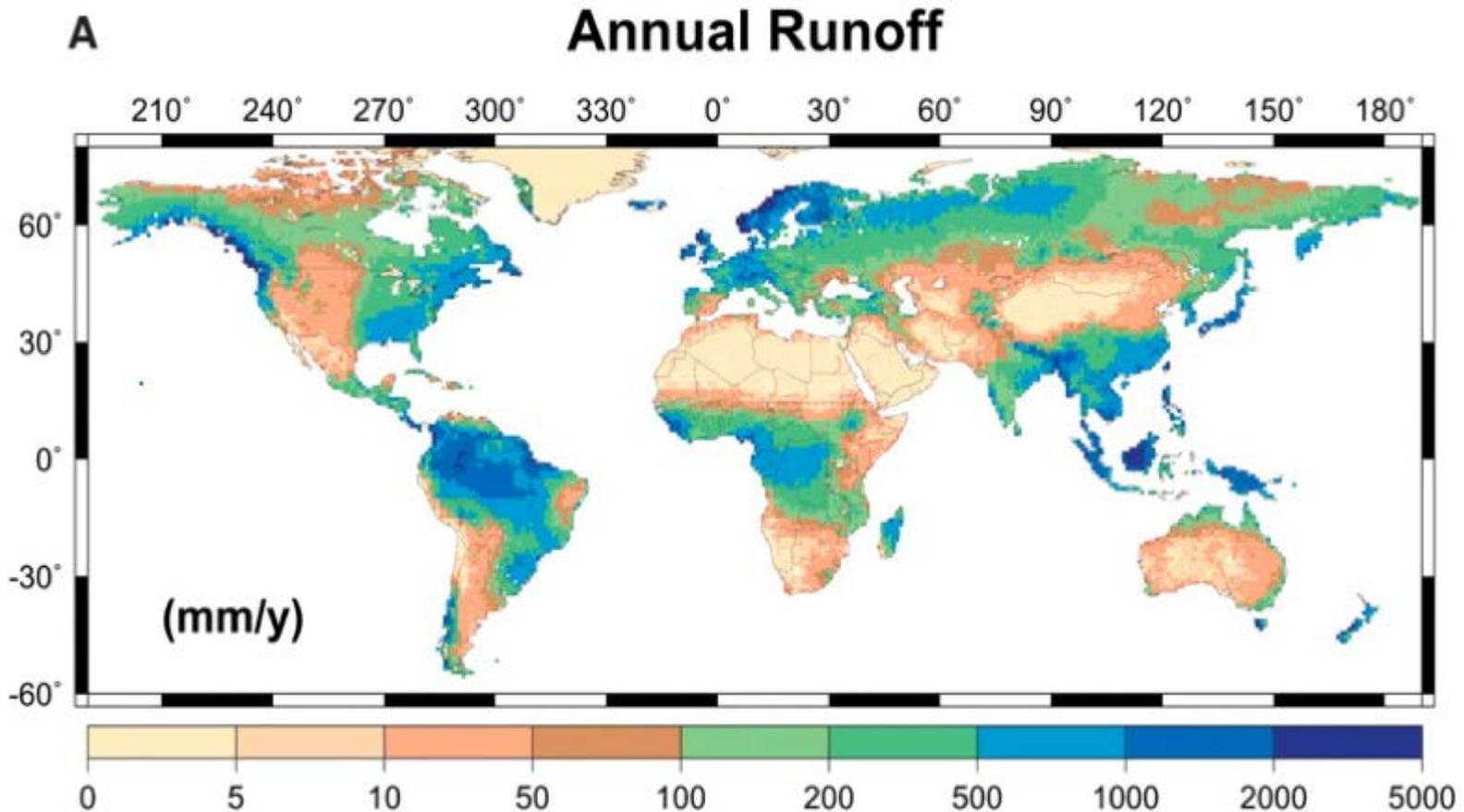


# How Much Freshwater is There?



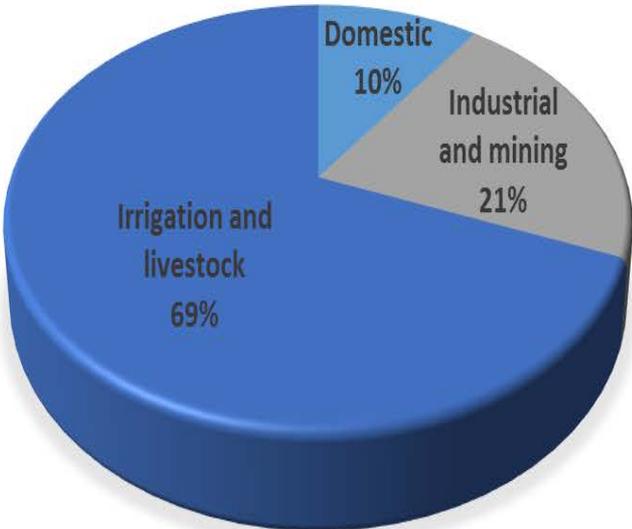
Data Source: Shiklomanov and Rodda (2003)

