

Irrigation water use and trading under hydroclimatic variability

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CATCHMENT HYDROLOGY

Introduction

- My project looks at farmer decision making under uncertainty
- Uncertainty in
 - crop water demand
 - water allocations
 - temporary water prices
- Today, forget about the uncertainty, just focus on variability



This seminar:

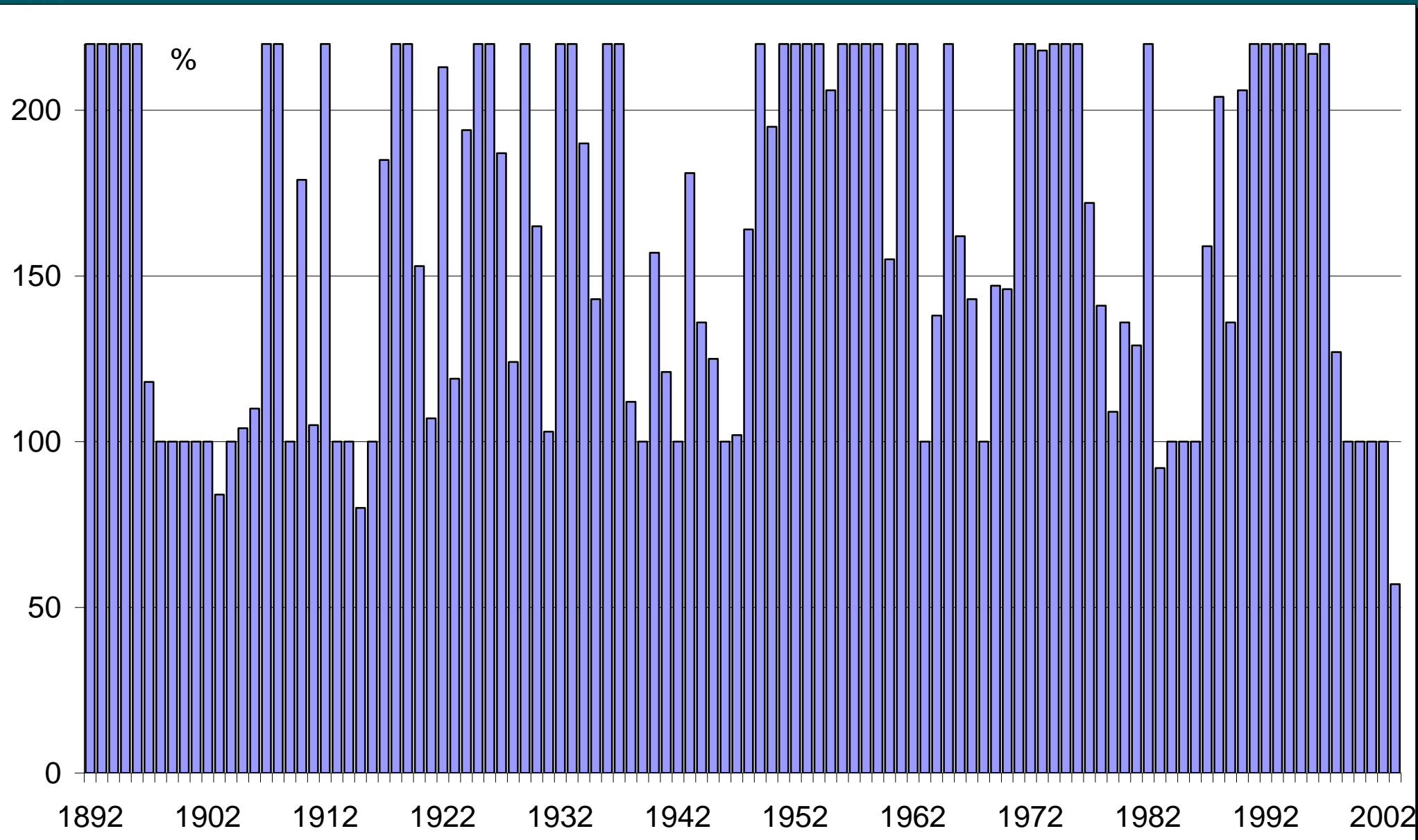
- Few concepts
- Brief look at the farm models
- Brief look at water markets
- Some results
- Discussion:
 - about the modelling
 - implications of results



Rights to irrigation water

- Permanent entitlement (ML)
- Allocation (%), updated through season
- Trading – temporary

Final allocations (Goulburn system)



G al b u r n s y s t e m

- 10 nodes
- Trade pretty freely



RURAL WATER SERVICES

HEADWORKS

IRRIGATION AREAS

- Shepparton
- Central Goulburn
- Rochester
- Pyramid-Boort
- Murray Valley
- Torrumbarry

WATERWORKS DISTRICTS

- Normanville
- West Loddon
- East Loddon
- River/Basin Diversion Areas
- Loch Garry Flood Protection District

