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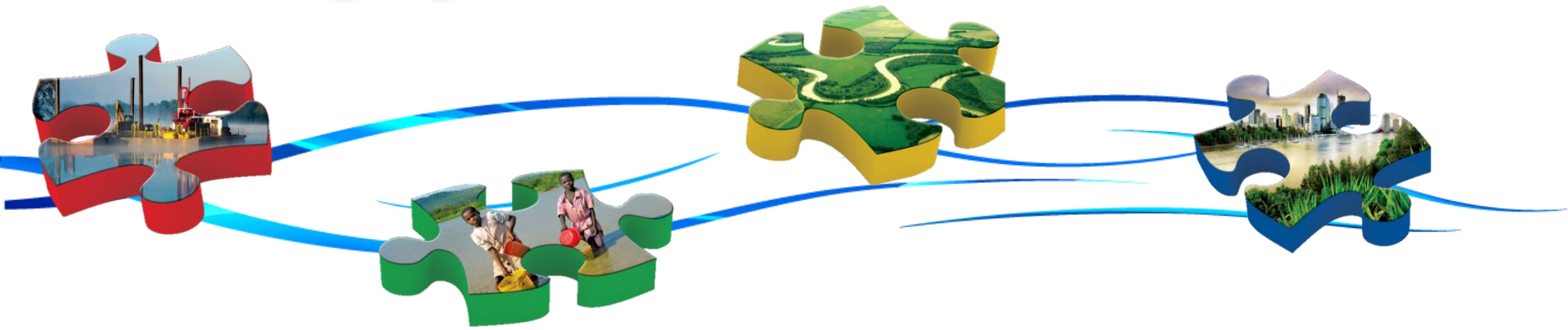


Understanding the value of resilience – lessons from the dismal science

Jim Binney

mainstream
economics and policy

The Value of Rivers

RIVERSYMPOSIUM

Presentation overview

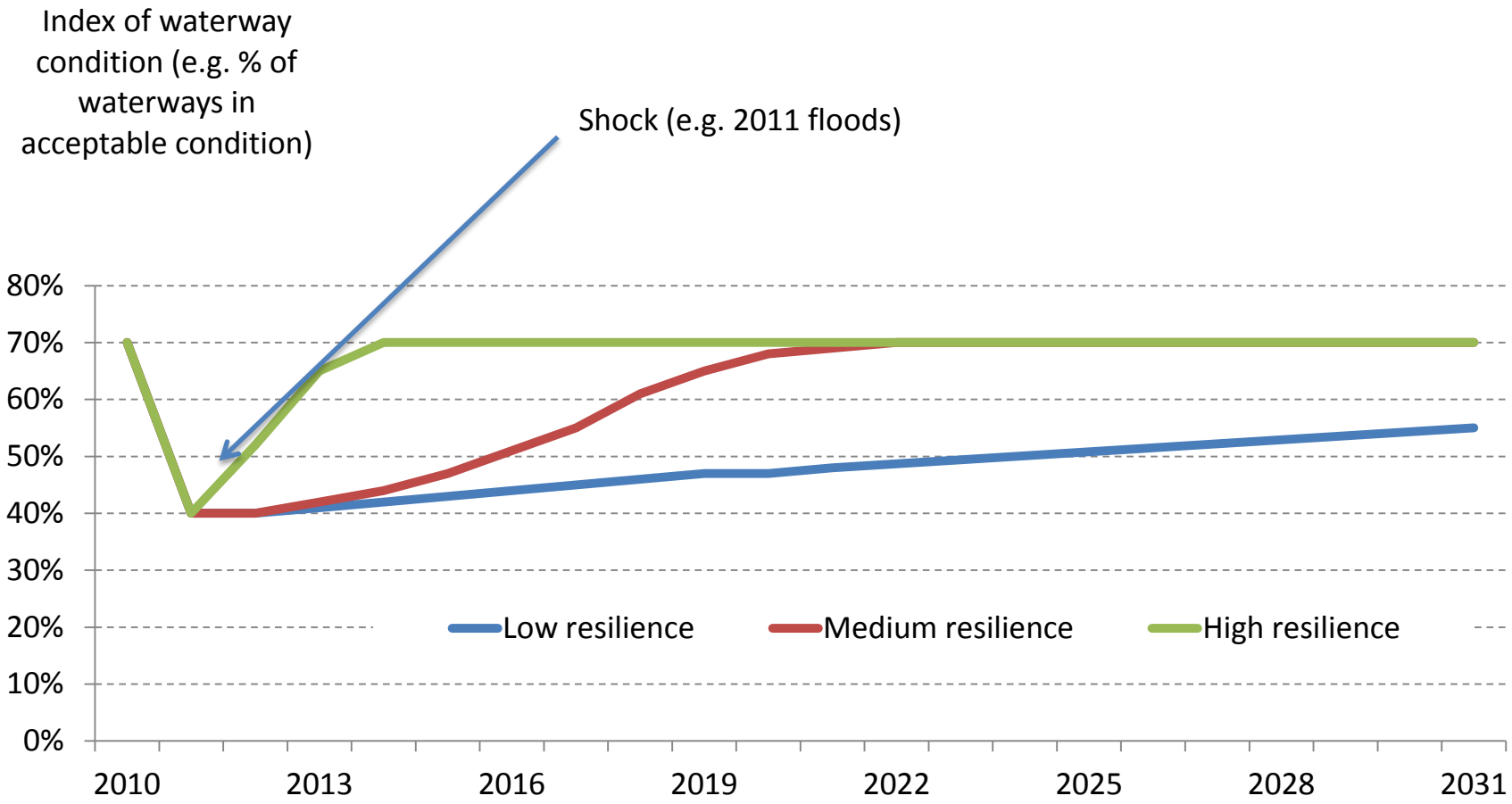
- Resilience meets economics.
- Economic values of waterways in SEQ.
- Value of waterway resilience - SEQ as a case study.
- Lessons from the dismal science.
- Discussion.