# Global Annual Runoff

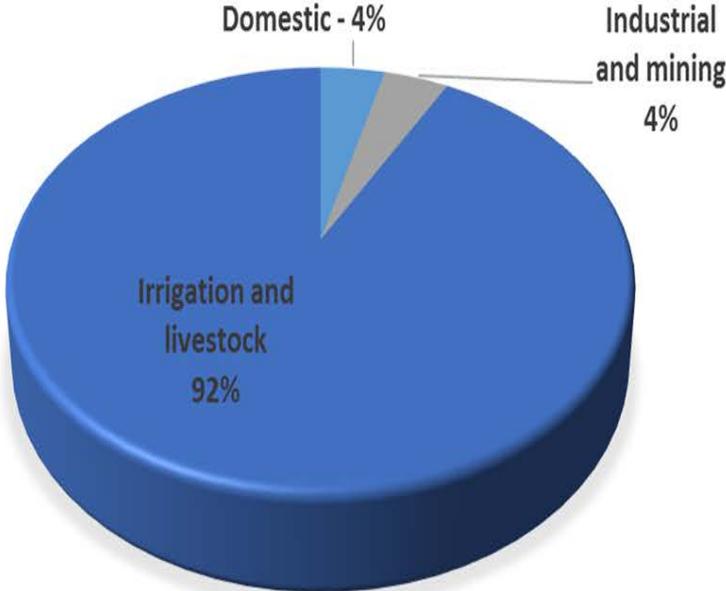


# Global Water Extraction and Consumption

### Extraction



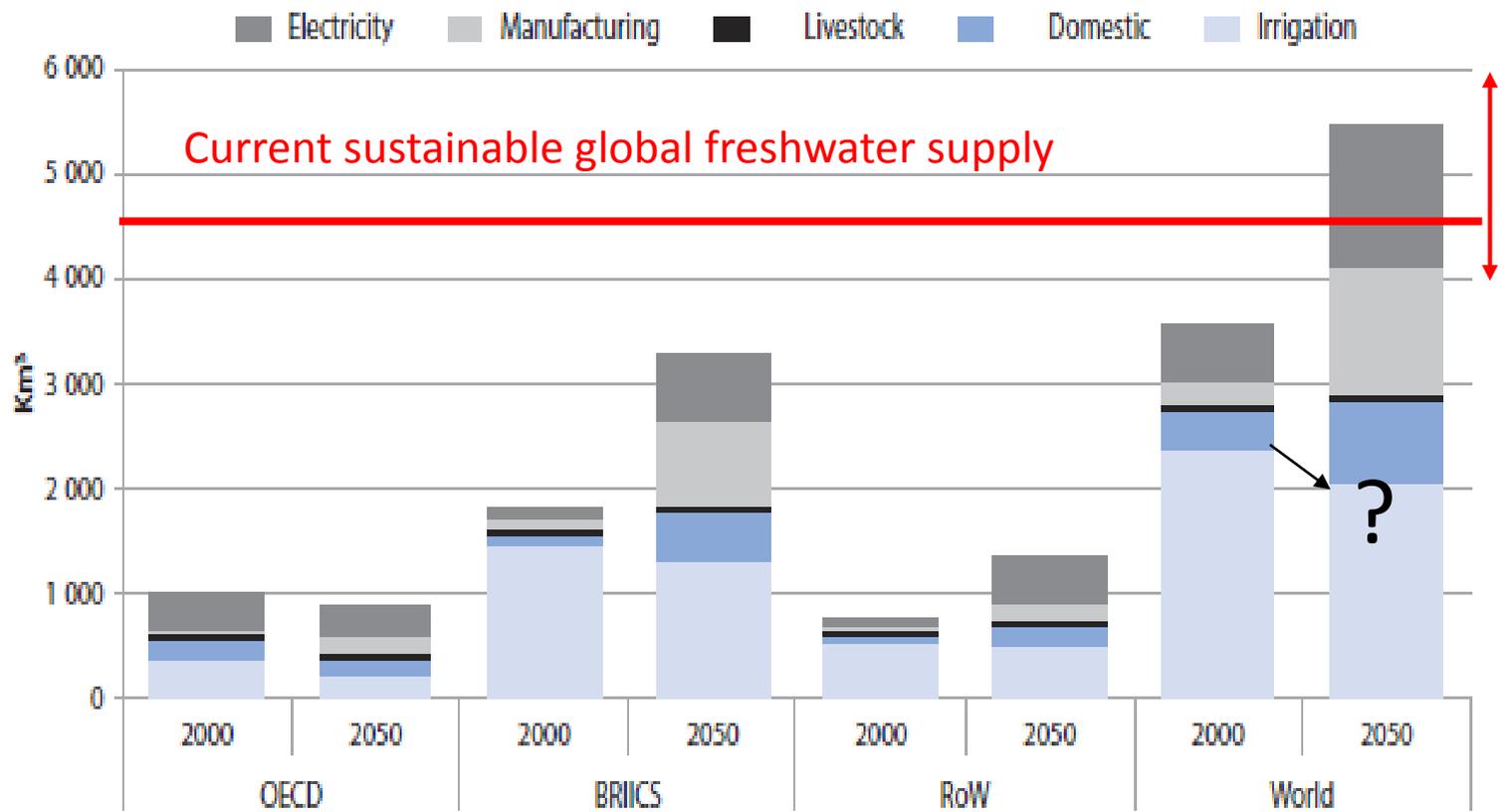
### Consumption



## 2. Risks & Opportunities

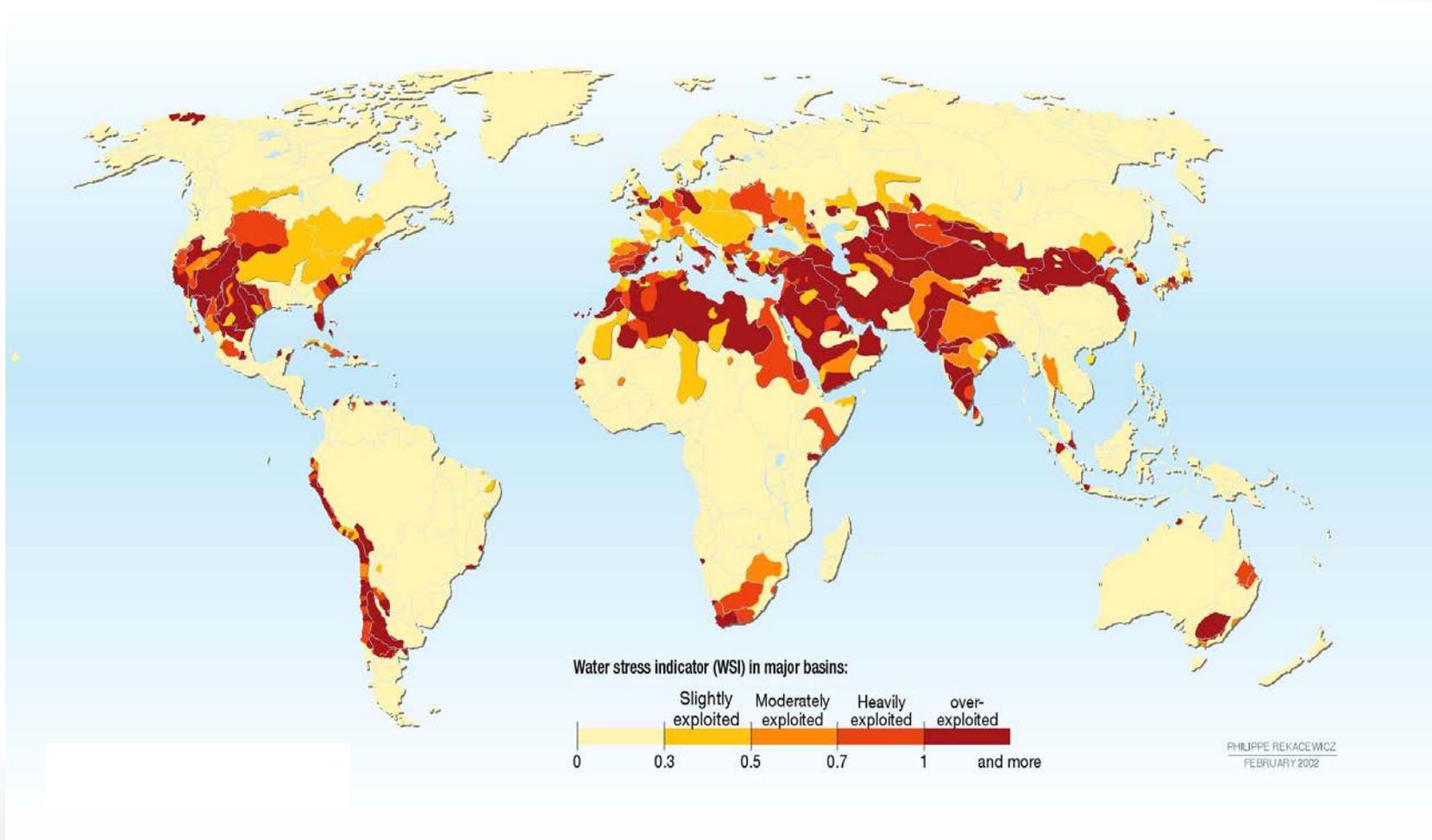


# 2.1 Water Extraction



Source: OECD (2015b)

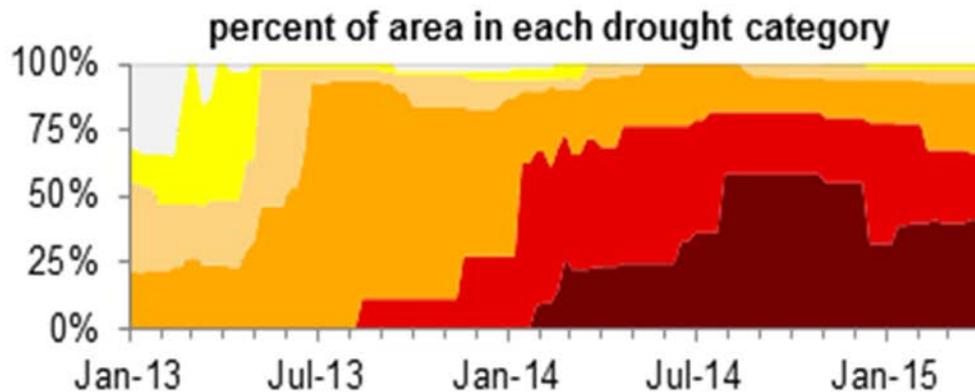
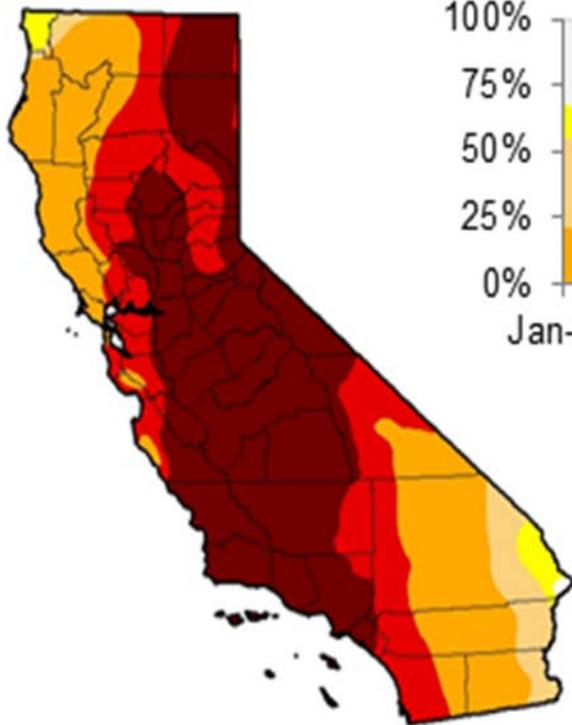
# Global Water Stress



