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Investing in Australia's water future: the economics challenges in MDB planning

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The challenge

- Water (services) demand grows and supply reliability is increasingly under threat,
- Technology is part of the solution
- But often has its own problems and negative feedback loops
- This leads to focus on efficient public and private management
- The MD Basin Plan recognises this – this talk outlines some of the economics science challenges

What are economics requirements of the MDBA plan?

- Basin water management that:
- **optimises: economic, social and environmental outcomes** (objective 3c, purpose 20d)
- **Maximise net economic return to the Australian community** (objective 3d(iii))
- Achieve **efficient and cost effective** water management and administrative arrangements (objective 3g)

Optimise economic to the entire Australian community?

Yes - outcomes are to be optimised include:

- Consumptive use and other economic uses of Basin water resources (21.4.c.ii)

- Social, cultural, indigenous and other public benefit issues (21.4.v)

- Meeting salinity and water quality objectives (purposes 20a&b)

Any thing else…

Additional mandatory items (section 22):

- Identification of risks to Basin water resource availability from: interception, climate change, limits to knowledge (item 3)
- Strategies to manage or address the risk identified in item 3 (item 5)

But wait, there's more…

economics (all) analysis for the plan have:

- Act on the basis of the best available scientific knowledge (21.4.b)
- Have regard for the national water initiative (21.4.c.i)

So are we (economists) up for it?

	knowledge/challenge
Consumptive use values:	
• Irrigation?	+++/-
• Urban water?	+/+
Water quality:	
• Salinity	+++/-
• Bluegreen algae	-/+
• Thermal pollution	-/+
Amenity, recreational values	++/++
other non-consumptive values	+/+++
Optimise net benefit given risks, variability?	--/+++

Managing water efficiently given risks, variability
The challenges of water infrastructure investment

Nature of the problem –

Water suppliers, irrigators face decisions to invest or disinvest in water provision infrastructure

These are long-term investments with high upfront cost that must be recouped over long time horizons

Future utilisation and investment returns are uncertain given inflow variability, climate change, and policy change

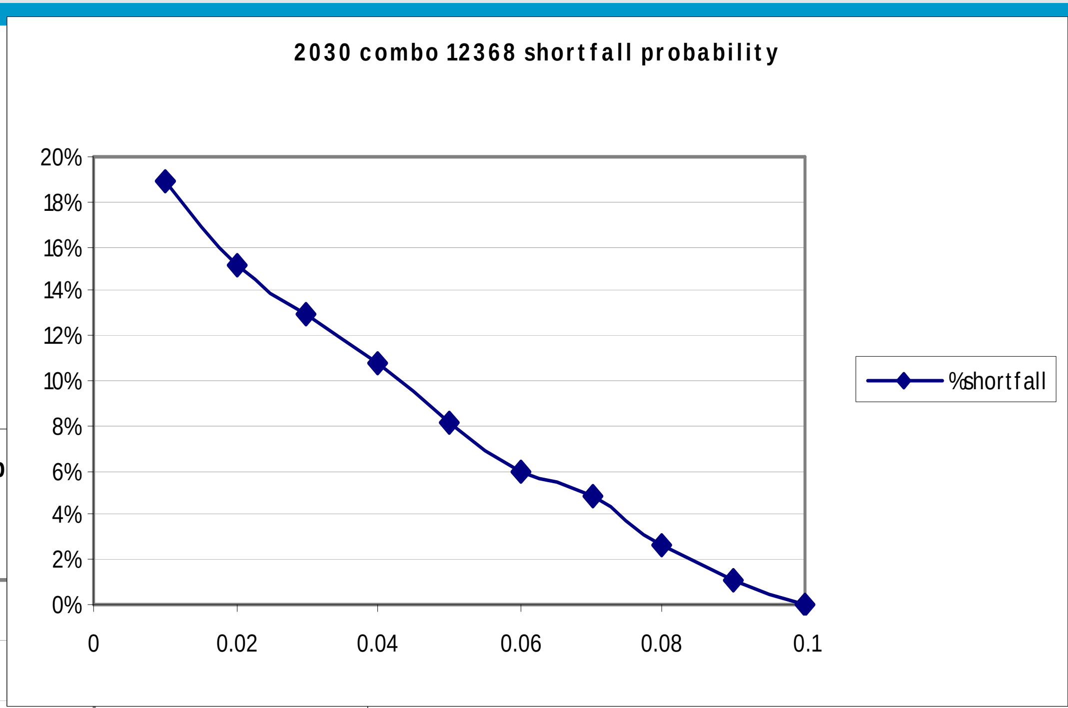
What to do – more rigorous stochastic risked based investment analysis and contingency planning