- Boundary
- Area Management Centres
- Other Work Centres

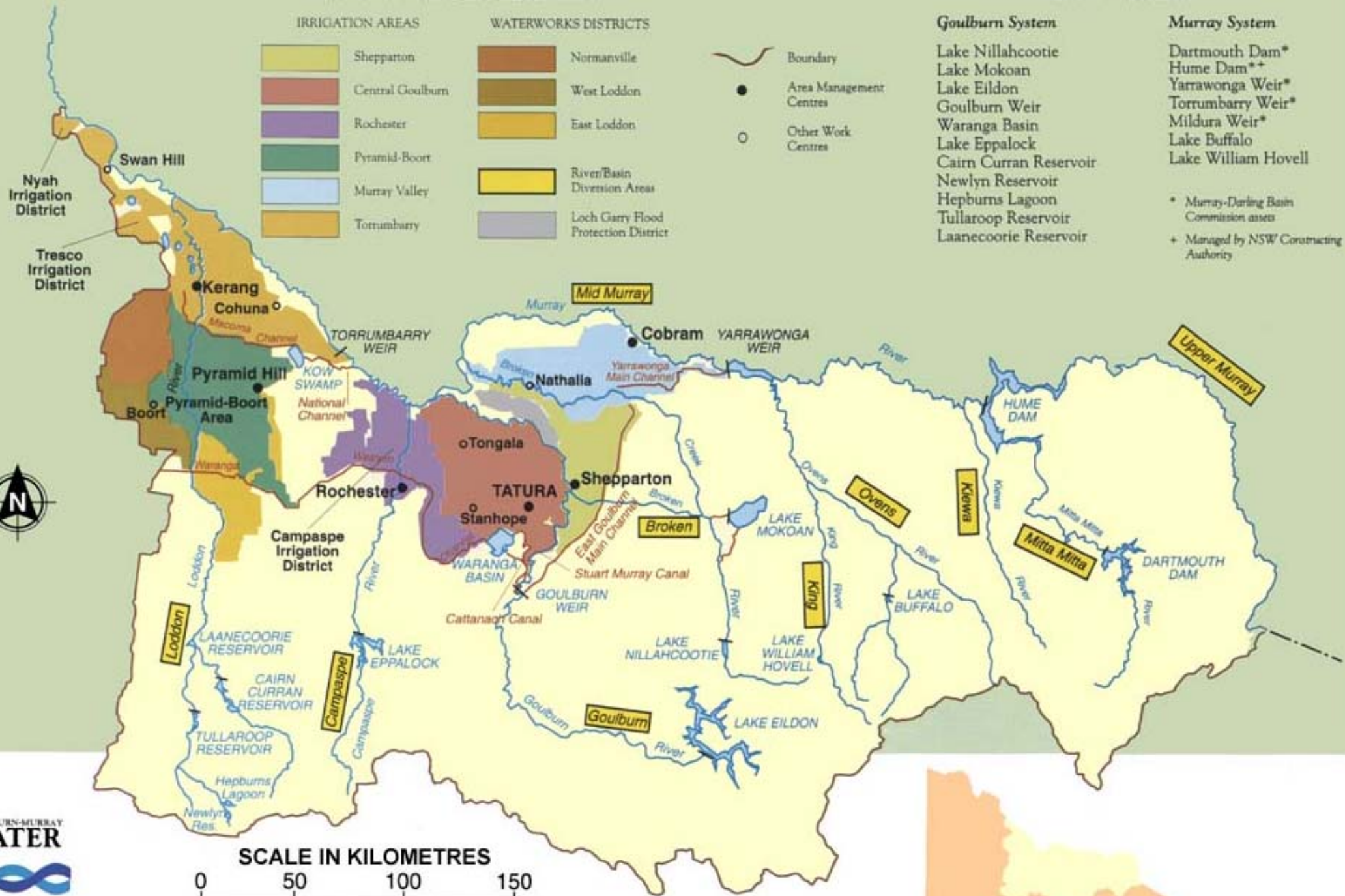
Goulburn System

- Lake Nillahcootie
- Lake Mokoan
- Lake Eildon
- Goulburn Weir
- Waranga Basin
- Lake Eppalock
- Cairn Curran Reservoir
- Newlyn Reservoir
- Hepburns Lagoon
- Tullaroop Reservoir
- Laanecoorie Reservoir

Murray System

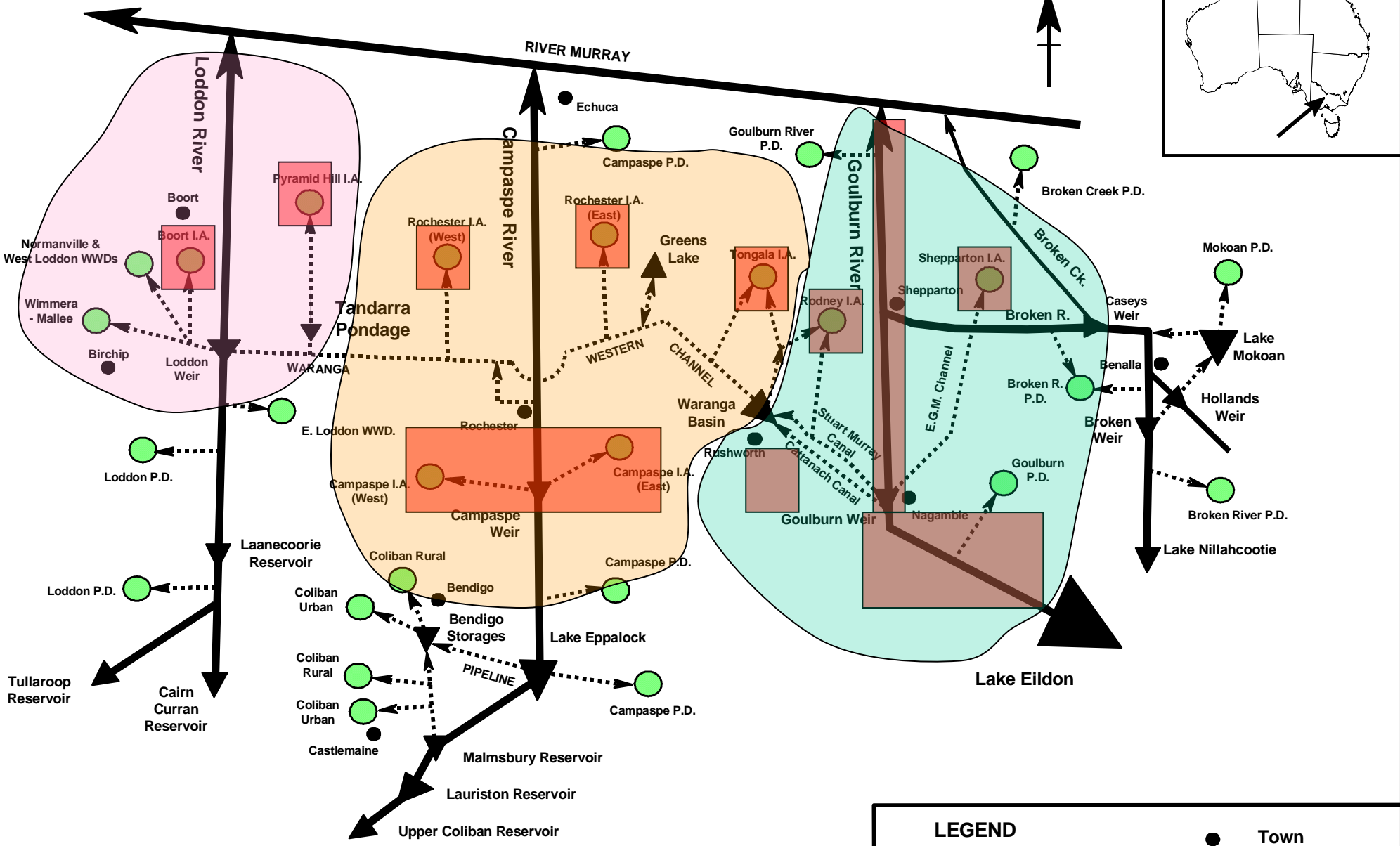
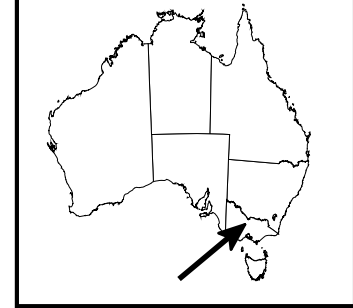
- Dartmouth Dam*
- Hume Dam**
- Yarrowonga Weir*
- Torrumbarry Weir*
- Mildura Weir*
- Lake Buffalo
- Lake William Hovell