Source: Smakhtin et al. 2004

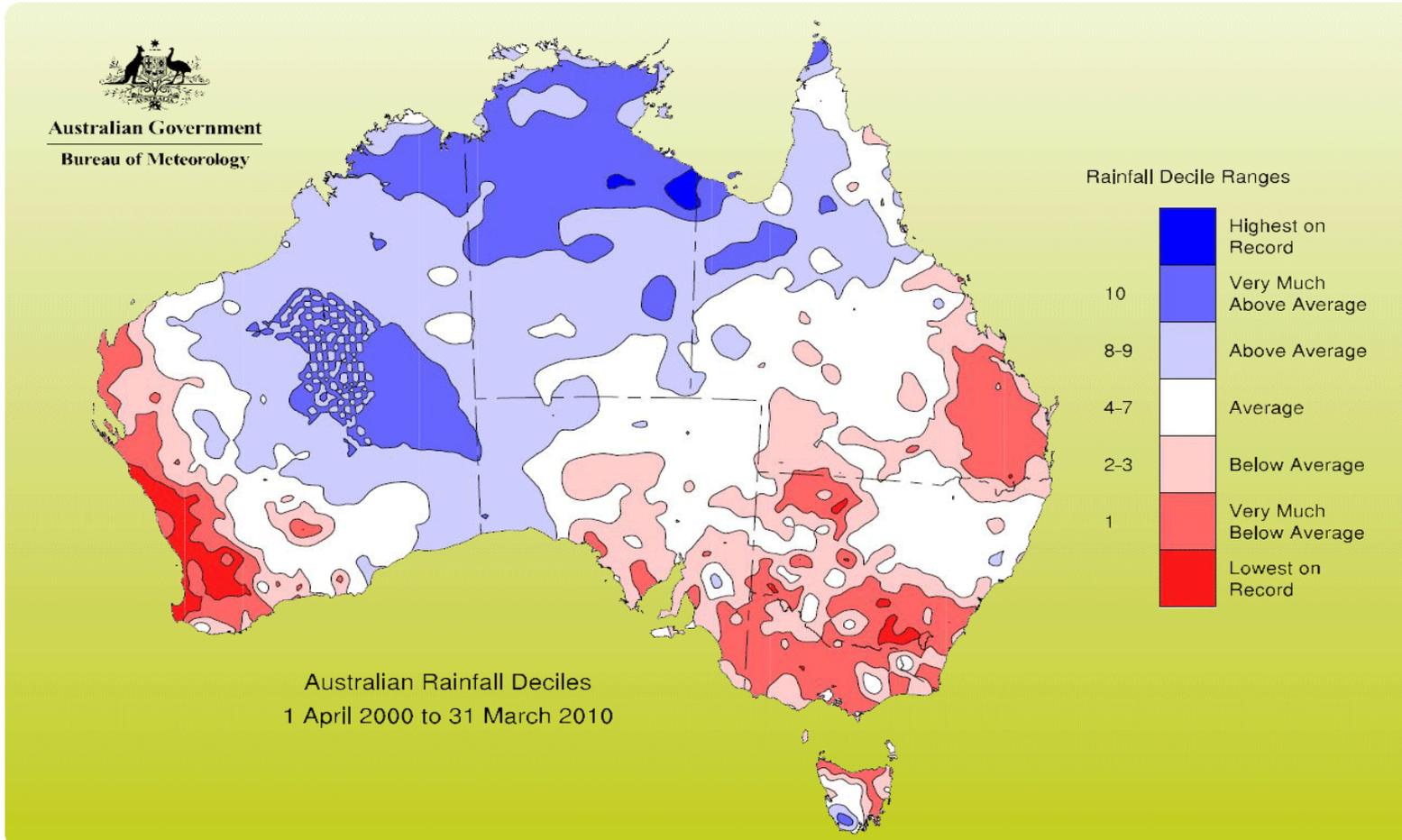
# 2.2 Climate Variability

California drought status  
as of April 7, 2015



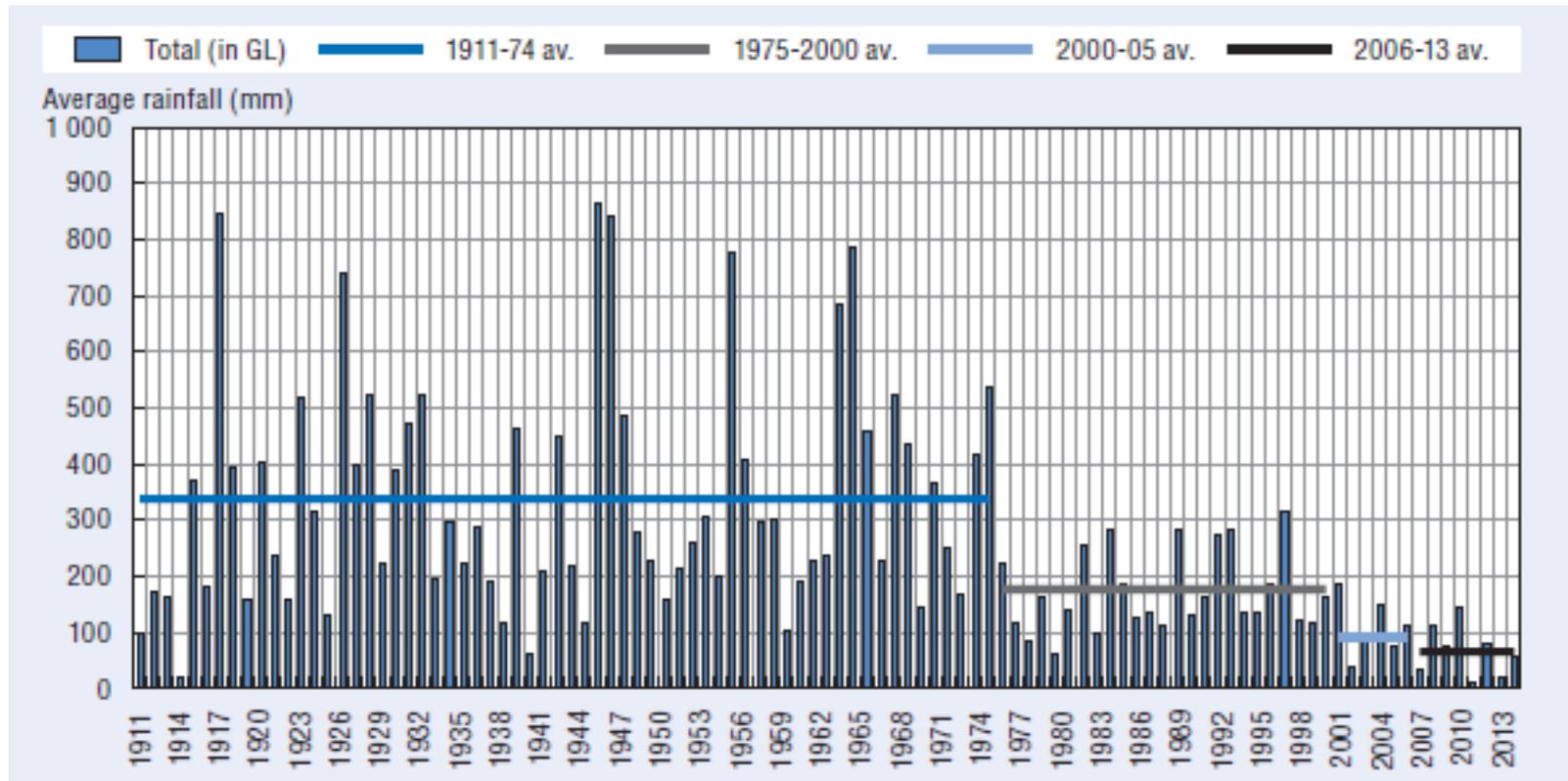
- None
- Abnormally Dry
- Moderate Drought
- Severe Drought
- Extreme Drought
- Exceptional Drought

# Australian Millennium Drought

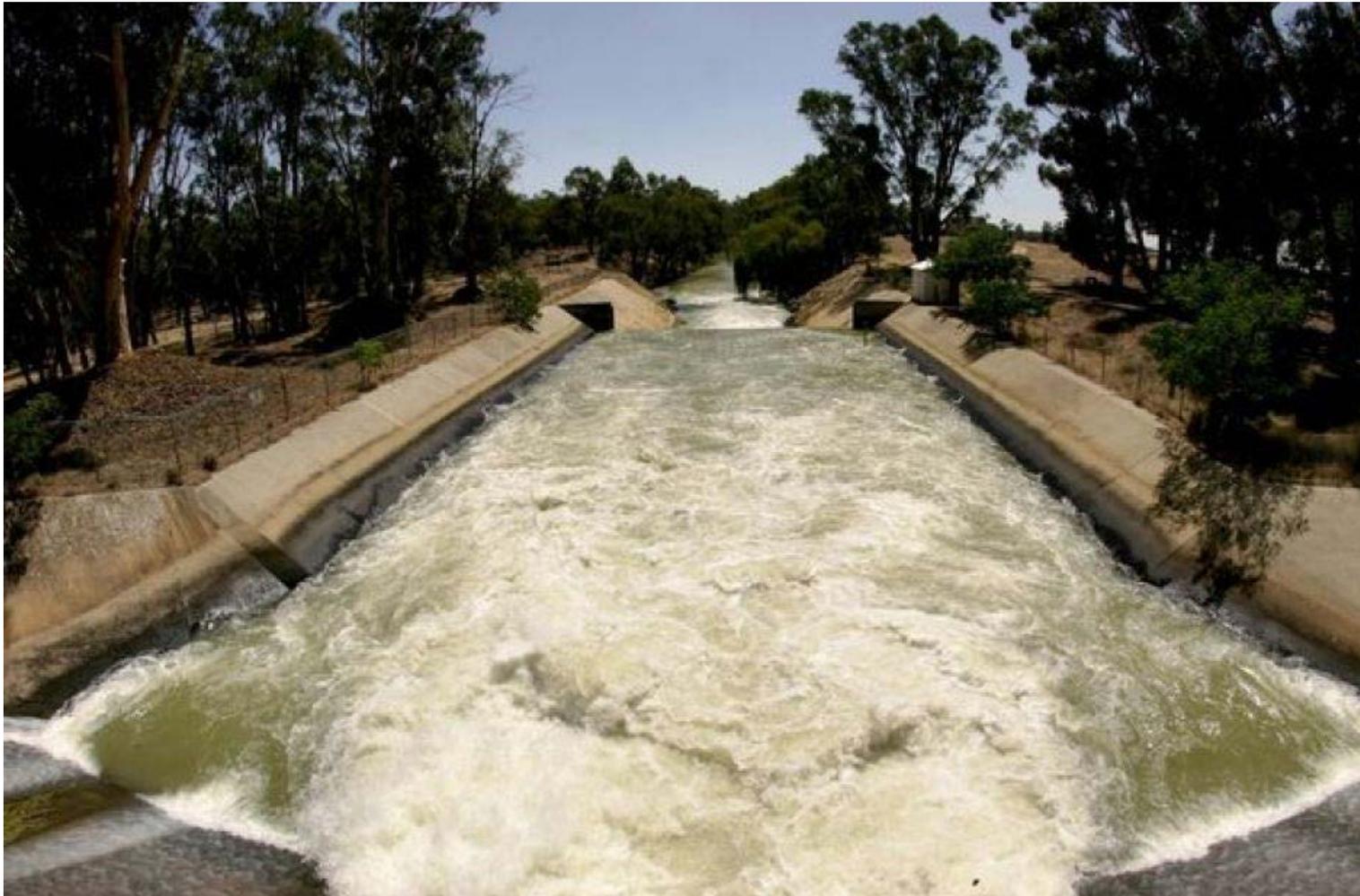


**40% decline in runoff 1997-2008 in southern MDB**

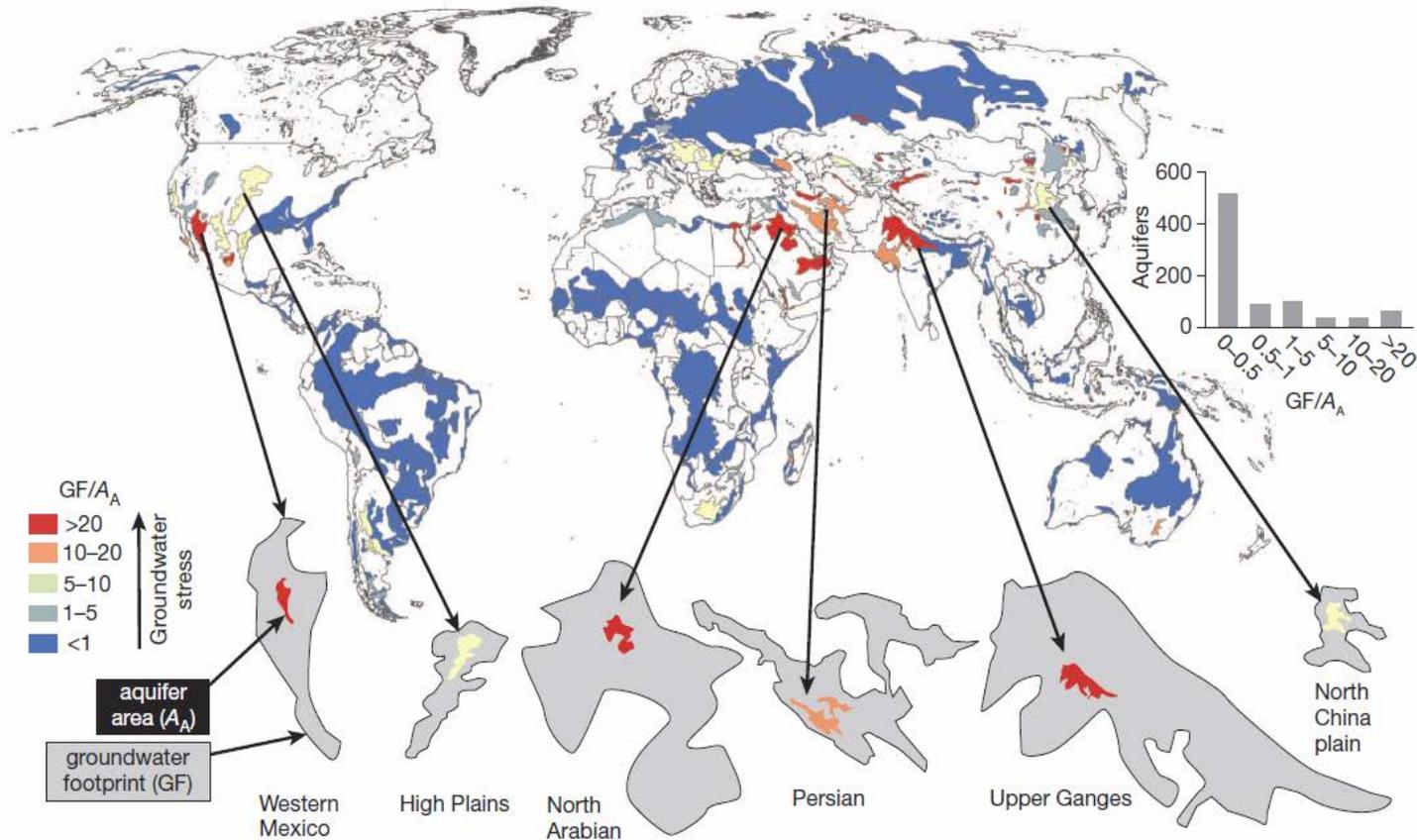
# Historical Streamflow into Sterling Dam (Perth, WA)