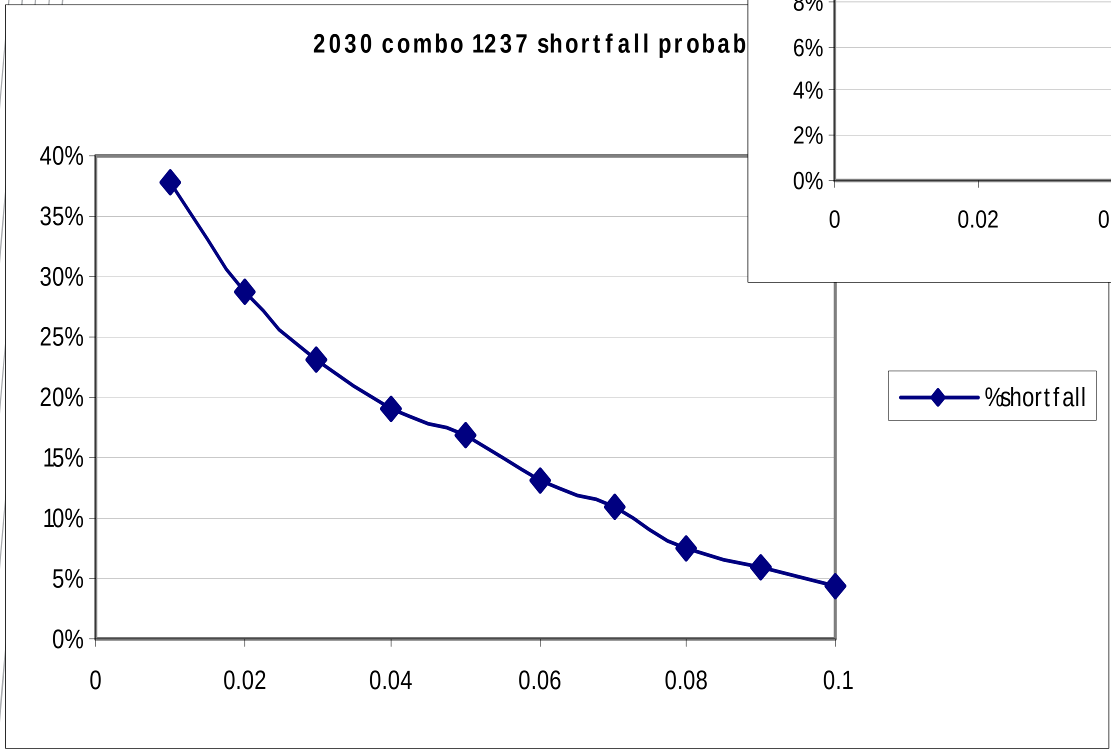
An Adelaide urban water example

Potential supplemental water supply sources for Adelaide

	Min	Median	Max	$/KL/yr
I. River Murray	52	109	115	1.15
II. All reservoirs in the Mount Lofty Ranges catchments	20	23	35	0.85
III Water savings from conservation efforts	105	117	166	1.08
IV. 50GL Desalination plant		137		3.30
V. 100GL Desalination plant		274		2.80
VI. Stormwater 20	26	55	58	1.30
VII. Stormwater 50	64	137	145	1.10
VIII. Recycled (waste) 20		55		2.09
IX. Recycled (waste) 50		137		2.00