* Murray-Darling Basin Commission assets
 ** Managed by NSW Constructing Authority



SCALE IN KILOMETRES





Irrigation Area
 Private Diversion
 W.W.D. Water Works District

LEGEND

	Reservoir, Lake or Weir		Town
	River or Creek		Demand Centre
	Supply Channel		

Modelling framework

- Farm models: optimisation models
- Water market model

Farm industry models

- Three industries:
 - dairy
 - horticulture
 - mixed cropping and grazing
- Short run annual models:
 - fixed permanent entitlement
 - fixed maximum crop areas
 - fixed number of cows



- Horticulture and mixed farming: profit maximisers – is it better to grow crops or sell water instead?
- Dairy: cost minimiser – what is best mix of pastures versus grain to feed cows?



- Get optimal responses as a function of the temporary water market price.
- Varies with crop water demands
- Interesting point: optimal irrigation doesn't depend on allocations.
- Can also get a bid/ask price

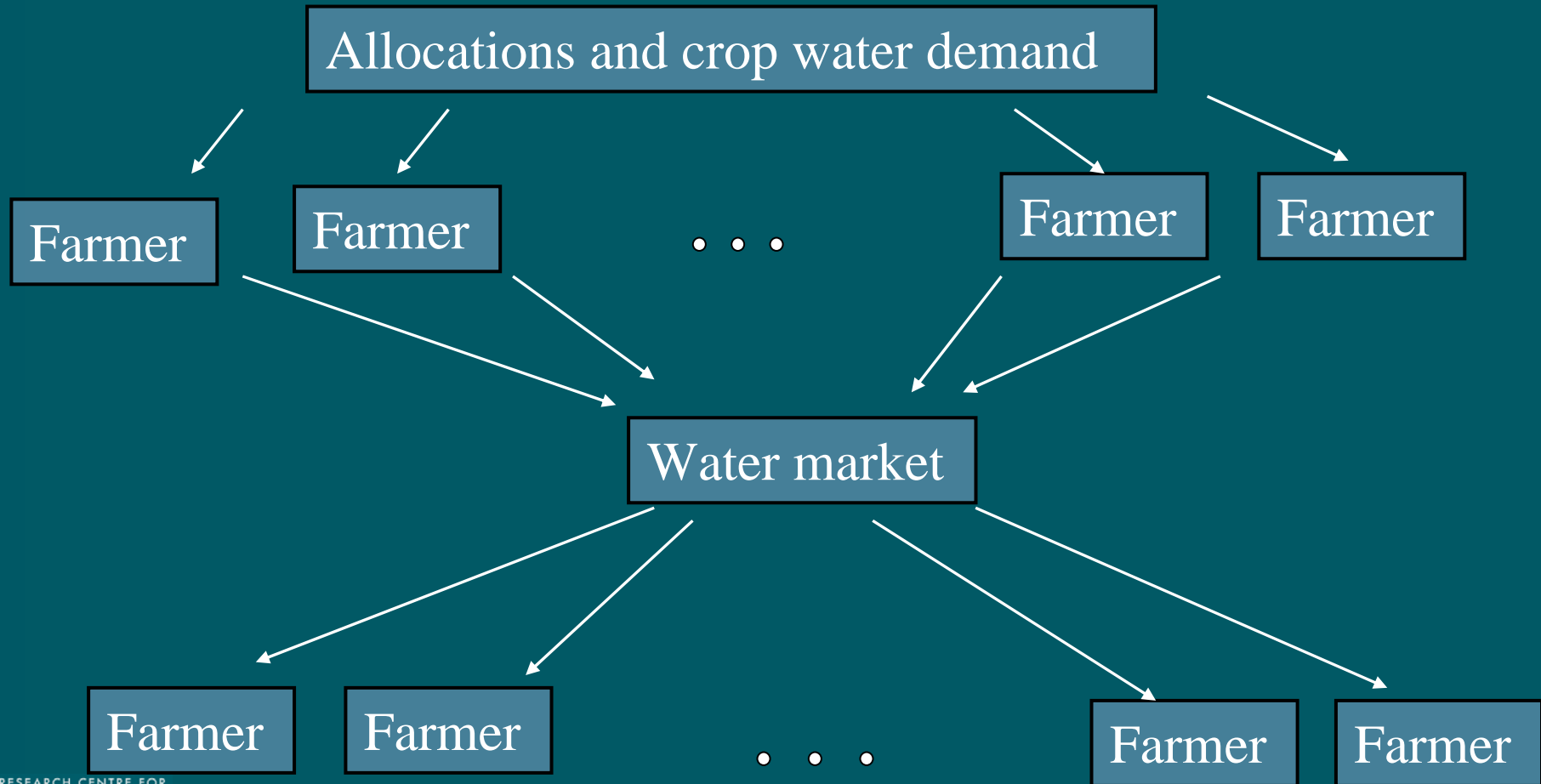


Water markets

- Benevolent dictator/Walrasian auctioneer
- Finds the market clearing temporary water market price
- Allocates from lowest value to highest value first



Modelling framework



Results for water markets

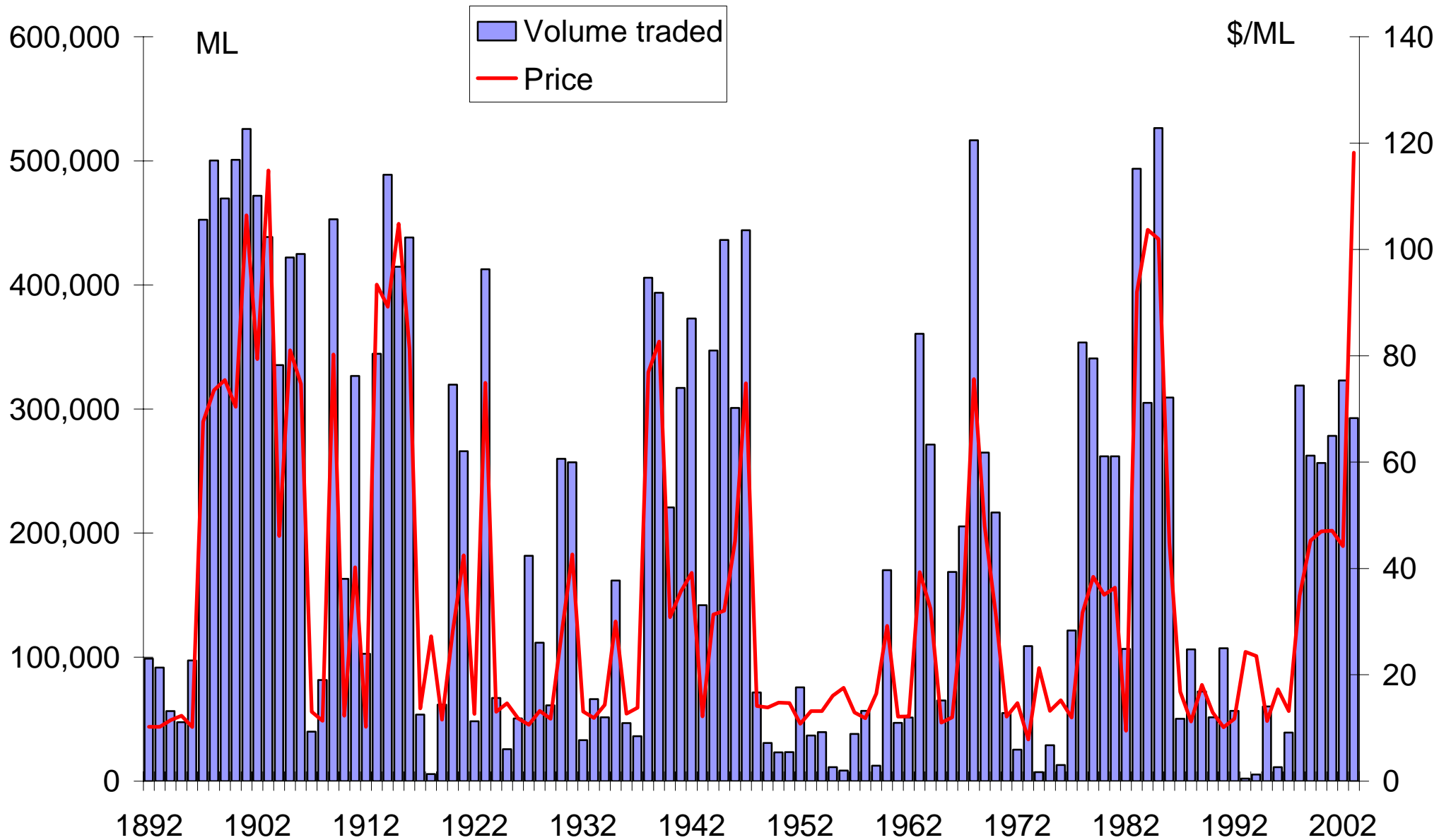
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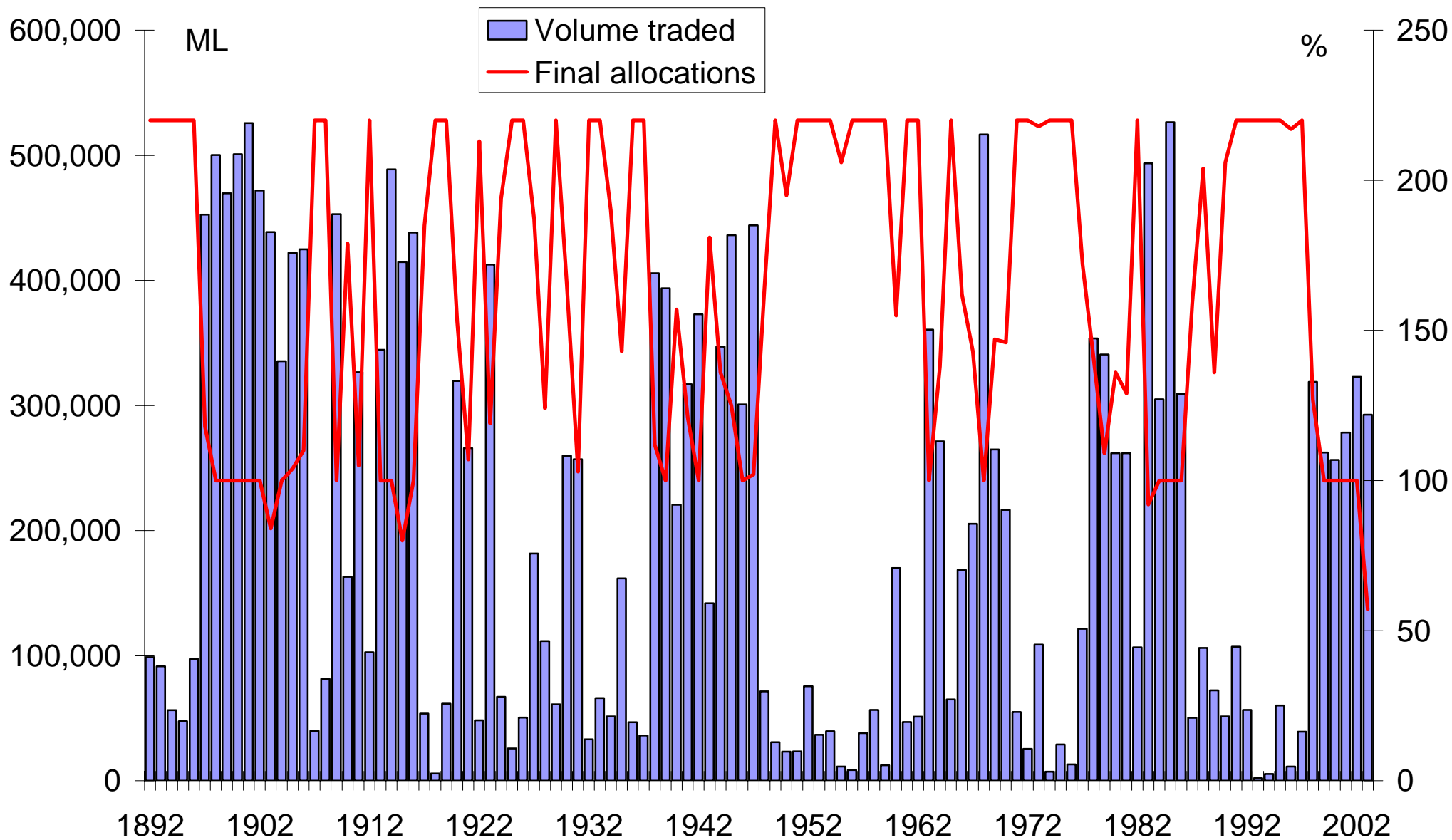
CATCHMENT HYDROLOGY

