

Risk and Uncertainty in Environmental Economics: From Theory to Policy Practice*

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Outline

- **(Risk &) Uncertainty**
- **Why they matter?**
- **In theory (review)**
 - **Standard economic theory**
 - **Adaptations**
- **In practice: a case study**
 - **Guidelines**

Risk

- **Probability of the event occurring**
- **Effect of the event**
- **Event risk – i.e. if it happens, when will it happen and what will be the degree of impact/damage – e.g. a catastrophic event (also known as uncertainty)**
 - **Hazard, exposure & danger**
 - **Objective vs subjective risk**
 - **Exogenous vs endogenous risk**

Uncertainty

Radical uncertainty – is where objective (or subjective) probabilities cannot be assigned to outcomes and the full range of possible events cannot be identified

Ambiguity/ignorance/indeterminacy

Unknown unknowns

Why do they matter?

- **Can lead to poor decision making**
 - **Can mean higher costs to policy providers and society, even a decline in welfare**
 - **Can inhibit R&D**

In theory

- **Standard theories: e.g. EU theory; CBA; Precautionary Principle.**
- **Specific theories: e.g. Quiggin's RDEU; Real Options Analysis.**
- **Ideas from other disciplines: e.g. Prospect Theory.**
- **Lesser known concepts: SMS; Irreversibilities; Shackle's Model.**

(it is) typically argued that the way in which mainstream economic theory deals with decisions under uncertainty does not take “genuine” uncertainty into account

(Basili and Zappia , 2006)

(For examples see Lawson 1985, Langlois 1994, and Hodgson 2000).

In practice

- Need to work with and across disciplines
- Need to be flexible and adaptive
- Need to aim for cost efficiency and welfare maximisation
- Need to account for the public's perspective

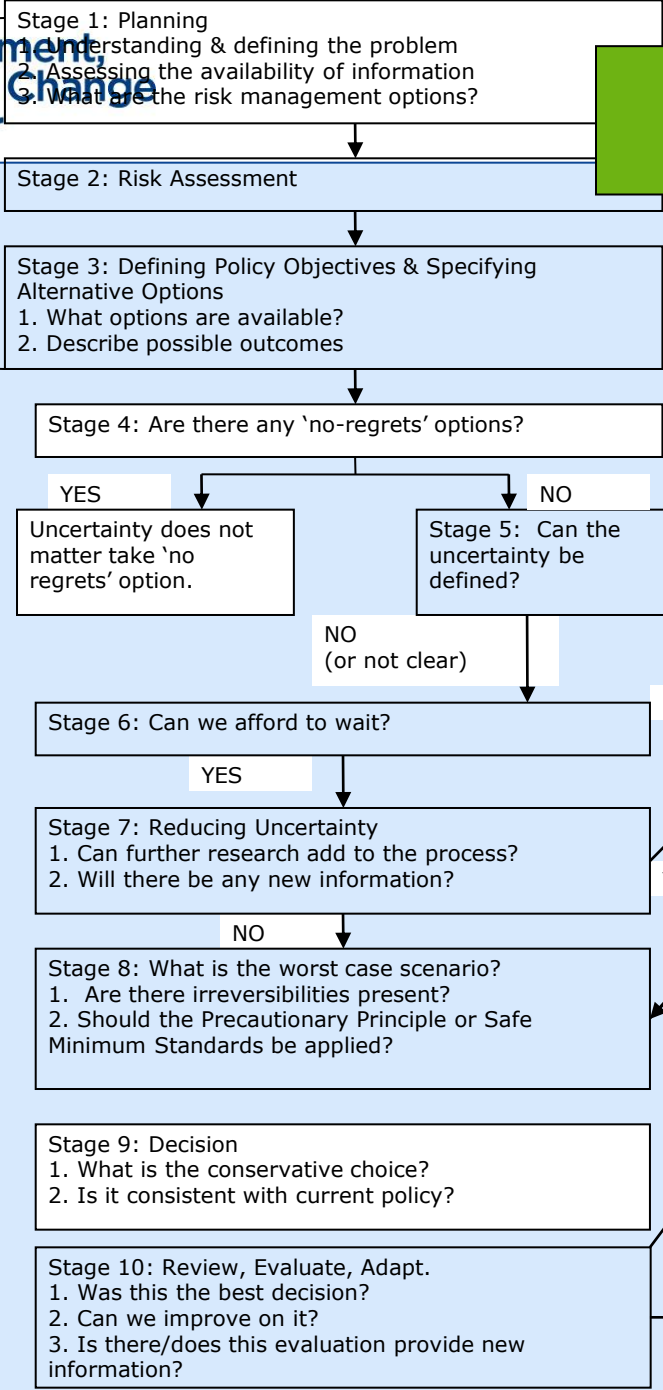
Guidelines for Best Practice Approaches to R&U



Case study: The MDB

When does uncertainty matter?

- **Size matters:** MDB large area (14% of Australia); 4 states & ACT; pop. > 2 mill.; 40% of Aust farms
- **Scope matters:** multi-dimensional issues: environ/resource/farming/economic livelihood/society etc
- **Perception matters:** big environmental issue – gaining popularity. Highlighted by climate change.
- **Perspective matters:** big environmental issue – gaining popularity. Highlighted by climate change.
- **Knowledge matters:** poor data monitoring environ & social perspective.
- **Time matters:** long term problem with big impacts.
- **Irreversibility matters:** damage already done.
- **Economics matters:** poor cost and benefit data available



CBA

Real Options Analysis; Value of Info Analysis

CBA

CBA

Stage 1: The Problem (wicked)
Needs to be clearly defined

- What's the problem?
- What info/data do we have?