Reliability profiles vary across supply source combinations





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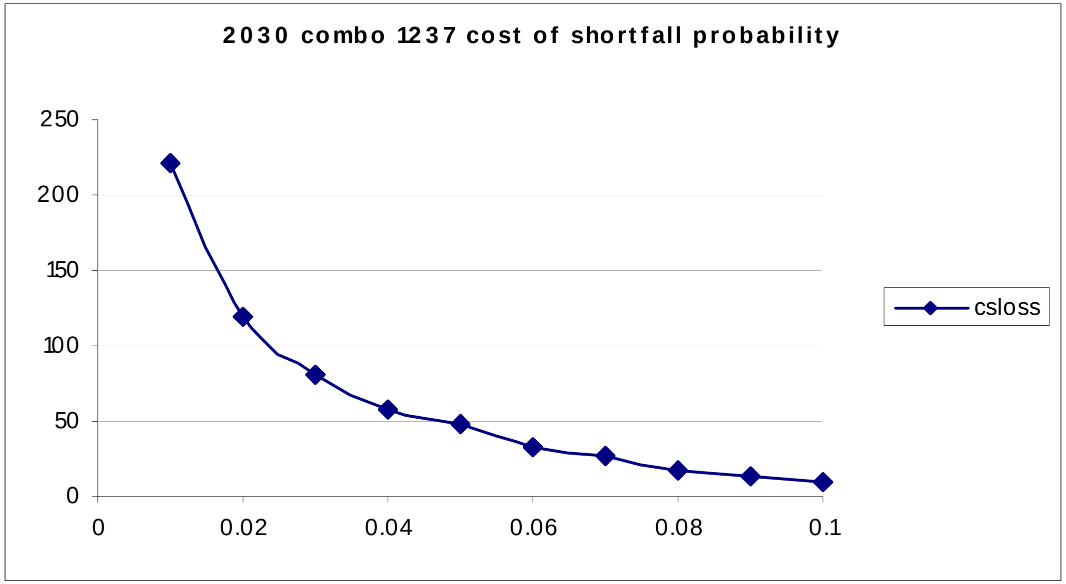
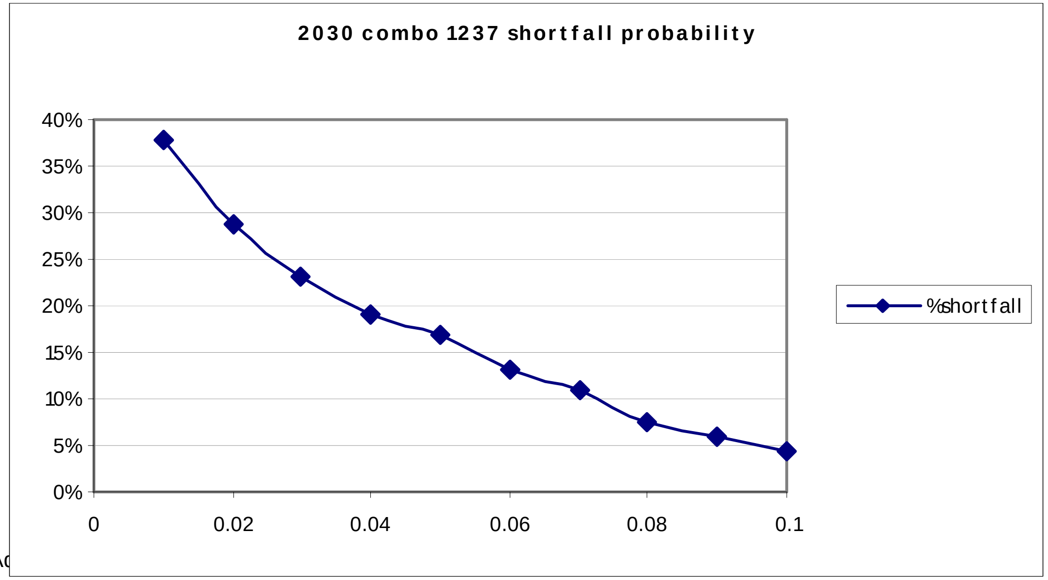
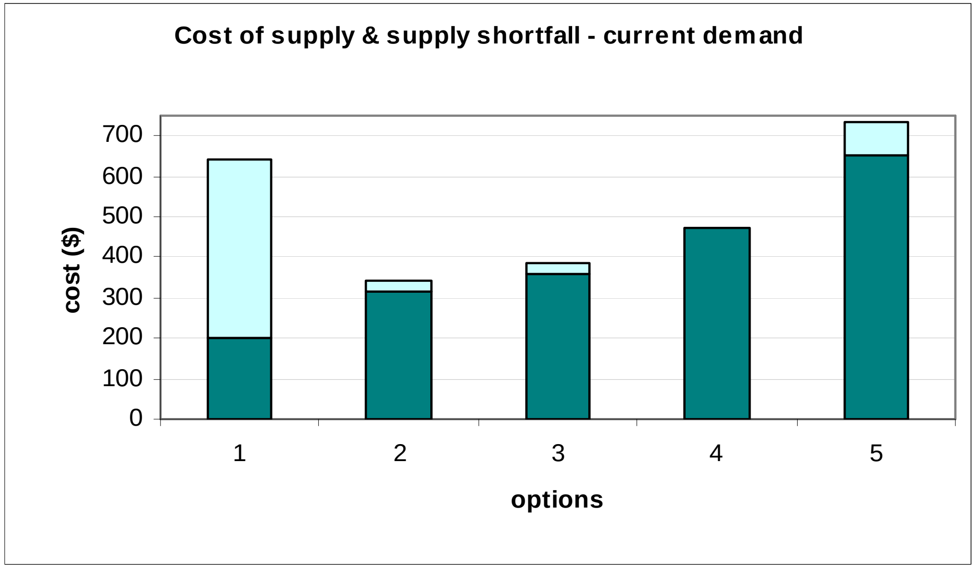
Reliability is about low probability high cost events





How much reliability should we invest in? when?



