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# Optimal Water Reform Strategies: The Buy-Back & Australia's Murray-Darling Basin Plan

David Adamson
ARC DECRA Fellow
The University of Queensland, Australia

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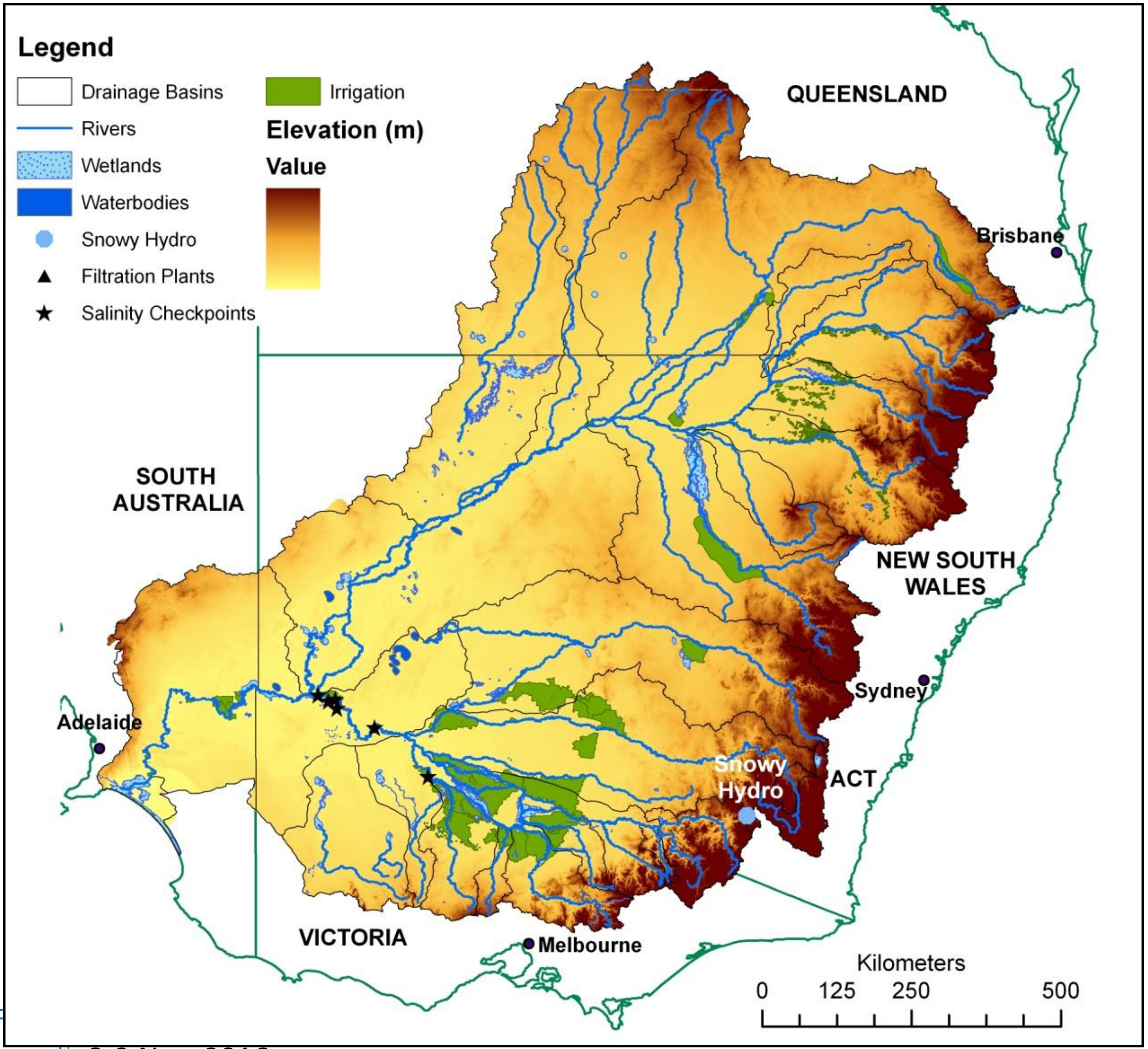
# Background

- Welfare (economic, social and environmental) loss occurs when water is over, and inequitably allocated.
- Water supply is not constant (floods and droughts)
  - Climate change is expected to increase variability
  - Augmenting supply has reached its limits (Can't make it rain)
- How do we reallocate resources to increase welfare?
  - Market based instruments




14 % of Aus = 1 million Km$^2$ (4 times size of UK)