## 2.3 Water Extractions

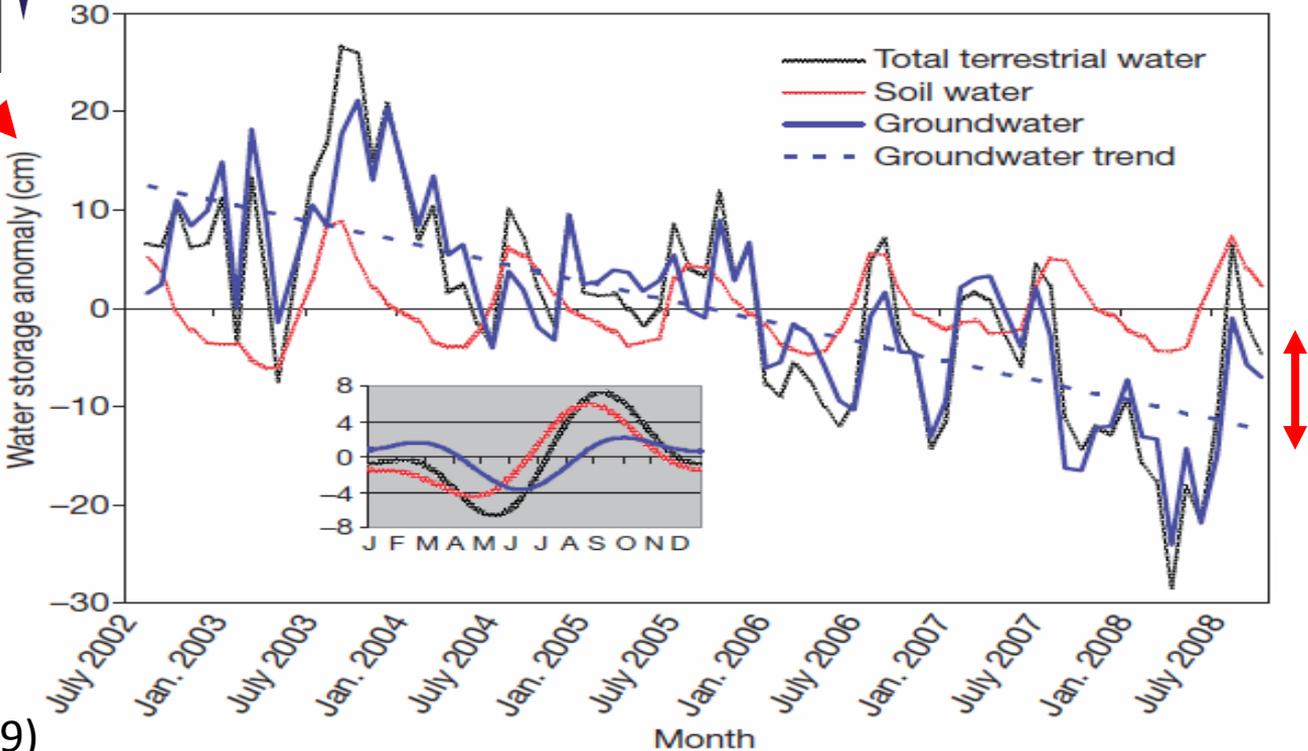
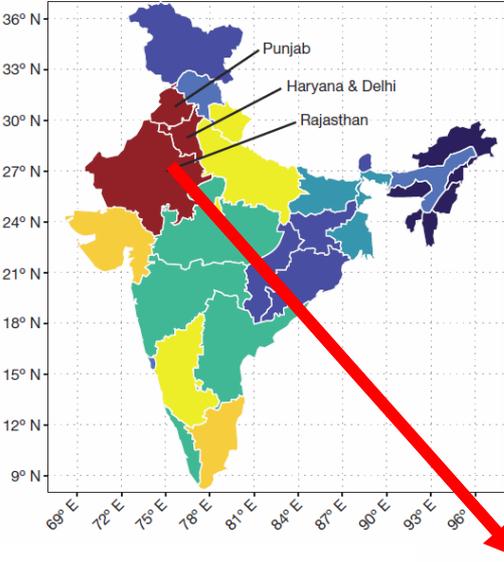


# Groundwater Footprint



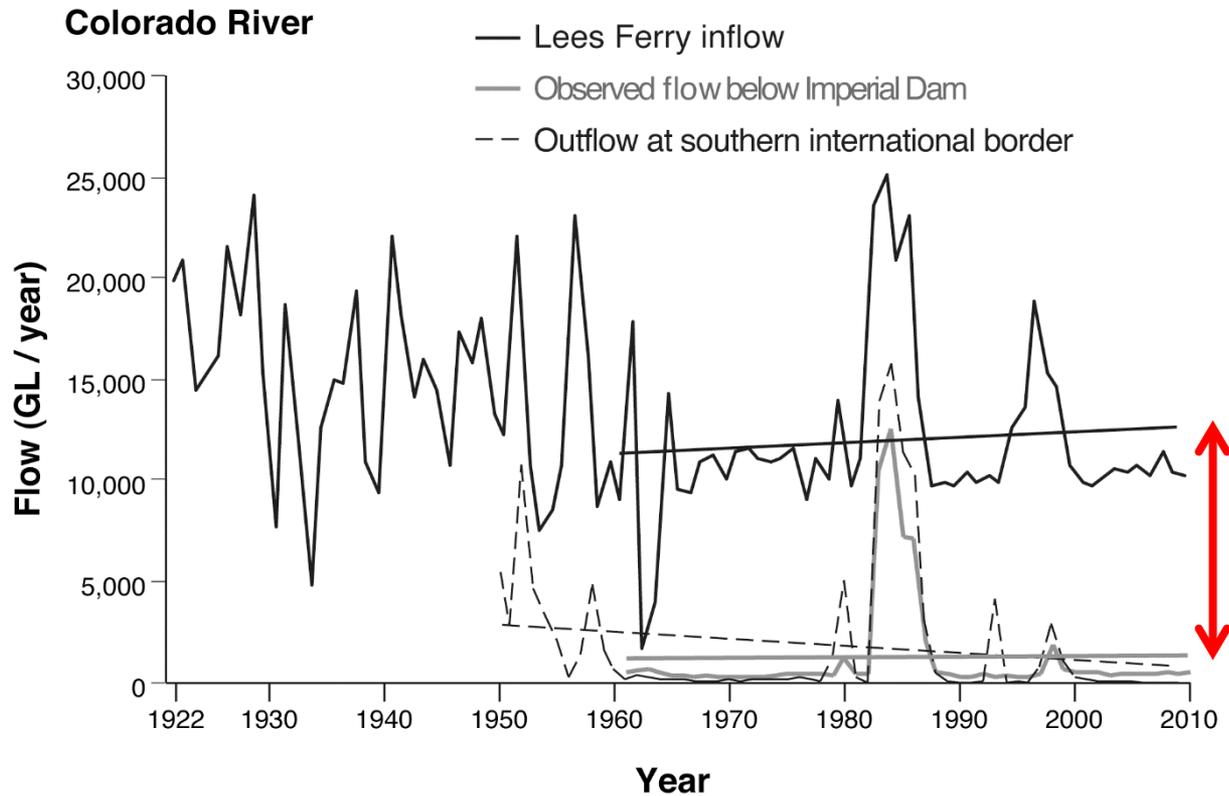
Source: Gleeson et al. (2012)

# North-West India – Groundwater and Soil Water

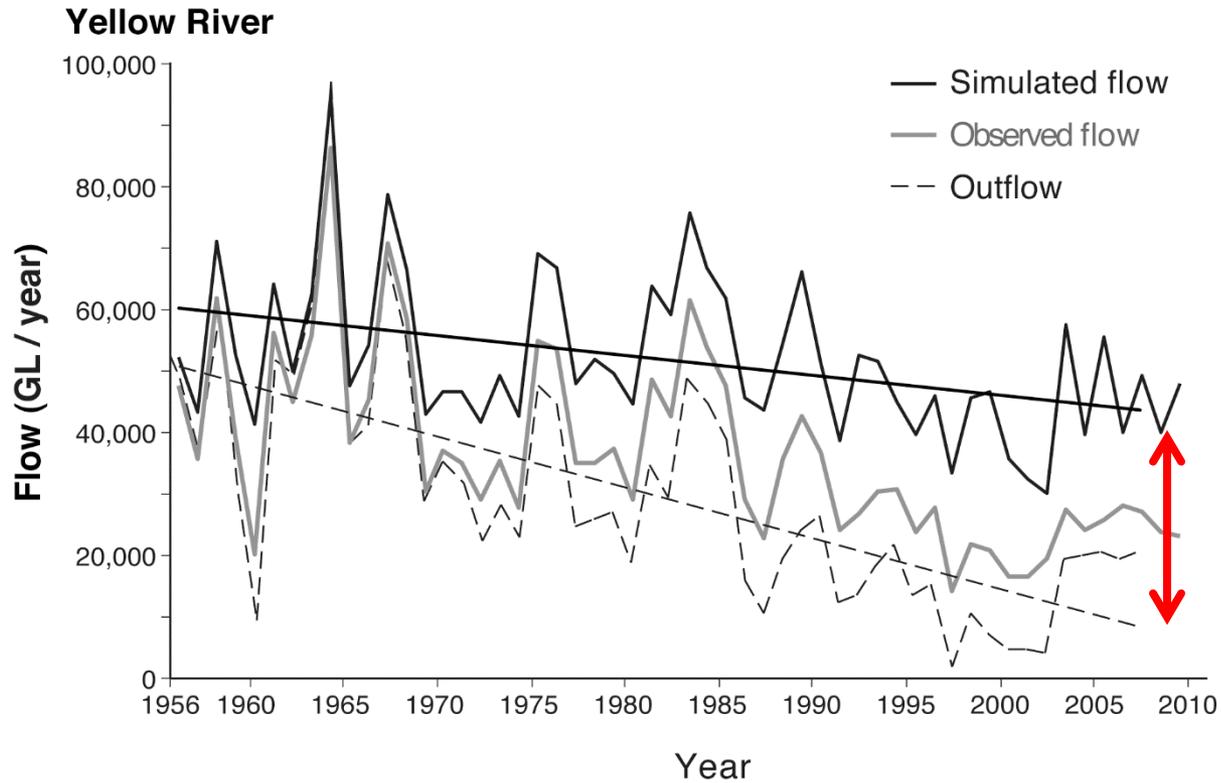


Source: Rodell et al. (2009)