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The further challenges & economics science agenda in this space

- Stochastic, probabilistic supply, demand projections, including risks (climate, interception, etc.)
- Estimating reliability cost, benefit trade-offs for a wide ranging (including extreme) scenarios
- Adding investment sequencing
- Adding contingency planning cost benefit analysis

The Economics challenge of understanding “other values” of water

Total Economic Value

Use Values

Direct Use value

Outputs & services that can be consumed directly

Extractive: water for regional communities, pastoral and mining
Non-extractive: Tourism and recreation, aesthetic

Indirect Use Value

Functional benefits enjoyed indirectly

Positive: Research and education, indirect support for regional communities
Negative: Greenhouse gas emissions released with water extraction

Option Value

Future direct and indirect use

Quasi-option Value

Expected new information from avoiding irreversible losses from:

-Species
-Habitat
-Ecosystems
-Groundwater reserves

Non-use values

Bequest Value

Value of leaving use and non-use values to future generations

- Icon
- Species
- Habitat
- ‘Way of life’ connected to traditional uses
- Groundwater reserves

Existence Value

Value from knowledge of continued existence

- Icon
-Species
- Habitat
- Ecosystems
- Groundwater reserves

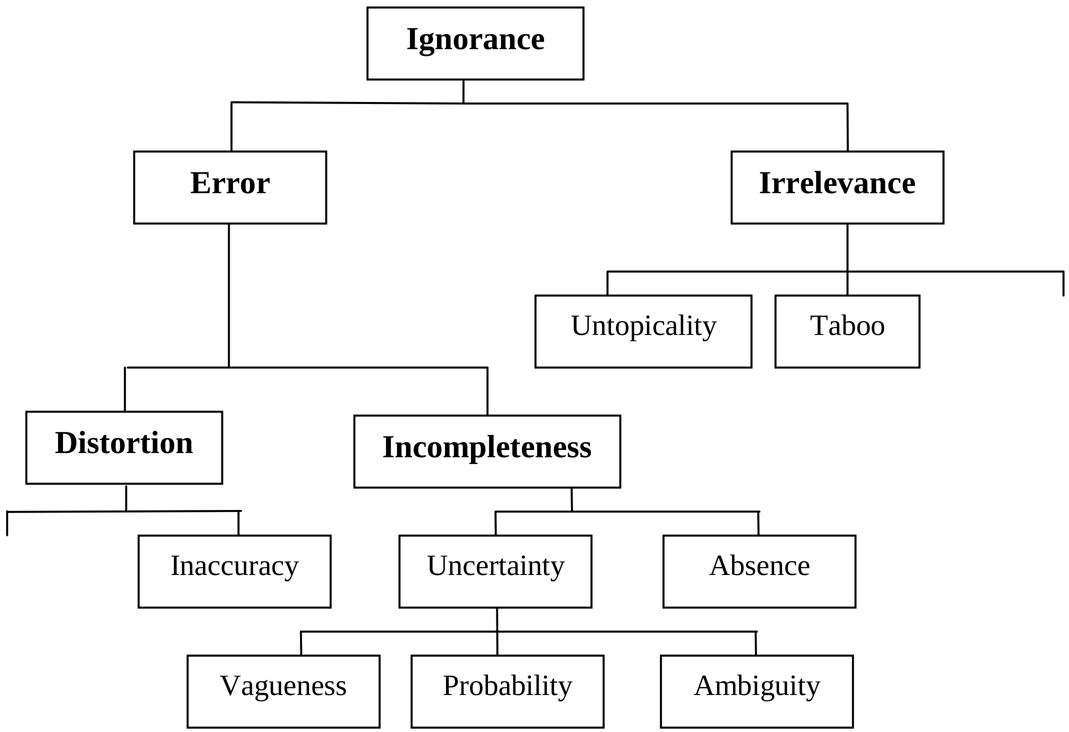
What we know about these values?