Resilience meets economics

Resilience meets economics

- *"A resilient ecosystem can withstand shocks and rebuild itself when necessary."* (Resilience Alliance)
- Economic benefit of resilience – value of reducing impacts from an external shock and recovering from it quicker.

Resilience – hypothetical example



2011 floods - financial impacts grab headlines, but tell us nothing about value of resilience

- January natural disaster damage cost and impacts significant. No SEQ region-specific impacts, but for Qld:
  - infrastructure damage estimates at $5-6 billion
  - mining sector earnings down $2.5 billion, agriculture down $1.1 billion, tourism down $600 million (PWC)
  - damage to private infrastructure still largely unknown.
- Note:
  - only relevant if resilience interventions would have reduced costs
  - values are gross financial impacts, not net economic costs
  - no consideration of natural assets
  - direct economic stimulus from repairs could boost final demand in 2011-12 by $10 billion (IBISWorld)
  - GSP growth estimated to be 1 ¾ per cent lower in 2010-11 due to floods, but ¾ per cent higher in 2011-12 due to repair stimulus (Qld State Budget) – flaw in national accounts logic.

Ingredients to estimate resilience

- To estimate economic benefits of waterway resilience we need to know:
  1. changes to the extent and condition of waterways over time from external shocks (e.g. flood)
  2. the differences in 1 depending on different degrees of resilience
  3. economic values associated with waterway health (need to have valuation data)
  4. an economic framework & approach for assessment.
- Plenty of focus on 1 & 2, but few hard results yet.
- Some existing data for 3 already.
- Simple economic tools available already.

Economic values of waterways in SEQ

Understanding the values of changes in asset condition and benefits that flow from waterway assets

Economic values – total economic value

- 3 dominant economic value types:
  - use (direct, indirect & option)
  - non-consumptive use
  - non-use
- Multiple values across multiple sectors and sectorial interests.