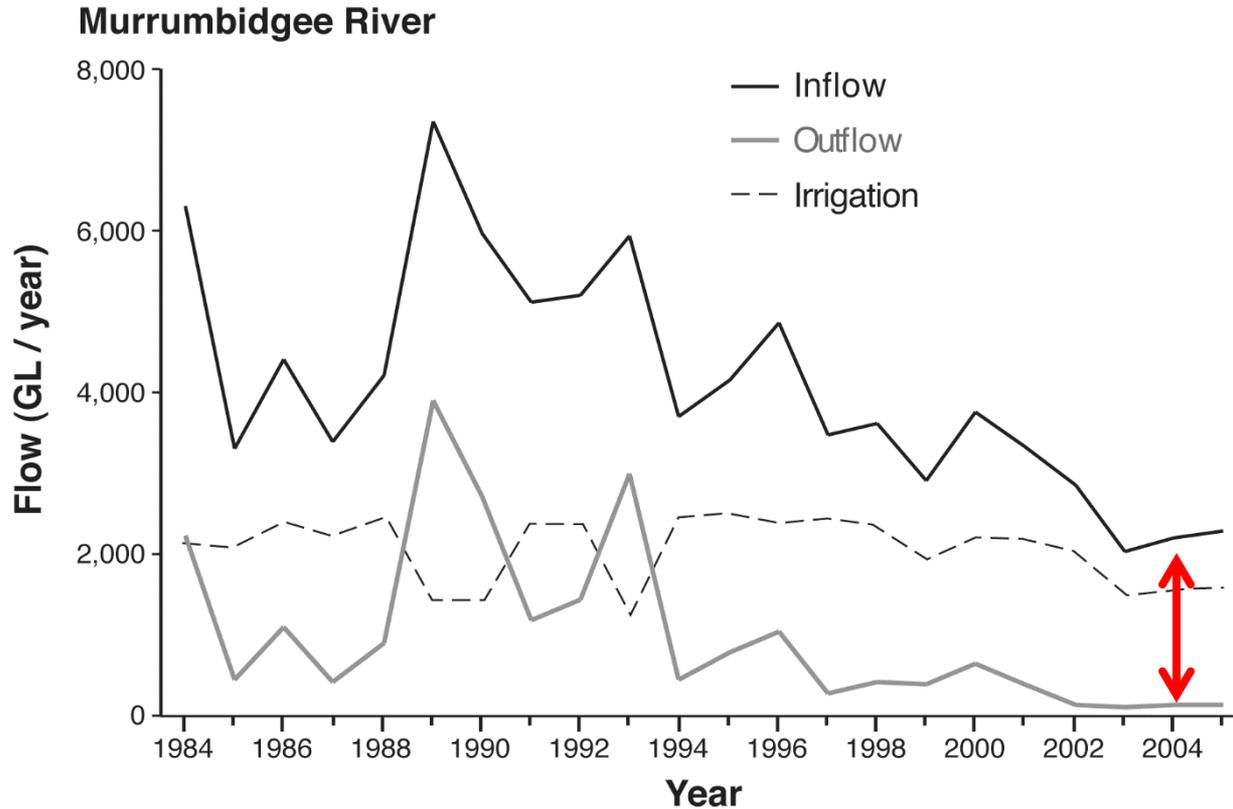
# Colorado River - Flow



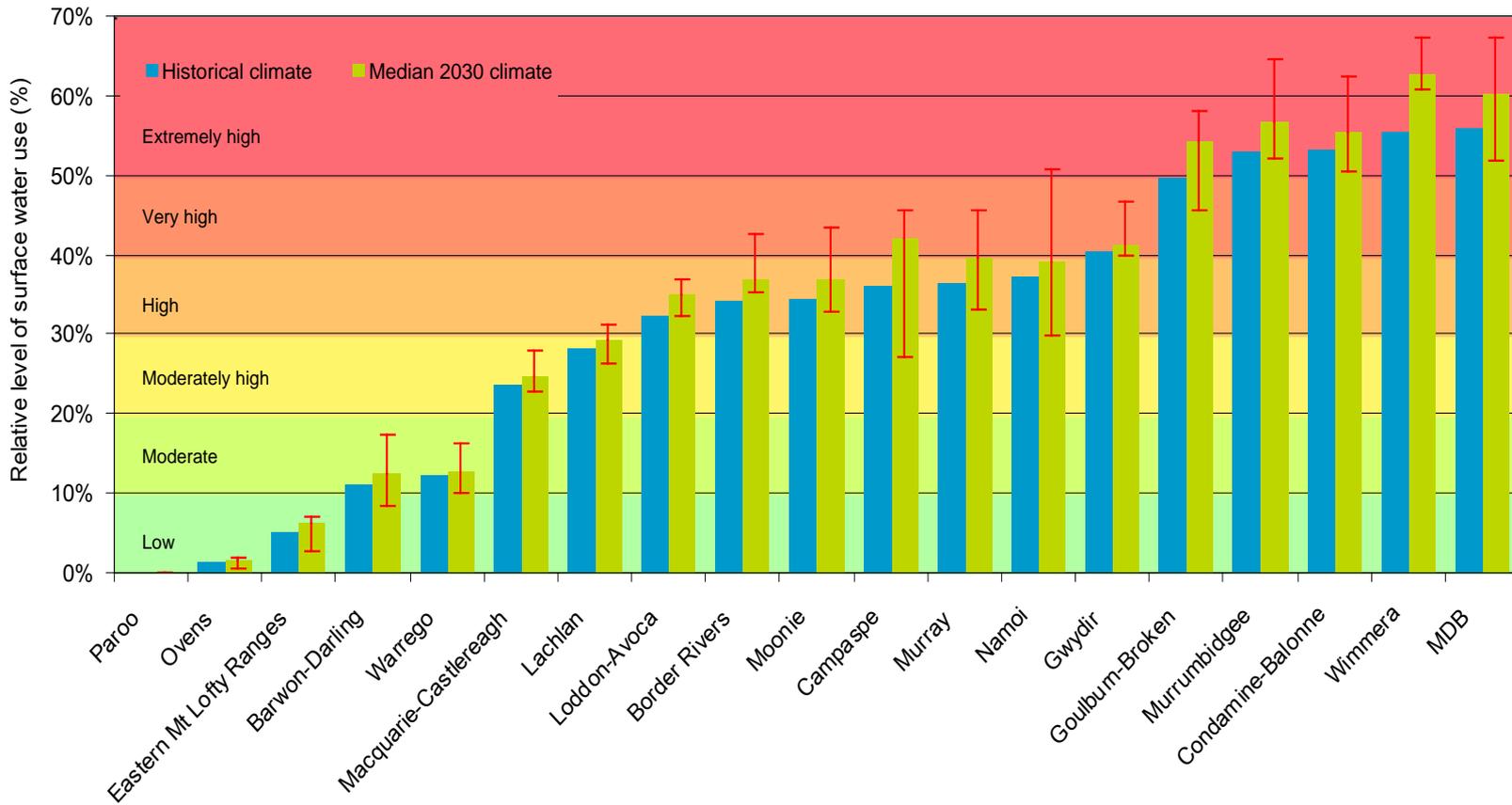
# Yellow River - Flow



# Murrumbidgee River - Flow

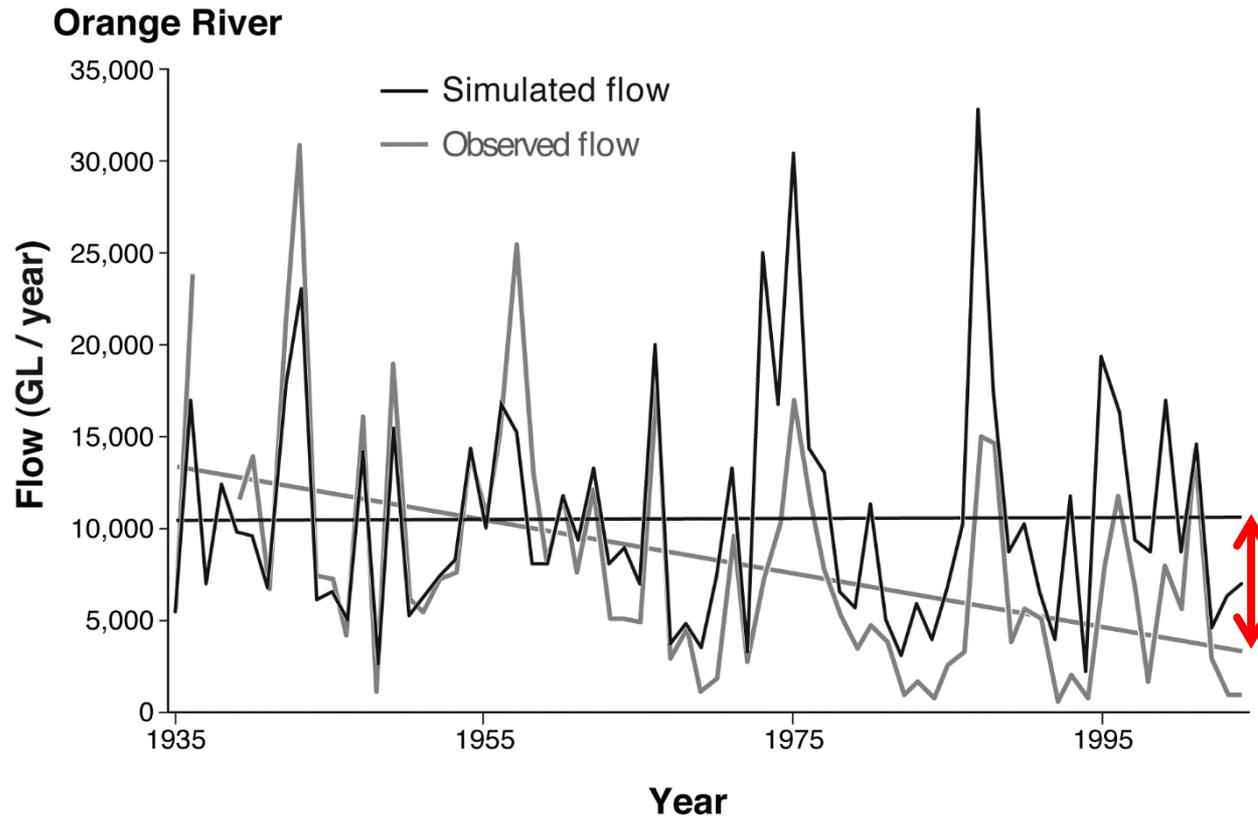


# MDB Surface Water Diversions



Source: CSIRO (2008)