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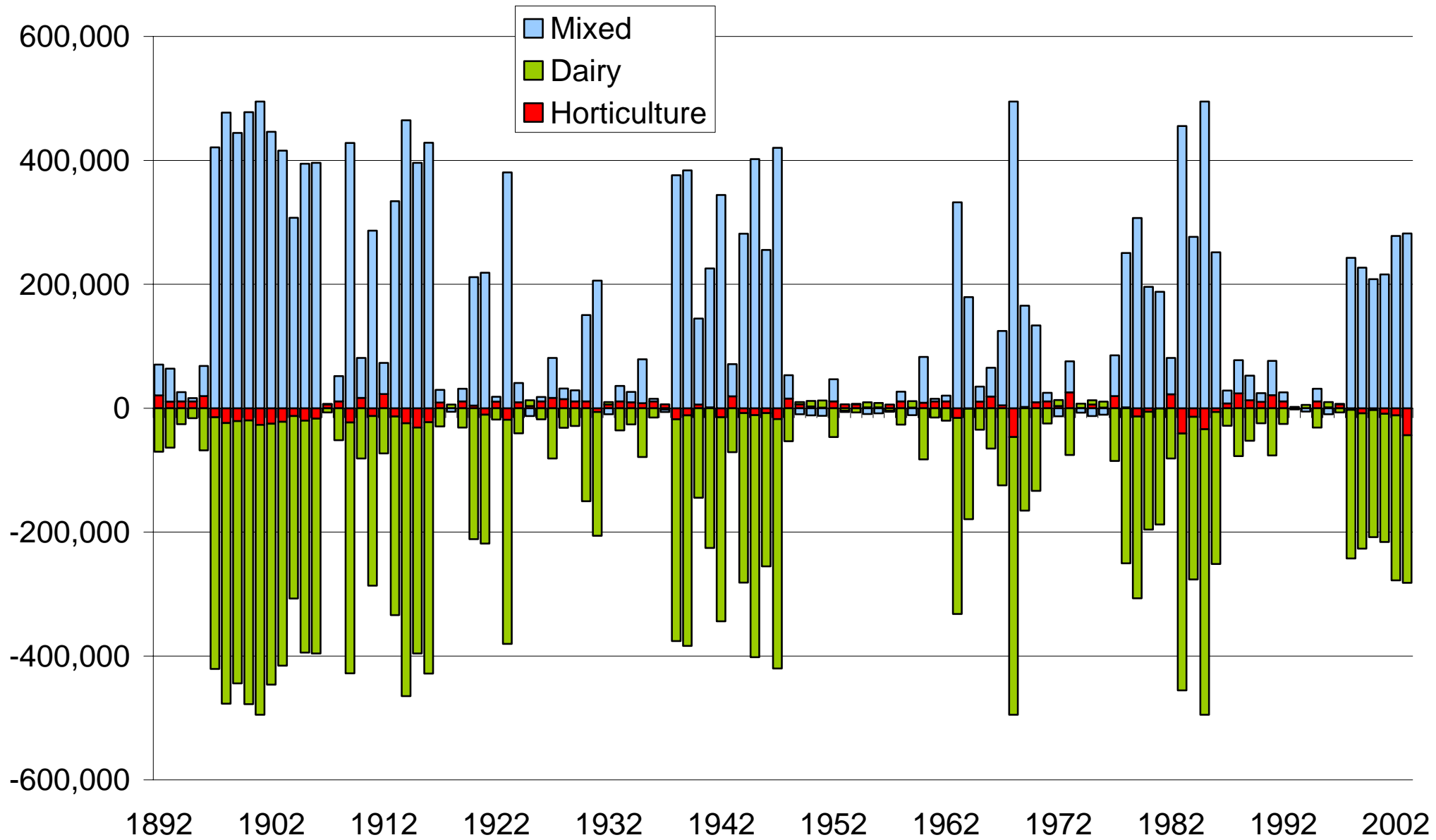
Price and volume