Study	Location	Attributes valued				
		Recrea-tion	Native veget-ation	Native fish	Colonial Waterbird breeding	Waterbirds and other species
1. Bennett, Dumsday, Howell, Lloyd, Sturgess and Van Raalte (2008)	Goulburn River	X	X	X		X
2. Bennett, Dumsday and Gillespie (2008)	Victorian River Redgum Forests, Murray River		X	X		
3. Bennett and Whitten (2002)	Upper South East	X				
4. Crase and Gillespie (2008)	Lake Hume, Murray River	X				
5. Hatton MacDonald and Morrison (2005)	Upper South East, SA		X			
6. Morrison (2002)	Macquarie Marshes		X		X	X
7. Morrison and Bennett (2004)	Gwydir and Murrumbidgee Rivers	X	X	X		X
8. Morrison, Bennett, Blamey and Louviere (2002)	Macquarie Marshes and Gwydir Wetlands		X		X	X
9. Morrison, Hatton MacDonald, Boyle and Rose (2010)	Murray River		X	X	X	
10. Rolfe and Dyack (2010)	Coorong and Barmah Millewa Forest (Murray River)	X				
11. Rolfe and Prayaga (2006)	Boondooma Dam, Bjelke-Petersen Dam and Fairbairn Dam, QLD	X				
12. Sinden (1988)	Ovens and Kings Rivers	X				
13. Whitten and Bennett (2001)	Murrumbidgee River		x	X		X

The challenges

- Expanding and generalising – related market “revealed preference” studies
- Understanding what people understand when we ask them about value, improving our questions

The challenge of asking about values

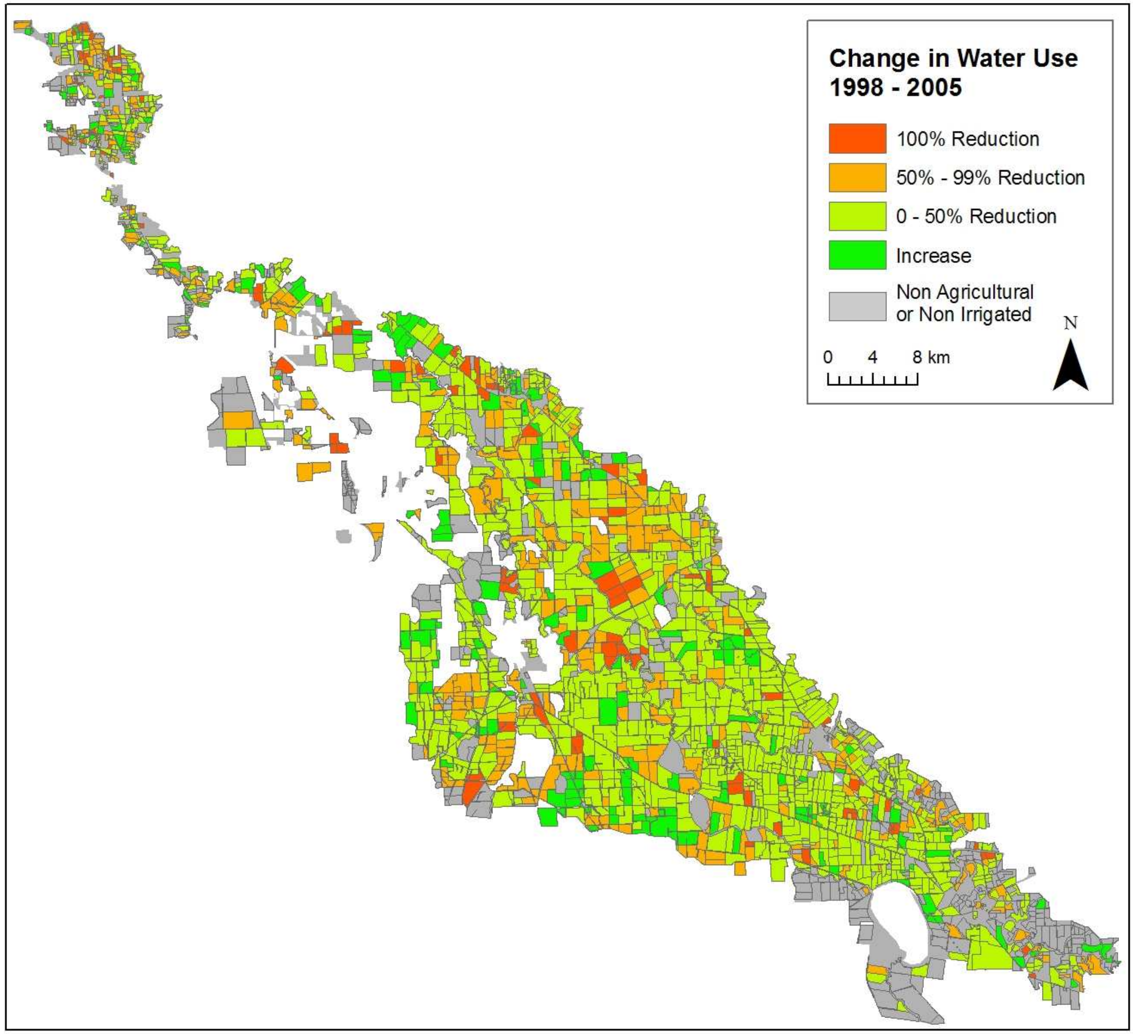


The Regional adaptation challenge landscape & economy renewal

- How would we optimally configure irrigation, landscape, regional economies in the MDB?
- Starting from scratch, with a blank slate
- Considering modern technologies, preferences, environmental preferences