- 80% MDB is ag

Economic

- 40-50% Aus GVAP
- 1/3 value irrigation
- Irrigation only 2% area

Population

- 10% inside
- 5% Adelaide

Wetlands

- 30,000
- 16 Ramsar
- 25,000 Km$^2$ (2.5%)

# Murray-Darling Basin Plan

- Addresses welfare loss by utilising the common property approach
- Define the environments share from current allocation
  - 3,200 GL = 2,594,286 acre feet
- Have a public trustee (CEWO) manage those resources for the common good
- Goals
  - Minimum flow target where the river meets the sea (Coorong)
  - Water quality target (Adelaide)

# Issue

- How do we transfer water from irrigators to the environment's trustee?
  - SRWUIP (subsidises adoption of water efficient technology) = $7.8 Billion
    - Can increase area irrigated, reduce flexibility, make environment worse off and create a private debt bomb
  - RtB (purchase water rights from irrigators) = $3.1 Billion

# Buy- Back

- Property rights in the MDB
  - Decoupled (not attached to land)
  - 3 alternative right structures (High, general, supp.)
  - Each structure has alternative reliability by
    - Location
    - State of nature (drought, wet, normal)
- How do we construct an optimal portfolio of rights, to meet the Plan's goals?

# Economic Problem

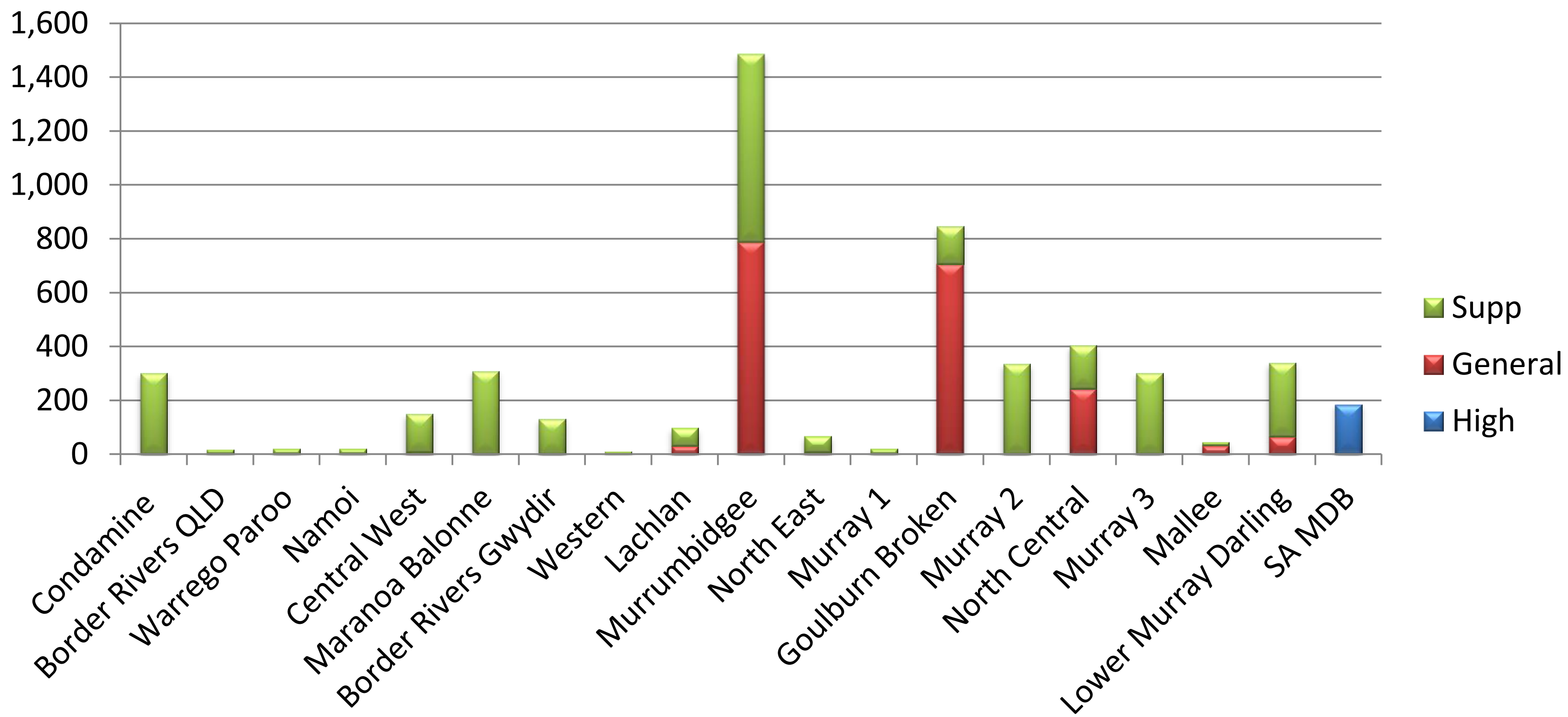
- Constrained welfare optimisation
  - behavioural economics on how water is used by state of nature