# Orange River - Flow



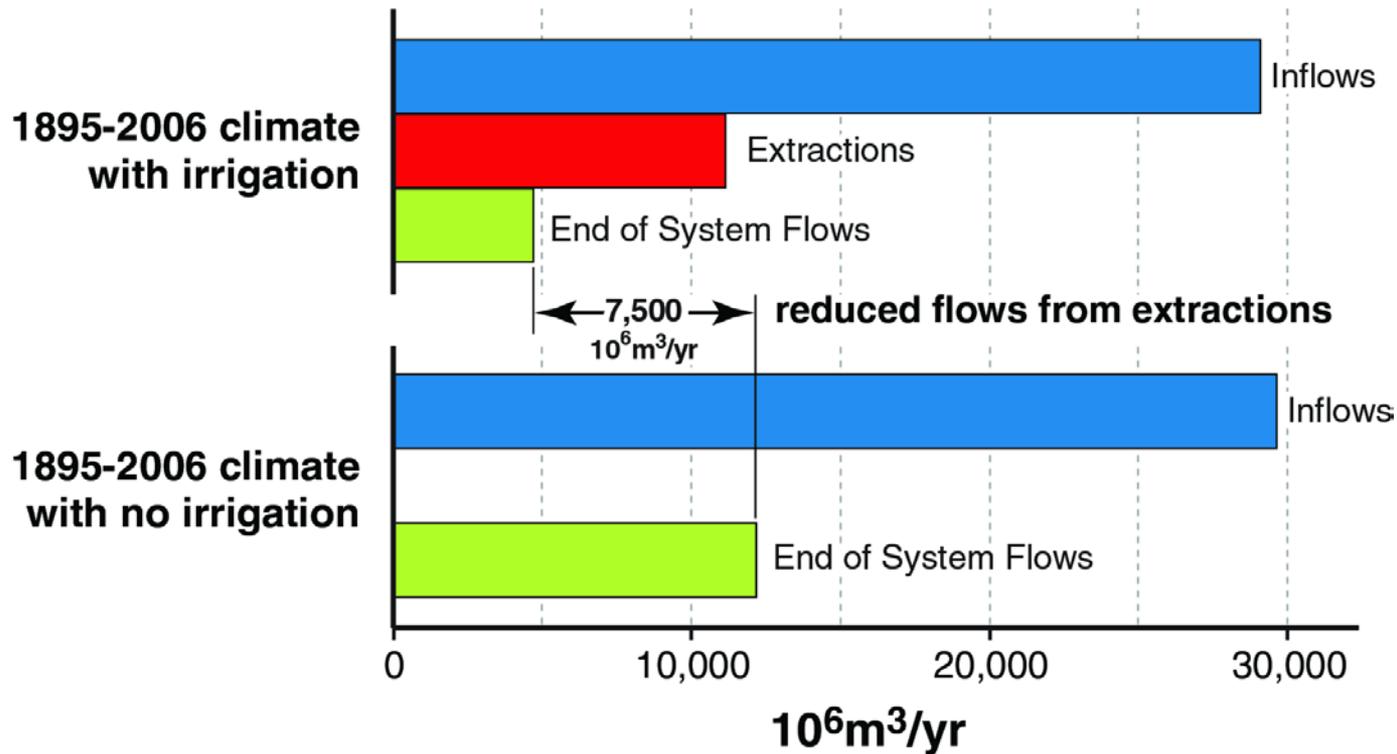
# 3. Water and Public Policy



# Murray-Darling Basin (MDB)

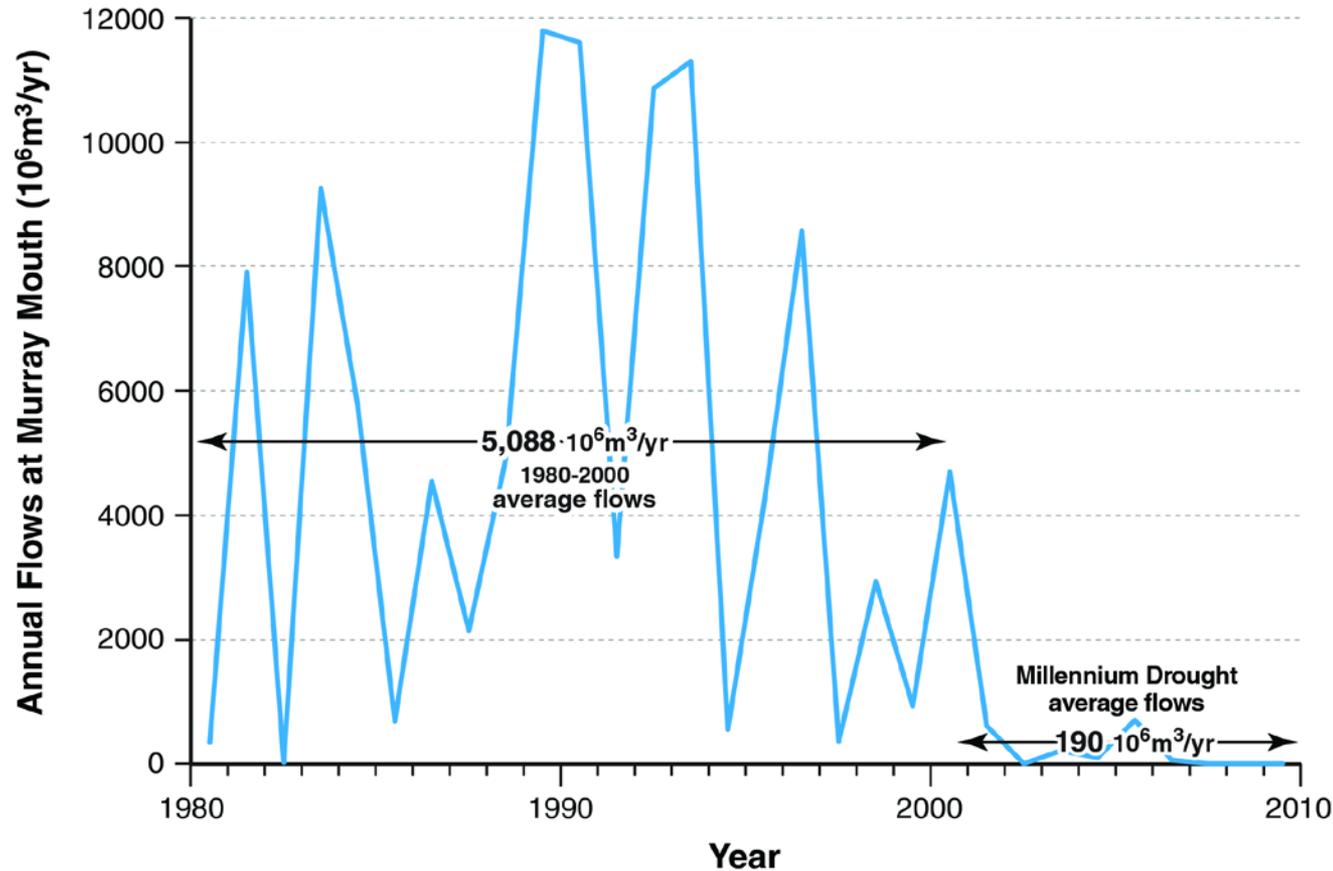


# MDB: With and without irrigation



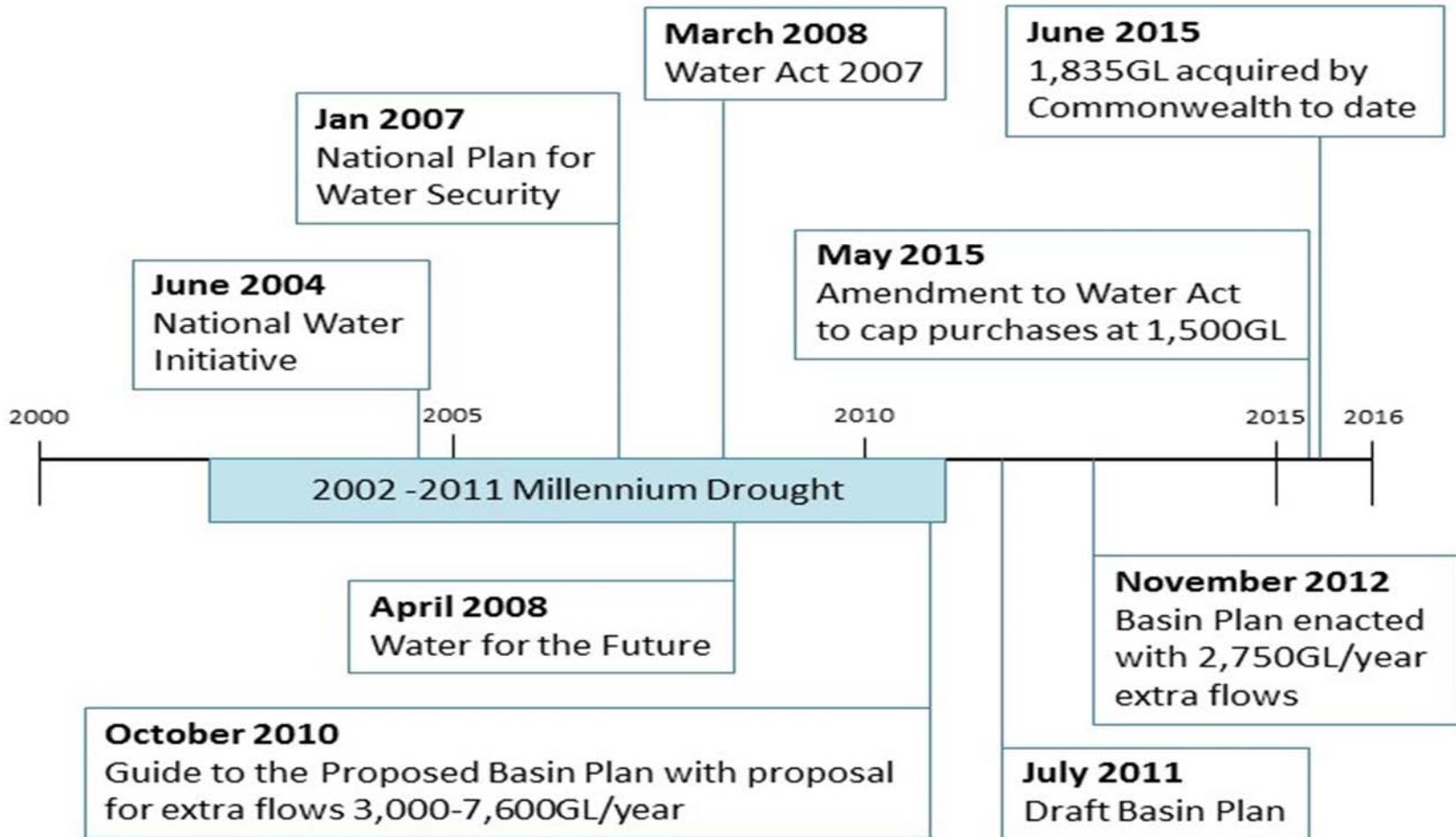
Long-term average annual basin flows

# Murray Mouth Annual Flows (GL)

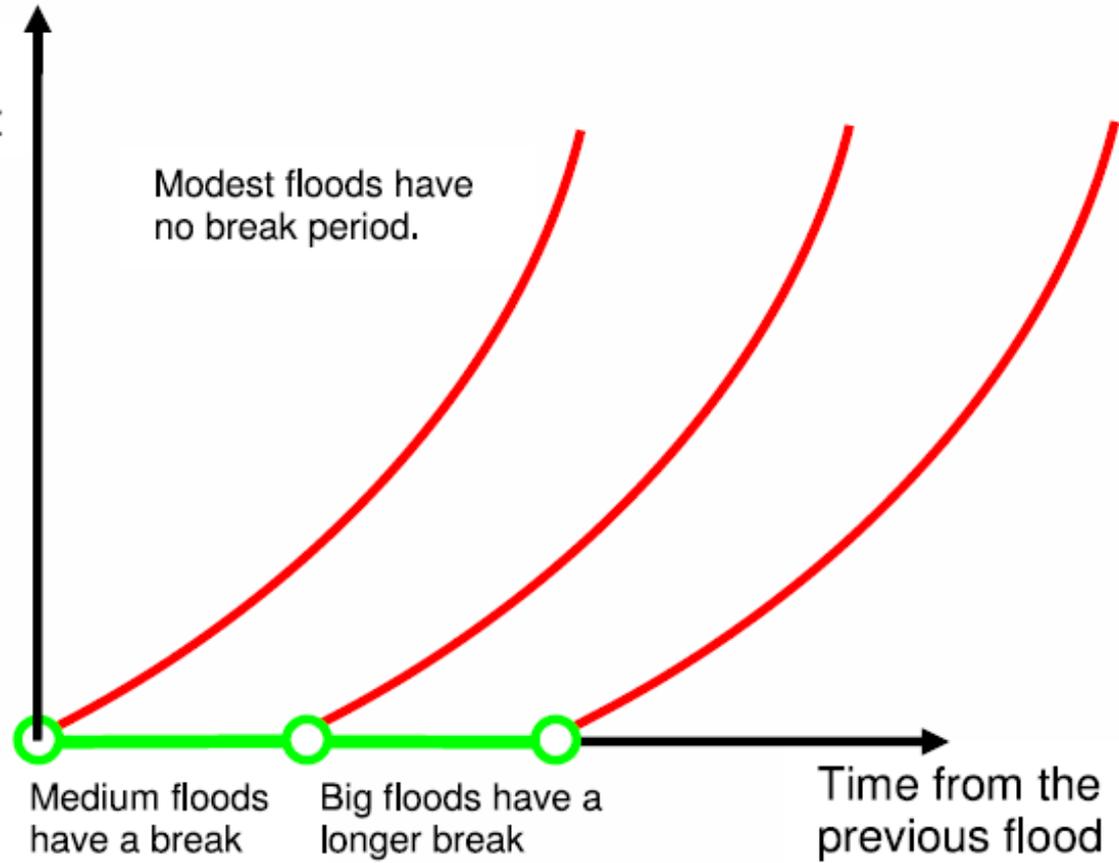


Annual flows at Murray Mouth

# MDB Policy Timeline



Drought cost to environment