Applying an asset based approach to regional adaptation strategy development

- Case study – Torrumbarry Irrigation Area, Victoria



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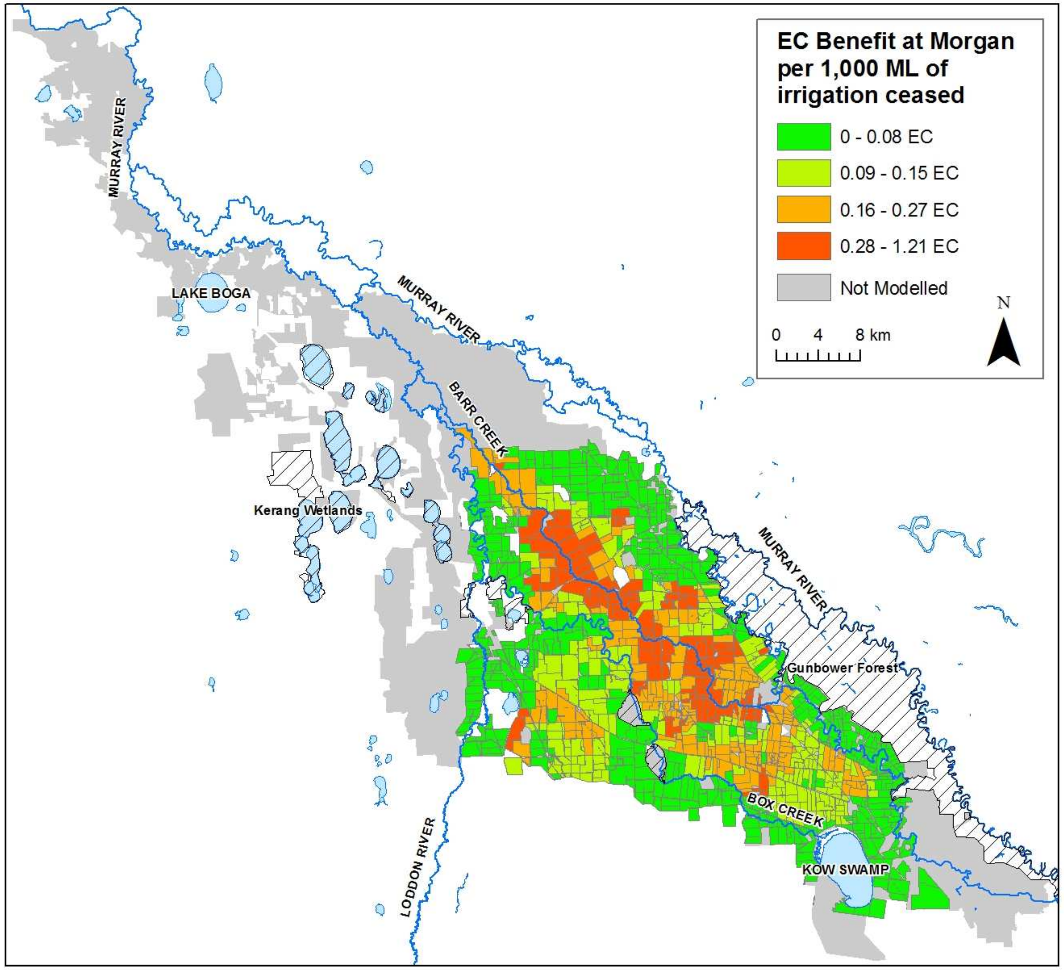
Environmental assets and threats

- Regional asset, the River Murray, local impact – Bar Creek, one of the largest sources of river salt load



Regional development assets in Torrumbarry

- Land suitability for irrigation
- Environmental and Potential Amenity Living:
  - Major Waterbodies
  - Native Vegetation
  - Residential Areas
  - 500m Buffer