Optimise irrigators return from water

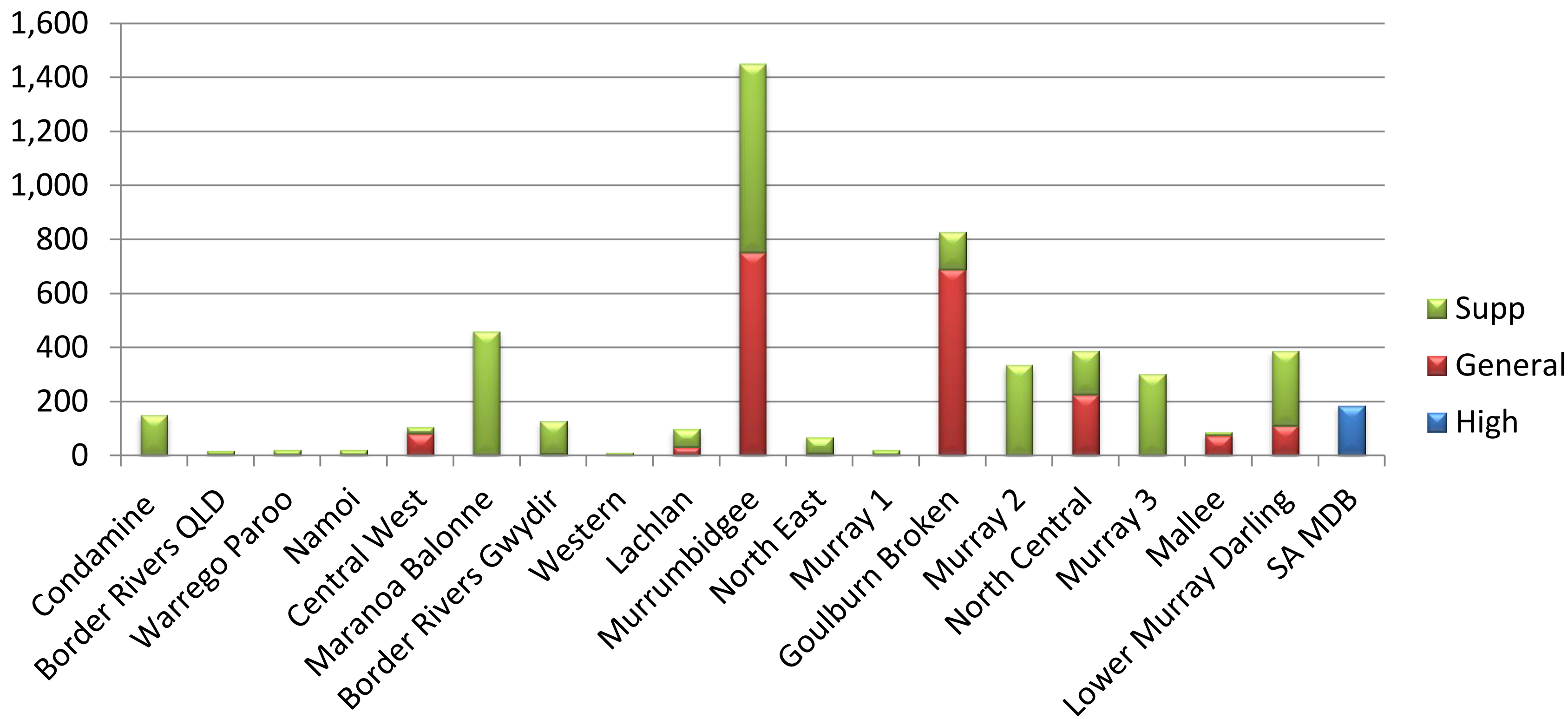
Subject to:

- Hydrological realities
- Property right structures (numbers, reliability)
- Plan objectives (SDL, environmental, water quality & budget)
- Acknowledge risk of climate change