# Gain Optimal *versus* Actual Allocations : Murray River 2002-2009

**a=10 b=15**

**\$3.52 billion**

**a=12 b=20**

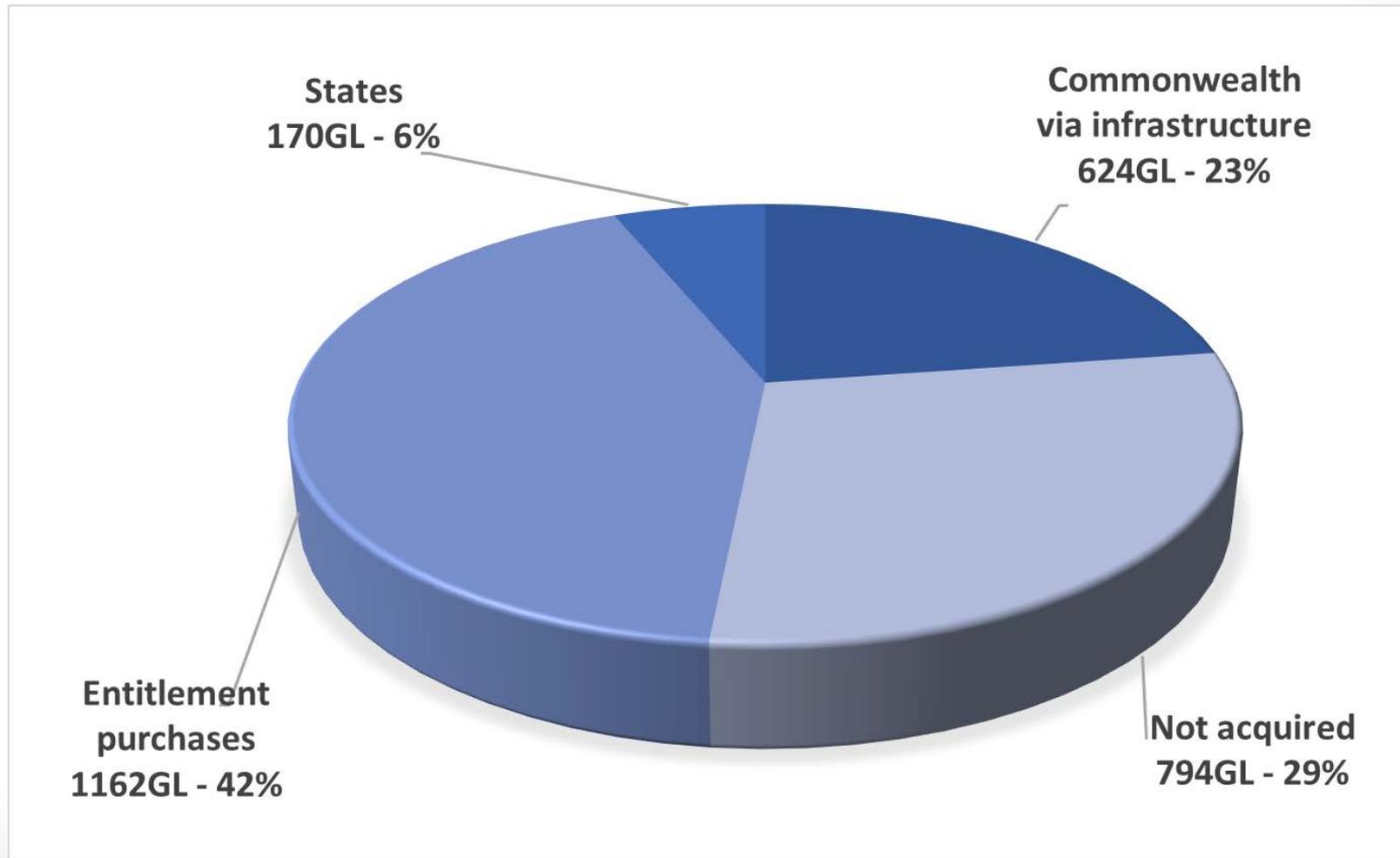
**\$2.67 billion**

↑  
Increasing  
environmental  
costs

a = Number of years until environmental costs of drought add up to 50% of PV of net profits in irrigated agriculture.

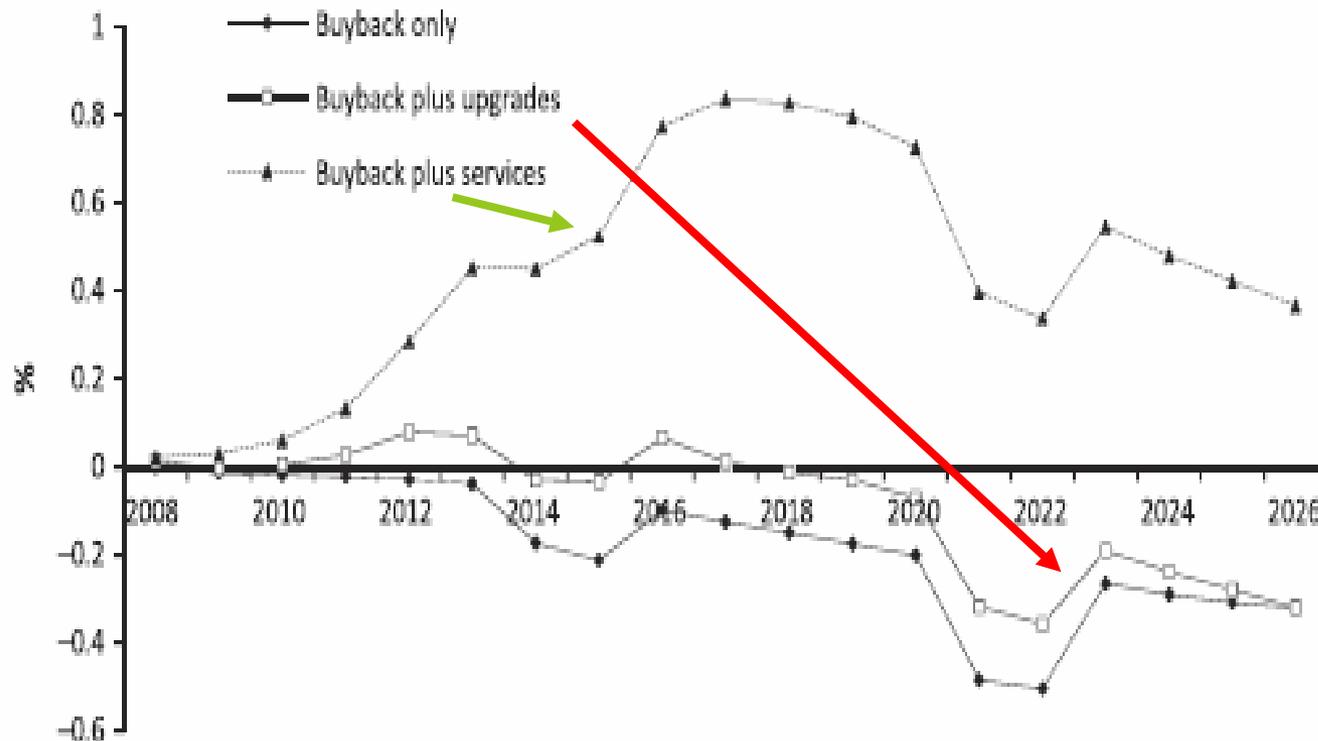
b = Number of years until environmental costs of drought add up to 100% of PV of net present in irrigated agriculture.