		Total economic value framework									
					Non-consumptive use values				Non-use values		
		Consumptive use values	Indirect use values	Option Value	Recreational	Aesthetic	Educational	Distant use	Existence	Bequest	Philanthropic
Primary industries	Irrigation	✓		✓							
	Farm use	✓		✓							
	Stock water	✓		✓							
Recreation	Primary recreation			✓	✓						
	Secondary recreation	✓		✓	✓						
	Visual appreciation		✓	✓		✓		✓			
Human consumption		✓		✓							
Industrial and mining use		✓		✓							
Cultural and spiritual values		✓	✓			✓	✓	✓	✓	✓	✓
Aquatic ecosystems		✓	✓	✓			✓	✓	✓	✓	✓

Economic values – ecosystem services

- Different types of waterway ecosystems services:
  - provisioning services (e.g. seafood, irrigated crops, water for consumptive use, hydropower etc)
  - regulating services (e.g. climate regulation, water purification)
  - supporting services (e.g. nutrient dispersal and cycling, primary production)
  - cultural services (cultural, recreation, scientific discovery etc.).
  - Ecosystem services descriptions tend to be generic – values typically context specific (location, assimilative capacity of receiving environment etc.).

Valuation approaches used for TEV & ES

- Many different valuation approaches used to value change:
  - avoided cost
  - replacement cost
  - factor income
  - travel cost
  - hedonic pricing
  - choice modeling
  - benefit transfer.
- Approach used depends on issue, decision to be made, data, resources etc.

What are SEQ waterways worth – consumptive & non-consumptive use values?

- No formal asset values available as relationships between asset condition & industry outputs uncertain. Gaps in knowledge:
  - only gross estimates available
  - relationships between resource condition & economic activity uncertain
  - degree of substitutability.

Sector	Current value ($M p.a)	Gross value of 1% change ($M) PV over 20 years
Agricultural & commercial fishing production (GVP)	1,400	100-110
Nature-based tourism (gross expenditure by visitors)	2,850	170-180
Nature-based recreation activity inc. fishing (gross expenditure by locals)	220	40-50

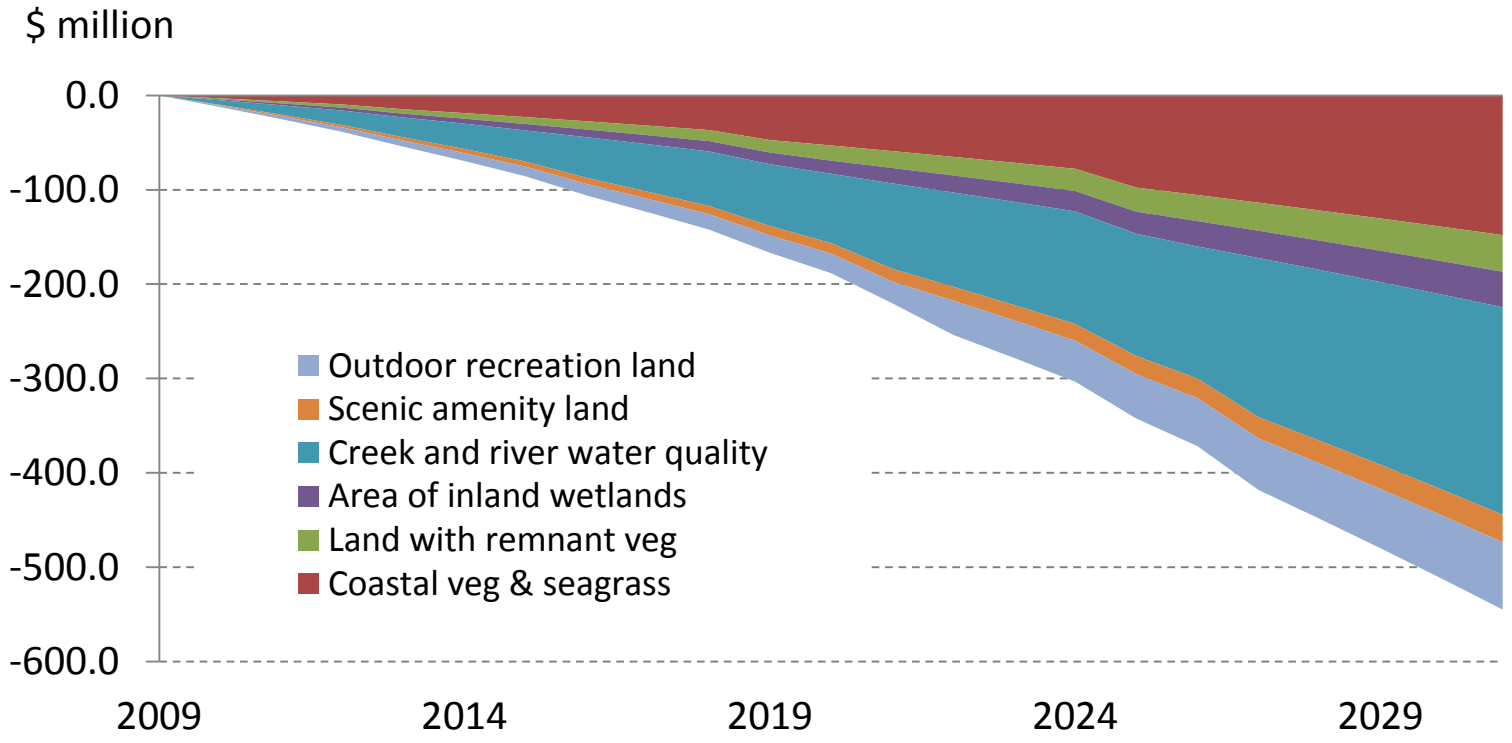
What are SEQ waterways worth – non-use values?