Trade and allocations



Trade by industry



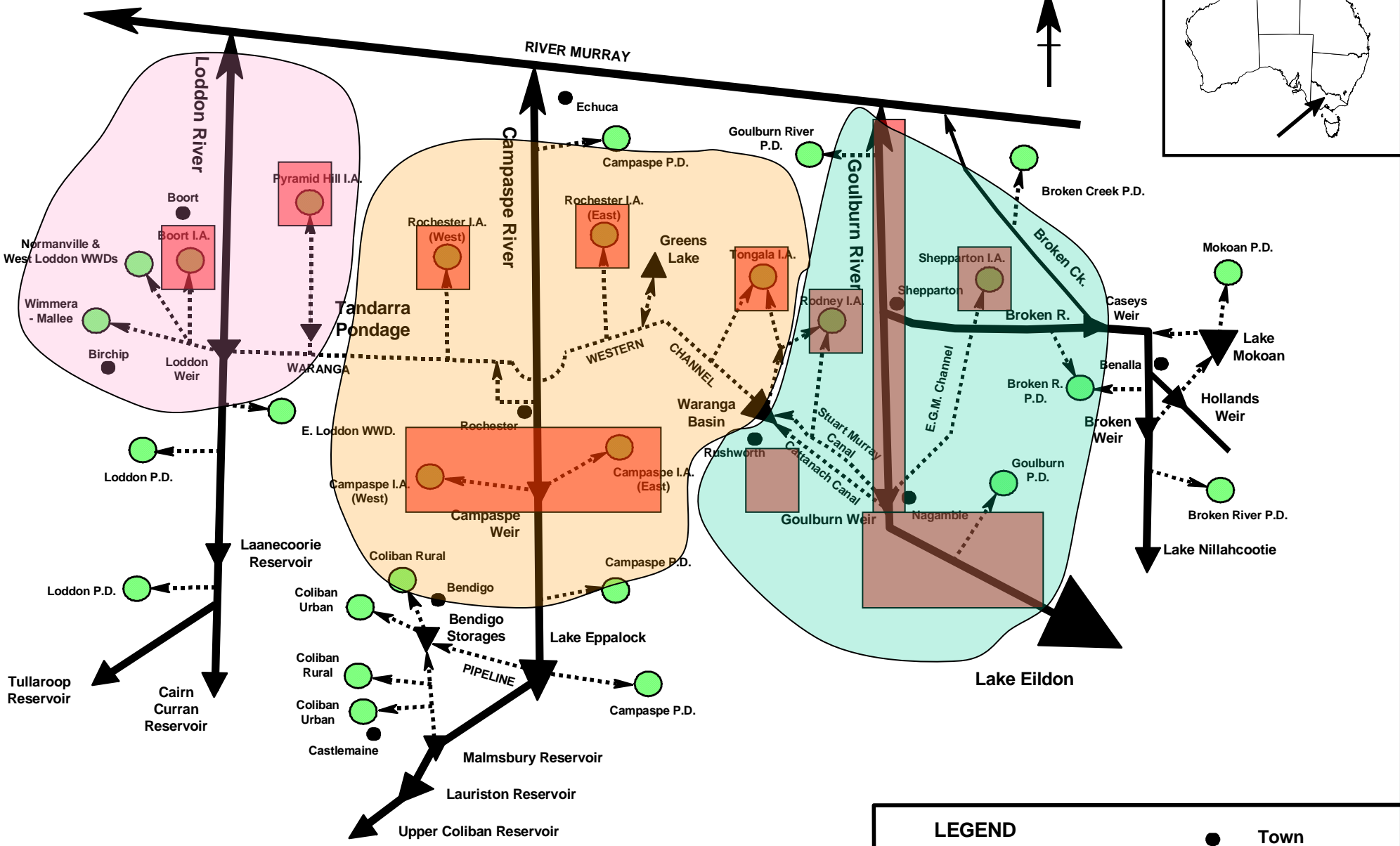
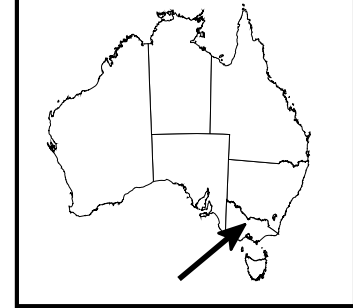
Results for water use

