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Risk, assumptions and uncertainty

Mark Burgman

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THE UNIVERSITY OF MELBOURNE
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Taxonomy of uncertainty

Variability is naturally occurring, unpredictable change, differences in parameters attributable to 'true' or 'inherent' variation.

Also called 'natural variation', 'aleatory uncertainty'

Lack of knowledge about parameters or models. i.e, measurement error, systematic error, model uncertainty, subjective judgement.

Also called 'epistemic uncertainty'

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Linguistic uncertainty

- Ambiguity – words have two or more meanings, and it is not clear which is meant.
- Vagueness – borderline cases.
- Underspecificity – unwanted generality.
- Context dependence – a failure to specify context.

(Regan et al 2002)

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Threat Assessments

Threats to conservation assets

Table 14: Key Threats to Conservation Assets

	Threats Across Targets*	Coastal Dunes and Cliffs	Rivers, Creeks and associated Swamps	Heathy Forests / Woodland Communities	Grassy Woodlands	Temperate Grasslands	Southern, Relictual Mallee Communities	Northern, Intact Mallee Communities	Low Rainfall Woodland, Shrubland & Grassland Mosaic (<250mm)	Overall Threat Rank
Project-specific threats		1	2	3	4	5	6	7	8	
1	Climate Change (Extended periods of extreme drought / temperatures, sea level rise)	Medium	Very High	High	High	Medium	High	Low	Low	Very High
2	Weeds	High	High	High	High	Medium	High	Low	Medium	High
3	Impact of Historical land clearance	Medium	High	High	High		High			High
4	Incompatible stock grazing / access		High	Medium	High	Medium	High	Medium	Medium	High
5	Feral herbivores (rabbits, goats, deer, mice, rats) and over-abundant native grazing	Medium	Medium	Medium	High	Medium	High	Medium	Medium	High
6	Water extraction (dams, stock, domestic, bores, plantations, diversion)		Very High		-					High
7	Urbanisation (sub-division), industry, infrastructure & road construction/maintenance	High	Medium	Medium	Medium	Medium	High	Low	Low	High
8	Feral Carnivores (foxes, cats)	Medium	Medium	Low	Low		Medium	Medium	Medium	Medium
9	Coastal / shorebird habitat degradation (outside of region)	High								Medium

Eastern Mount Lofty Ranges Landscape, South Australia (from Greening Australia report)

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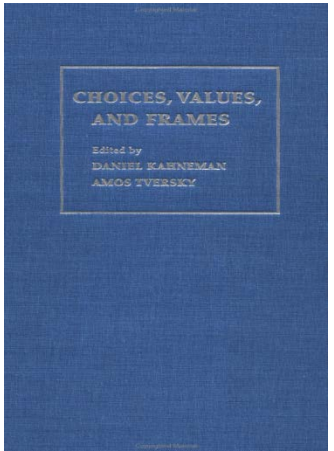
The psychology of risk perception

Judgements under uncertainty are coloured by...

- framing
- level of personal control
- understanding of the issues
- degree of personal experience
- dreadfulness of the outcome (kill size, outrage)
- equitability
- visibility
- prospects



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Cognitive Bias	Explanation
Anchoring	Rely too heavily on a starting value or past reference
Availability bias	Estimating what is more likely by what is more available in memory
Base Rate Neglect	Rely too heavily on specifics, ignoring general statistical information
Confirmation bias	Interpret new information in a way that confirms preconceptions
Overconfidence	**Excessive confidence in one's own answers to questions. For example, answers that people rate as "90% certain" turn out to be wrong 40% of the time**
Framing effect	Drawing different conclusions from the same information, depending on how that information is framed (e.g., number of lives saved Vs number of lives lost)
Sunk Cost bias	Justify increased investment in a decision on the basis of prior investment, despite new evidence that the decision was probably wrong
Group Think	Group members' strivings for unanimity override their motivation to realistically appraise alternative courses of action
There are LOTS more...	

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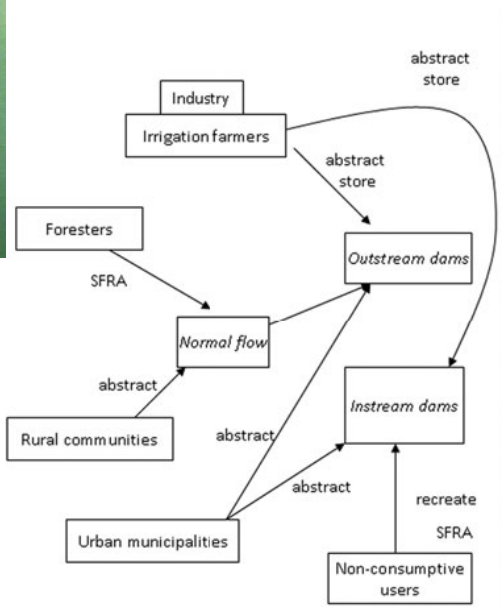
Motivational bias



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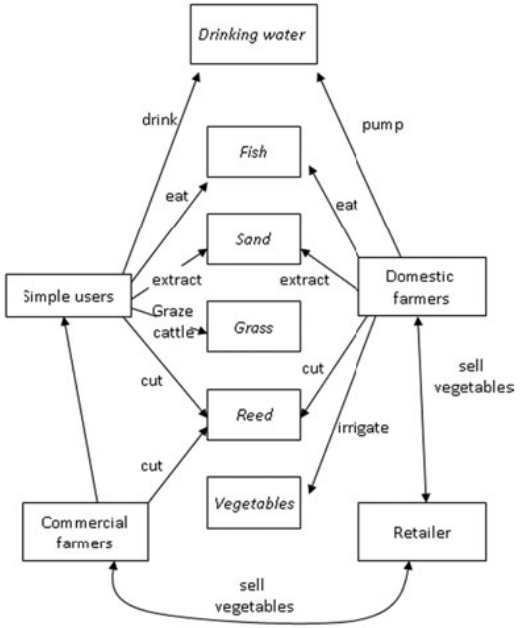

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Morena Mills

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Decision tables

'States' depend on context.

	State 1	***State 2***	
Act 1	*Outcome*$_{1,1}$	*Outcome*$_{2,1}$	…
Act 2	*Outcome*$_{1,2}$	*Outcome*$_{2,2}$	…

- Expected Utility of each act is the sum of the utilities for each State
- Utilities encompass costs and benefits in a single measure

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Rational decisions under risk

- Calculate Expected Utility of each Act, choose the highest EU

	State 1	State 2	State 3
	p=0.1	p=0.4	p=0.5
Act 1 (Cull)	1	5	6
Act 2 (No cull)	2	2	2

- MaxiMin Rule:
  - Identify the minimal outcome associated with each Act
  - select the Act with the largest minimal value.

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Rational decisions under uncertainty

- Characterise uncertainty of Acts, States

	State 1	**State 2**	**State 3**
	p=[0.05,0.15]	p=0.4	p=0.5
Act 1 (Cull)	[1,2]	[4,6]	[5,7]
Act 2 (No cull)	[3,5]	[2,3]	[2,3]

- MaxiMin Rule:
  - Identify the minimal outcome associated with each Act
  - select the Act with the largest minimal value.

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Tools for decision making

MCDA
(multiple criteria, social choices)