- No formal asset values available.
- Previous studies estimated:
  - economic value of avoiding decline in condition from BAU policy
  - costs of avoiding decline.

Item	Value ($M) PV over 20 years
Benefits of achieving NRM targets	
Inland water quality (social value)	1,300
Coastal & marine (social value)	590
Total benefits	> 1,890
Costs of achieving NRM targets	280
Net benefits	> 1,610
BCR	> 6.8

Waterways – high priority natural assets in SEQ

- Previous research shows high social cost of decline – particularly for waterway assets (non-linear values).



Value of waterway resilience in SEQ

Approach

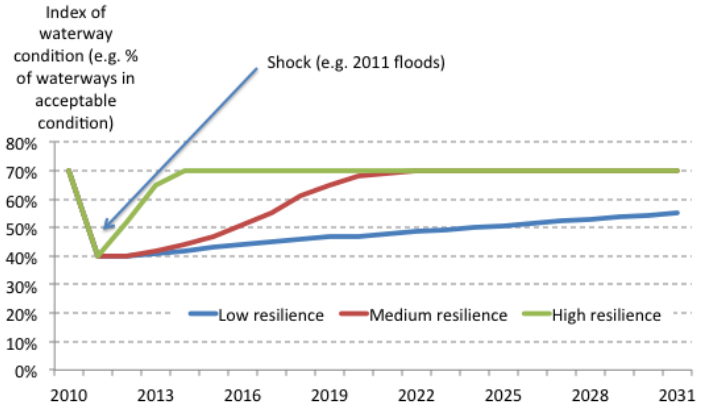
- Simple costs-avoided technique can be applied to estimate value of resilience benefits by comparing NPV of costs with varying degrees of resilience.
- Values drawn from previous studies.

Example one

Non-market values of enhancing resilience of waterways (rivers & creeks)

Approach & data

- Hypothetical as biophysical science not yet available.
- BOTE economic model (external shock event):
  - used marginal economic values of change in waterway health from choice modeling study (HH WTP to avoid marginal declines in condition)
  - calculated annual costs attributable to loss in condition (using household forecasts)
  - estimated NPV of 3 scenarios
  - compared NPV to estimate benefits of resilience.
- Estimated value of random occurrence (1 in 50 year event).



Results

- Significant benefits from enhancing resilience – largely diffuse.
- Benefits additional to just maintaining or enhancing baseline condition.
- Framework and data allows assessment of marginal benefits of investment.
- Could incorporate into formal investment appraisal.
- Can estimate benefits under uncertainty.
- Benefits likely to rise under CC.