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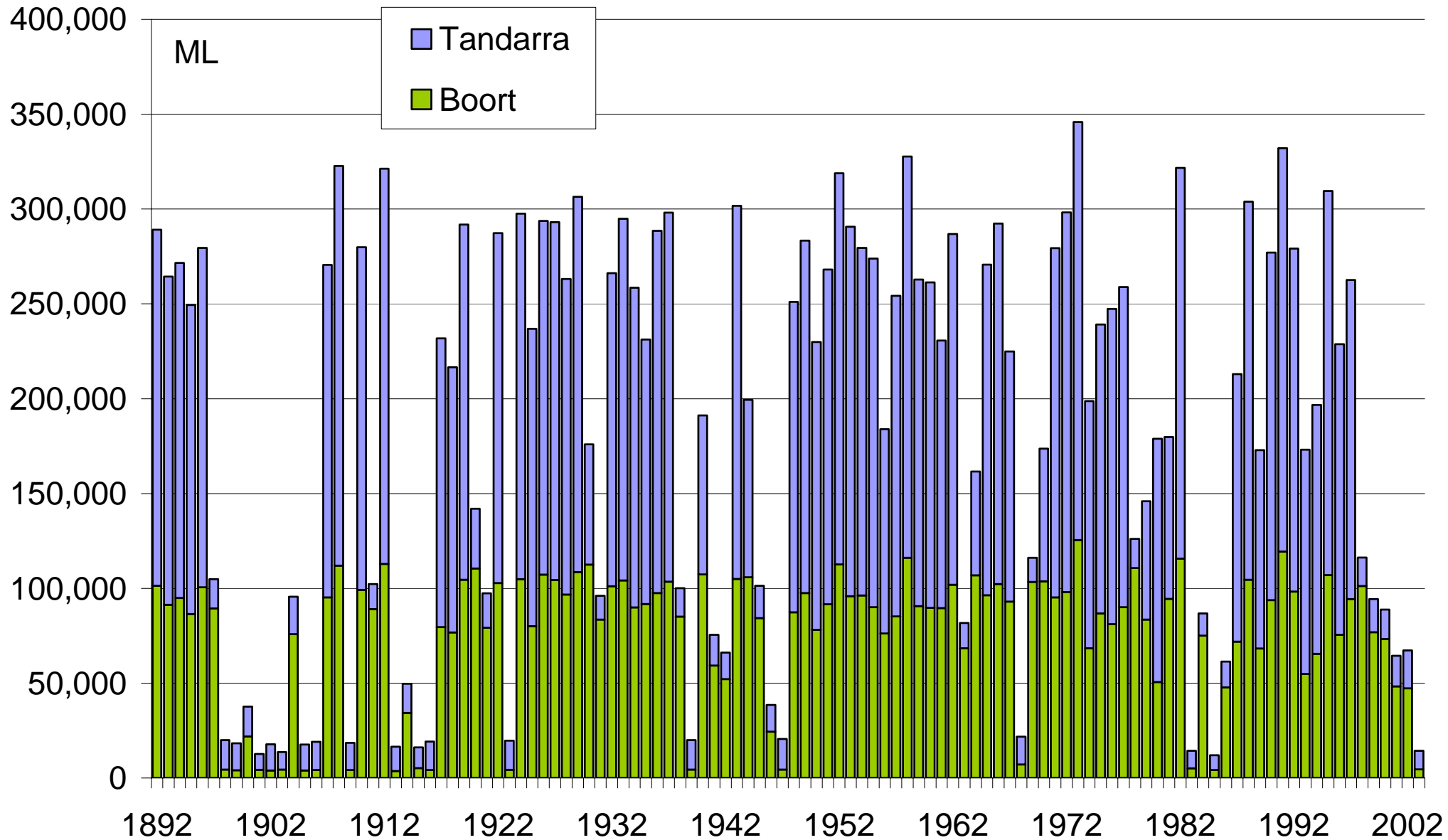