# Basin Plan and Surface Water Sustainable Diversion Limits (Progress to May 2015)

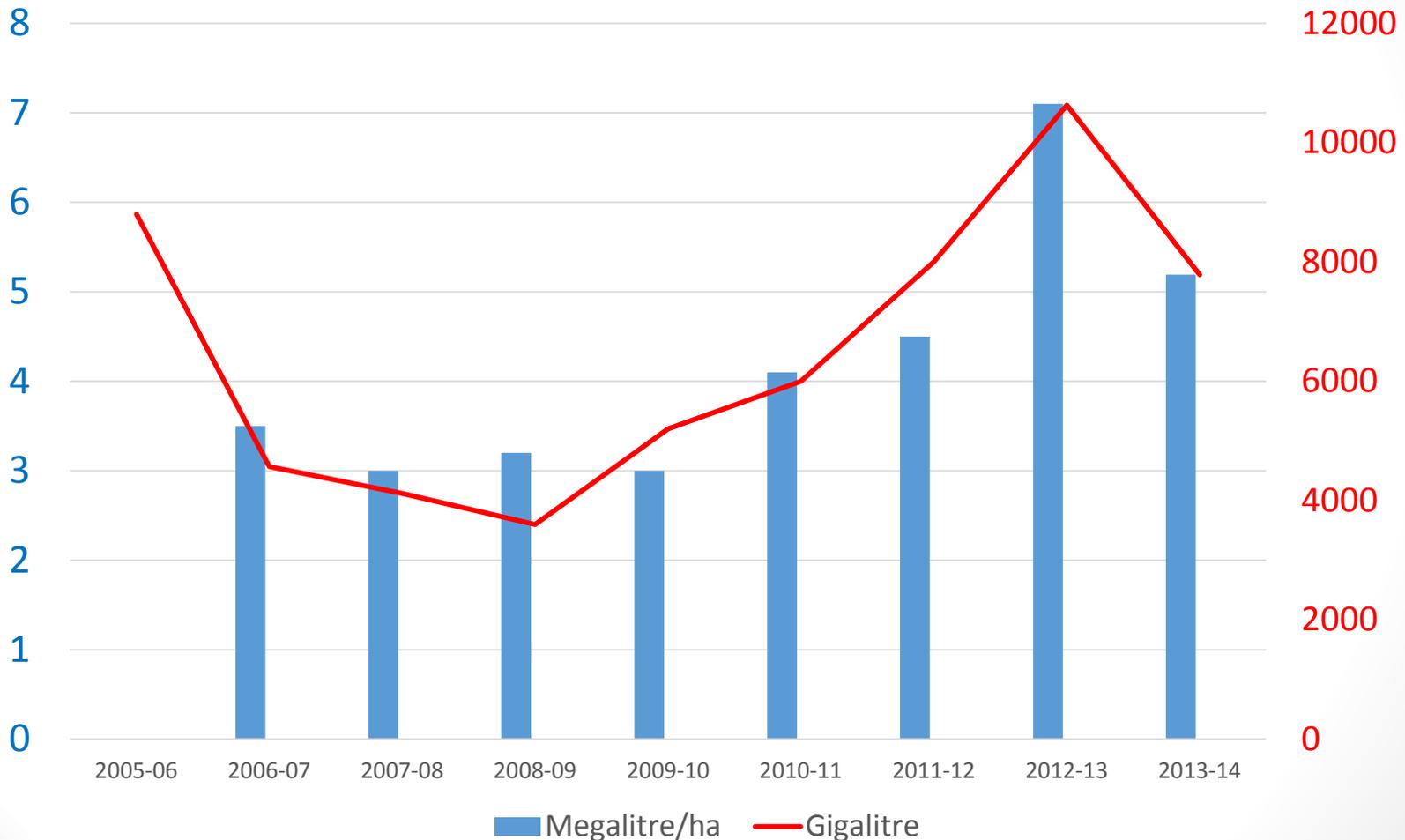


Data sourced from the Australian Department of Environment

# Buybacks Versus Infrastructure

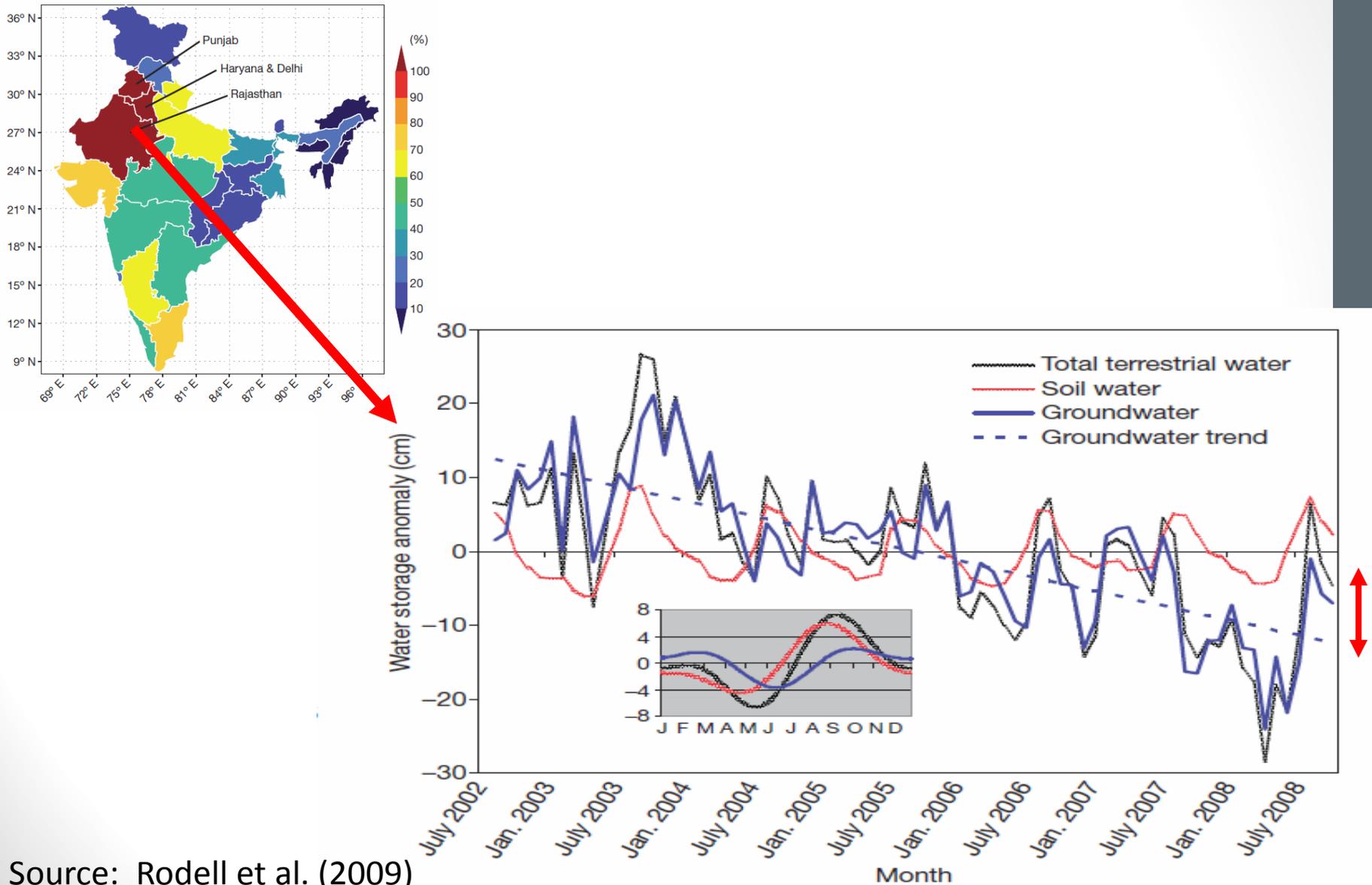


# Basin Irrigation Diversions (GL/yr) and Water Application Rate (ML/ha.)



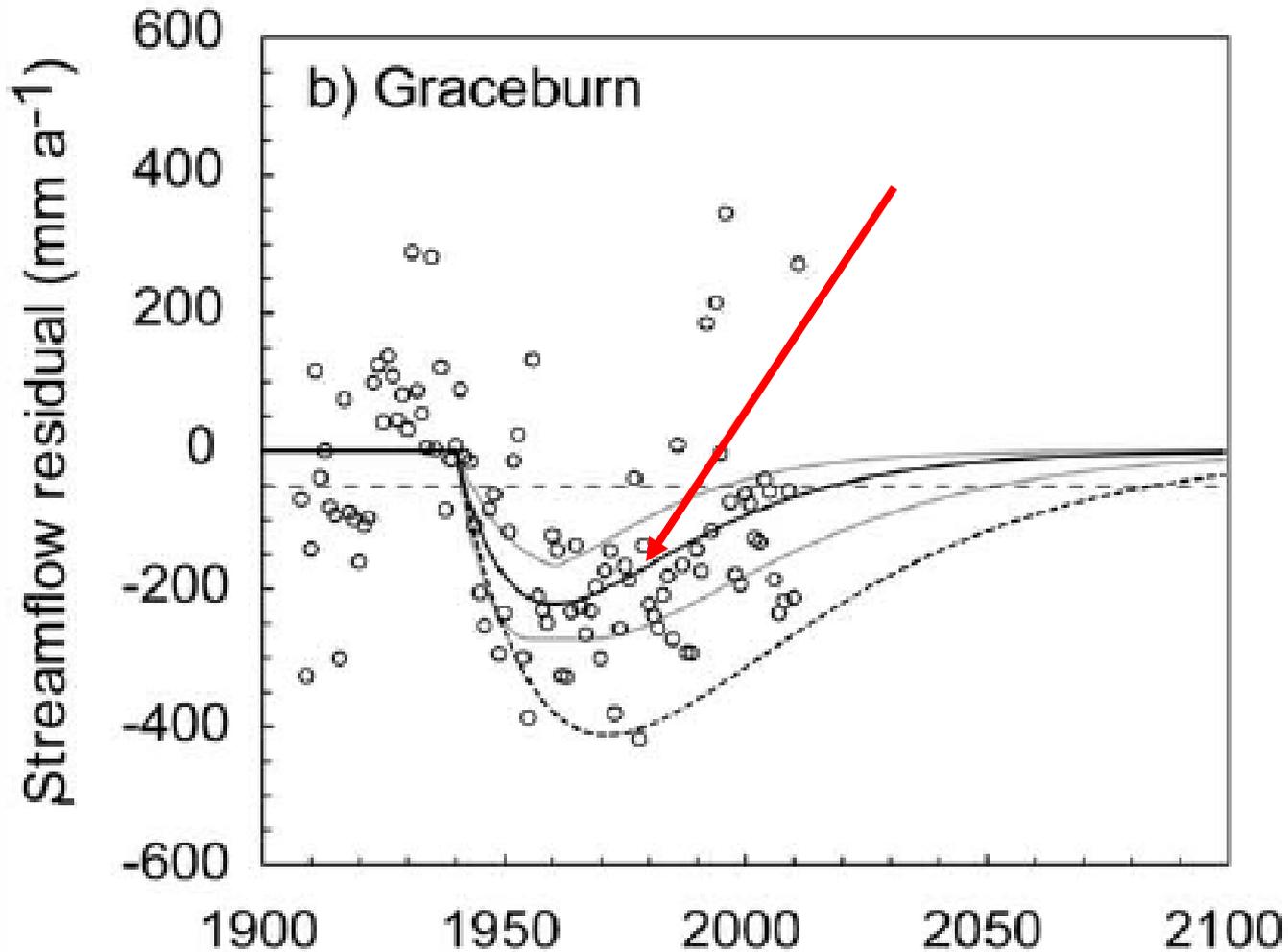
Data Sources: ABARES (2014) & ABS (2014, 2015)

# North-West India – Groundwater and Soil Water



Source: Rodell et al. (2009)

# Bushfires and Streamflow



# Policy Advice versus Policy Actions

## Sustainable Diversions in the Murray-Darling Basin

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An analysis of the options for achieving a sustainable diversion limit in the Murray-Darling Basin

June 2010

## Dry Water

An economic evaluation of the  
National Plan for Water Security

# Dredging the Murray Mouth

*Basin Plan 2012*

“...the mouth of the River Murray is open without the need for dredging in at least 95% of years, with flows every year through the Murray Mouth barrages...”

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