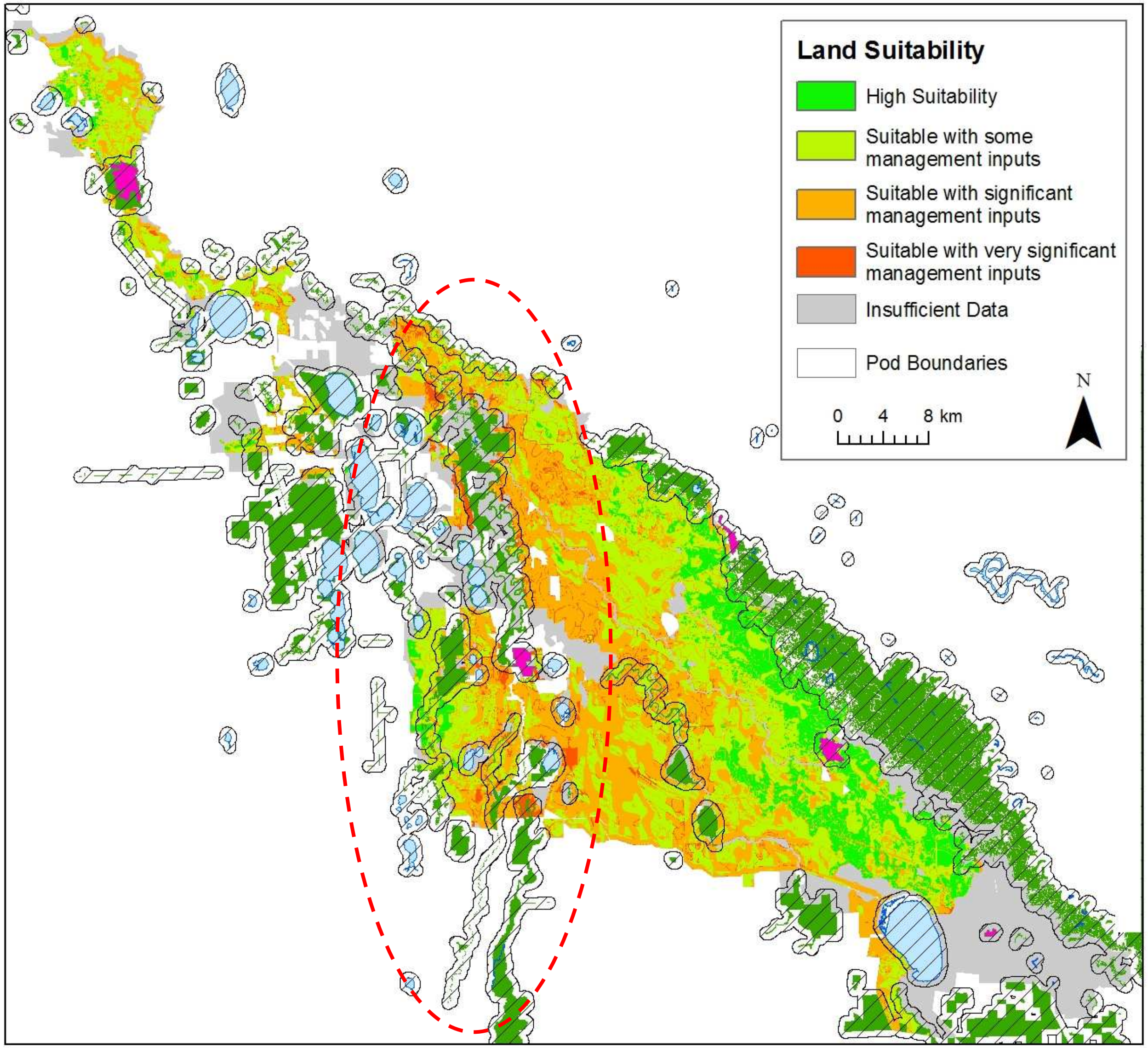


Figure 3. The decision tree used to spatially target properties for investment. The investment priority categories are identified by the red, amber and green coloured boxes.