Stage 2: RA

Stage 3: Policy Options
Needs to be clearly assessed

- National Water Initiative (2004)
- Howard funding
- "The Living Murray"
- The Water Act (2007)

If NO "END"



Stage 1: Planning
1. Understanding & defining the problem
2. Assessing the availability of information
3. What are the risk management options?

Stage 2: Risk Assessment

Stage 3: Defining Policy Objectives & Specifying Alternative Options
1. What options are available?
2. Describe possible outcomes

Stage 4: Are there any 'no-regrets' options?

YES
Uncertainty does not matter take 'no regrets' option.

NO
Stage 5: Can the uncertainty be defined?

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Stage 4: 'No regrets' option?
• Was there a simple solution – perhaps uncertainty does not matter? NO



Stage 5: Uncertainty?
Natural resource perspective
AND
Environmental perspective
AND
Climatic perspective
AND
Socio-economic perspective
AND
Regulatory perspective

NO (or not clear)

Stage 6: Can we afford to wait?

YES

Stage 7: Reducing Uncertainty
1. Can further research add to the process?
2. Will there be any new information?

NO

Stage 8: What is the worst case scenario?
1. Are there irreversibilities present?
2. Should the Precautionary Principle or Safe Minimum Standards be applied?

Stage 9: Decision
1. What is the conservative choice?
2. Is it consistent with current policy?

Stage 10: Review, Evaluate, Adapt.
1. Was this the best decision?
2. Can we improve on it?
3. Is there/does this evaluation provide new information?

If NO "END"

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Stage 6: Waiting?

- Can improve things in the LR. Waiting to regulate may be beneficial – more data, better understanding?
- Or is this just a cop-out?
- Could apply a Real Options Analysis to determine value of waiting.

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2. Will there be any new information?

YES

NO

Stage 8: What is the worst case scenario?
1. Are there irreversibilities present?
2. Should the Precautionary Principle or Safe Minimum Standards be applied?

Stage 8: Worst case scenario
•Are there irreversibilities present?
 •damage already done
•Should the PP or SMS be applied?
 •maybe if it had been?

Stage 9: Decision
1. What is the conservative choice?
2. Is it consistent with current policy?

YES

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If

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Stage 9: Good policy 'fit'?
• multi-dimensional once again

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Environment, Climate Change & Water

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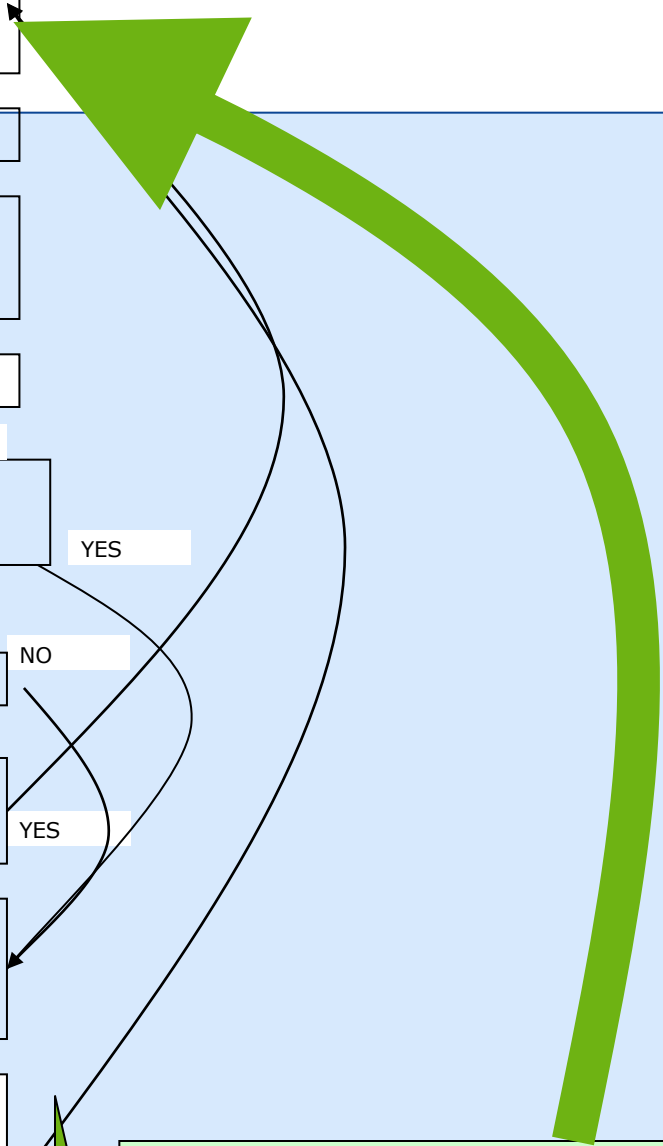
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Stage 10: Review & Revise
Needs to be more of this!



In summary:

- 1. Conventional one-shot ex ante economic analysis is inadequate where there are significant uncertainties;**
- 2. Economics becomes part of an on-going analytical/policy process;**
- 3. Continuing monitoring and re-evaluation becomes integral to economic analysis of policy with risk/uncertainty.**



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