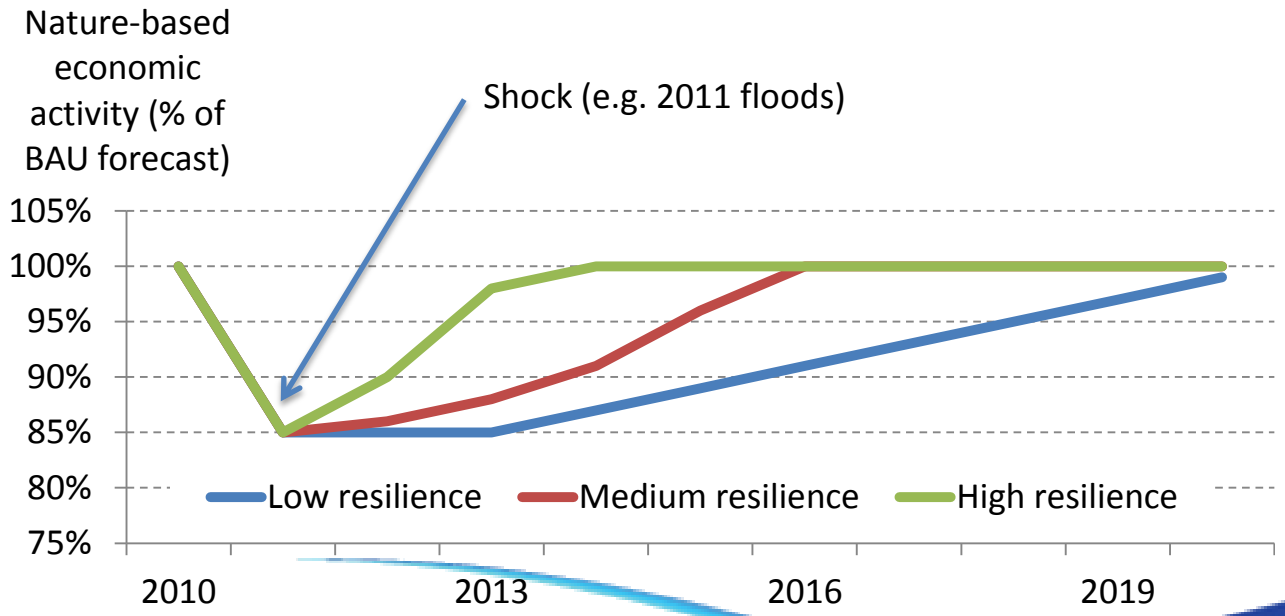
	Resilience		
	Low	Med	High
The shock event			
PV damage ($M)	138	65	19
Resilience benefits ($M)	N/A	73	119
Random occurrence			
1 in 50 year event ($M)	N/A	30	48

Example two

Reduction in nature-based tourism activity

Approach & data

- Benefits from resilience come from shorter disturbance to access and use of waterways as key driver of nature-based tourism activity.
- Expenditure based on Tourism Qld, ABS data & MainStream estimates of tourism sector attributable to nature-based tourism activity.
- Industry growth prospects from Tourism Forecasting Council.



Results

- Tourism activity likely to shift temporarily to other "substitute" regions.
- Substitution out of SEQ significant.
- Note: substitution is gross impact & does not equal change in economic surplus.
- Significant benefits from resilience, but often diffuse across much of economy.

	Resilience		
	Low	Med	High
The shock event			
PV reduced turnover ($M)	2,200	1,350	700
Resilience benefits ($M)	N/A	850	1,500
Random occurrence			
1 in 50 year event ($M)	N/A	350	600

Lessons from the dismal science

Lessons & policy implications

- Financial values from major events typically don't help understand value of resilience unless ecosystem reduces damage in the first place.
- Resilience likely to have significant economic benefits – additional to baseline benefits.
- Multiple types of benefit streams.
- Can build on emerging physical science & establish economic assessments and business case for enhancing resilience (including insight into risk & uncertainty).
- Put resilience and natural infrastructure on same decision making basis as built assets.
- Benefits & costs won't be linear, so significant efficiency gains from risk assessment & targeting investment.
- Financing investment in resilience still a challenge given diffuse nature of benefits.
- Challenge for science community – estimating timing of bounce back.

Discussion

e: jim@mainstreameco.com.au

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