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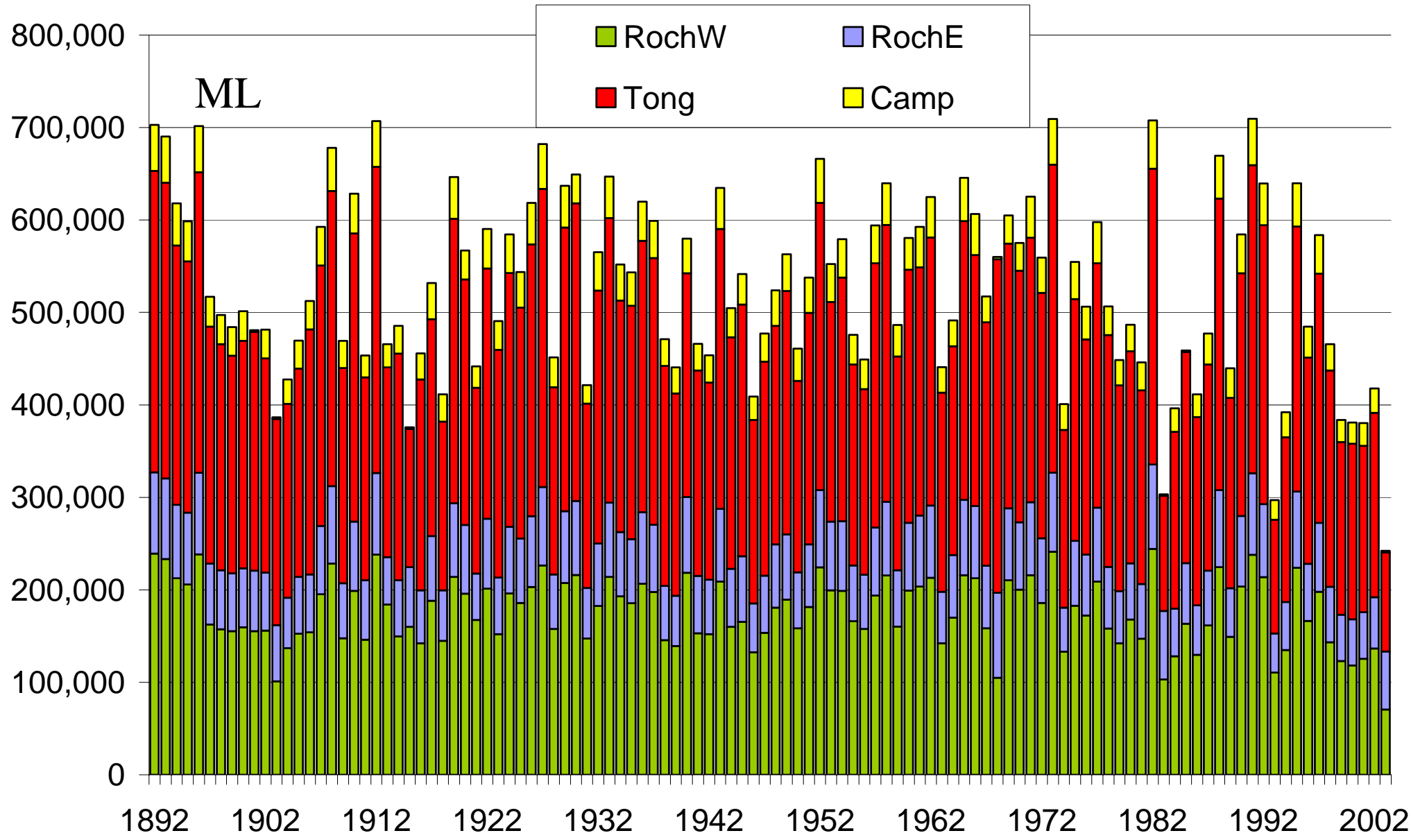
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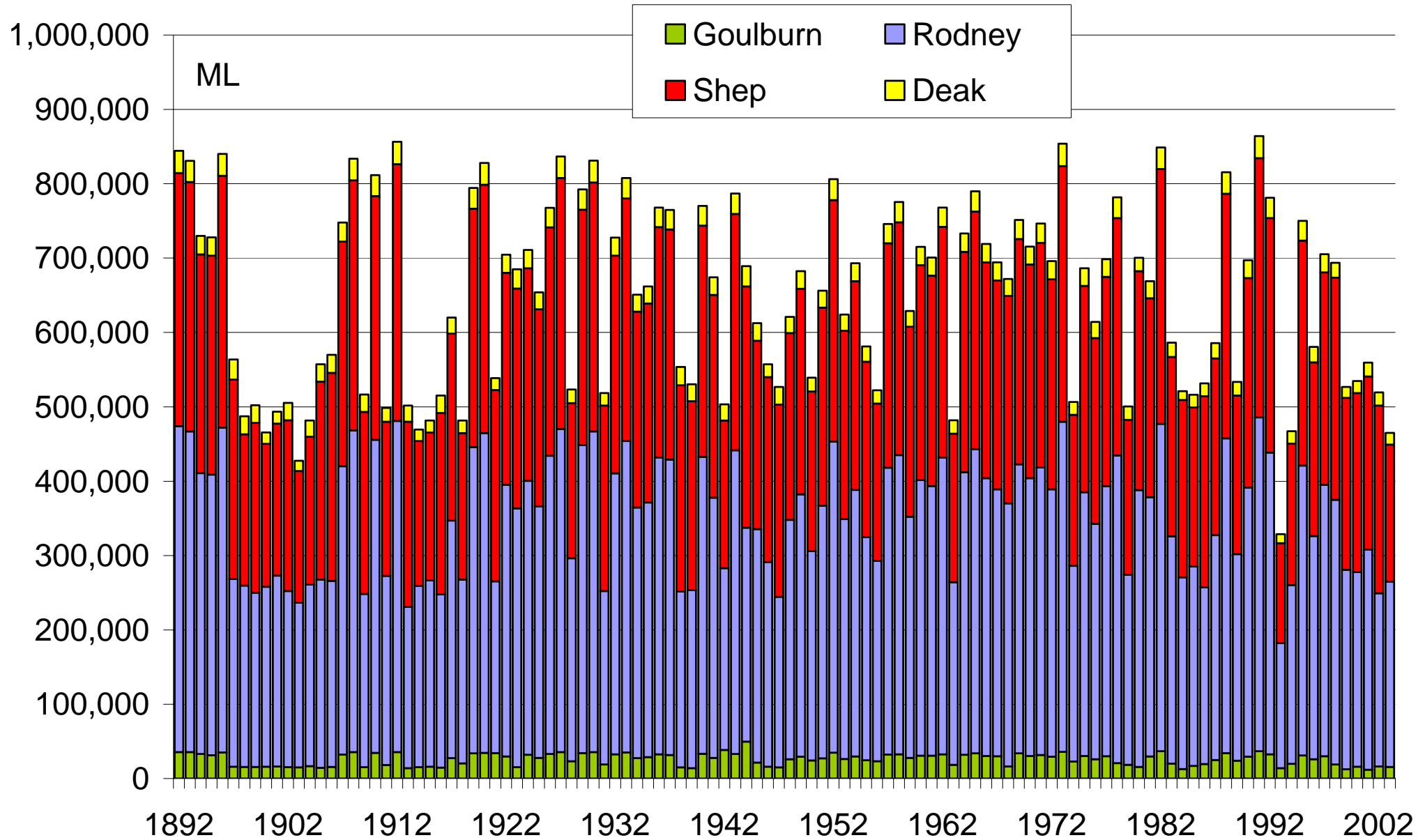
Western water use (mixed c&g)



Central water use (daily)



Eastern water use (a real mix)



Summary

- The amount traded and market clearing price vary a lot with hydroclimatic variables
- In some regions water use almost completely vanishes in high price years
- Implications of this variability...