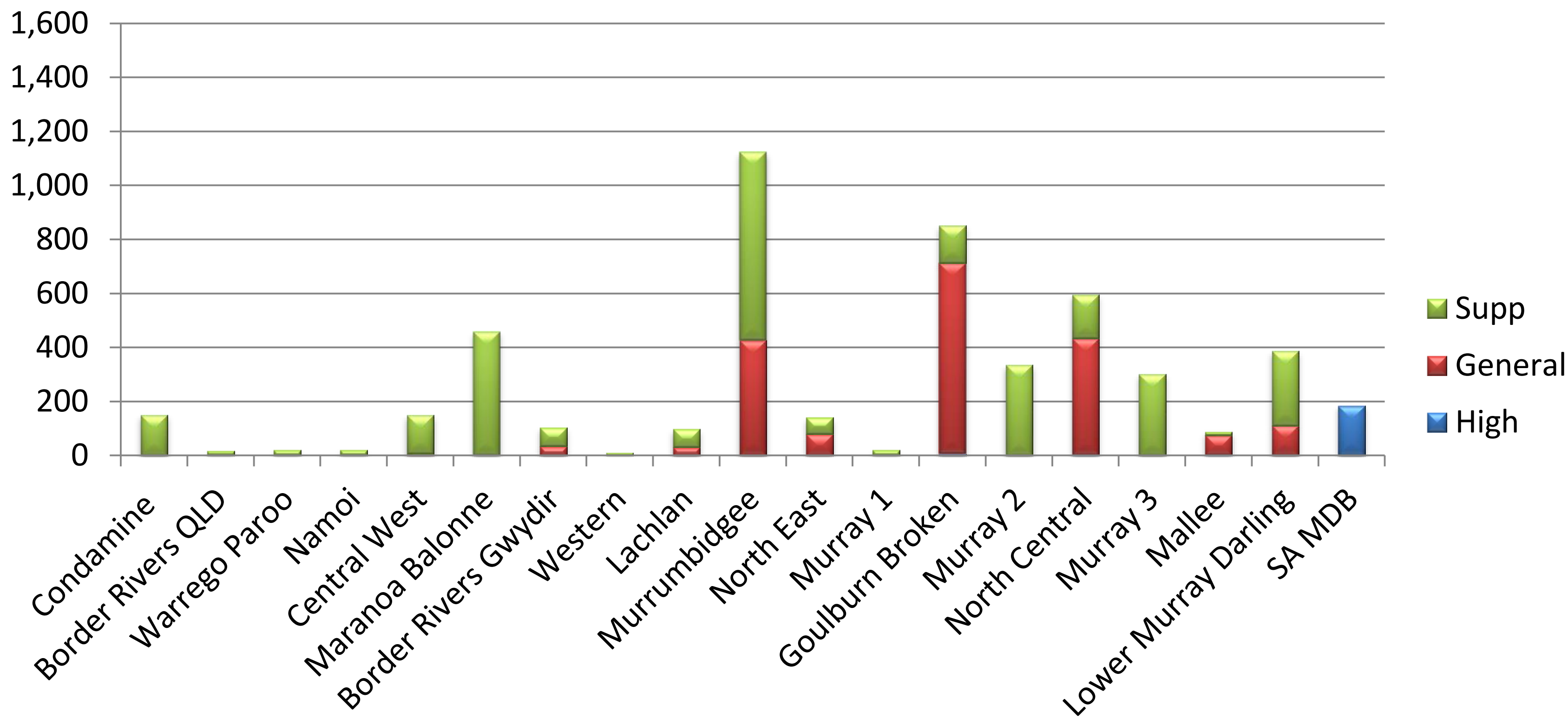
# Optimal Portfolio (Current Climate)



# Optimal Portfolio (450 Avg 2050)



# Optimal Portfolio (Drought Frequency)



# Discussion

- Climate alters the heterogeneity of inflows into the MDB
- Policy allows CEWO flexibility to use the market
  - Reallocate the portfolio (spatially & structurally)
  - Trade with farmers (lots of issues here)
  - Reduces risk
    - new issues of: future reliability of rights + how CEWO and farmers adapt in extreme droughts, remain unexplored

# Discussion (part 2)

- While economic returns from irrigation decrease (offset by buyback)
  - Water quality improves,
  - New player in the market allows real water price to be discovered (increased private equity),
  - environment has a defined supply preventing irreversible losses

- Introduction of more environmental targets would lead to a reallocation of rights and (potentially) more funds required to obtain a new portfolio