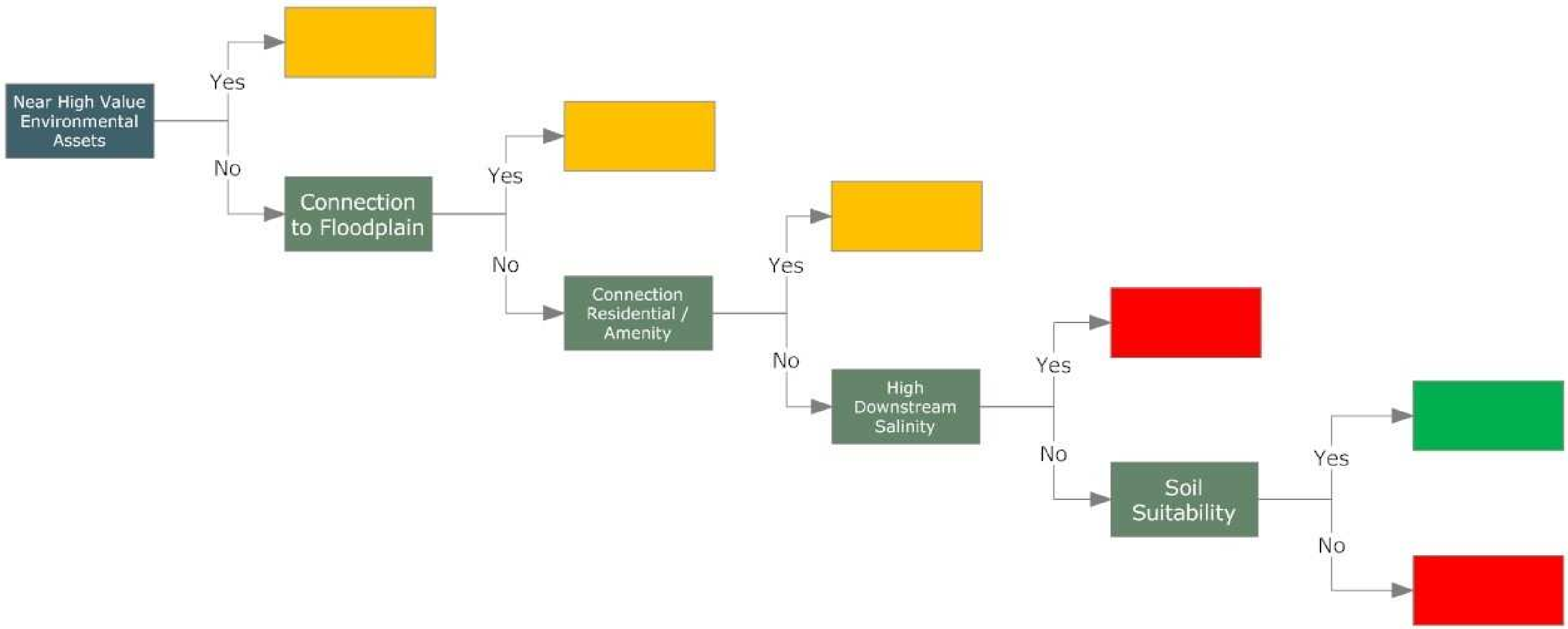


Table 2. Summary of ecosystem service values used in this study.

Variable	Description	Units	Values (AUS$)
River Salinity	Avoided costs of removing salt from the River Murray through cessation of irrigation	PV $/ML	0 – 4,823
Stable Climate	Value of carbon sequestered by reforestation of irrigation areas, assuming $AUS 20/tonne CO_2^{-e}	NPV $/ha	4,377 – 5,404
Productive Agriculture	Value of additional agriculture (dryland and irrigated) possible under reconfigured landscape	NPV $/ha	1,696 – 98,490
Environmental Flows	Value of water returned to the environment for increased flows	NPV $/ML	500 – 2,200
Recreation and Amenity	Value of reforested and restored landscapes for visual amenity and recreational enjoyment	PV $/ha	96 – 642

		Current	Non-Targeted	Targeted
NPV of Agriculture	Irrigated	$743.2	$642.0	$874.0
	Dryland	$34.7	$67.0	$88.3
	Total	$777.7	$709.0	$962.3
Ecosystem Service Values	Productive Agriculture[a]	n.a.	-$68.7	$184.6
	River Salinity	n.a.	$11.6 - $23.0	$26.9 - $53.5
	Stable Climate	n.a.	$0.0	$76.3
	Environmental Flows	n.a.	$31.6 - $139.1	$31.6 - $139.1
	Recreation and Amenity	n.a.	$0.0	$1.5 - $10.2
	Total	n.a.	-$25.5 - $93.4	$320.9 - $463.7
Water Delivery Cost Savings		n.a.	$0.0	$25.1
Total Benefit			-$25.5 - $93.4	$346.0 - $488.8
	Environmental Water (GL)	n.a.	61	61
	ECs Avoided	n.a.	5	13
	Carbon Sequestered (million tones $CO2^{-e}$)[b]	n.a.	0	10.6

Recommendations

- There is a possibility of public investment crowding out or distorting private investment.
- A sequencing is desirable: market forces first ahead of significant public investment infrastructure may be desirable.
- Opportunities for private sector in the process of landscape reconfiguration for multiple benefit.
- Facilitate local government planning capabilities to facilitate high value private investments, diversification.
- Technical support for impacted communities to allow understanding of change & “reconfiguration” responses

Questions and follow up

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