Climate Adaptation Flagship

Science and solutions for Australia and the global community

Economic tools for coastal decision making

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SCCG – ABC of Coastal Economics, Bondi Beach 28 November 2013

Structure for this talk...

1. From vulnerability to adaptation
2. The CAPs projects – overview
3. The use of economics approaches
4. Review of the CAPs
5. What's around the corner?

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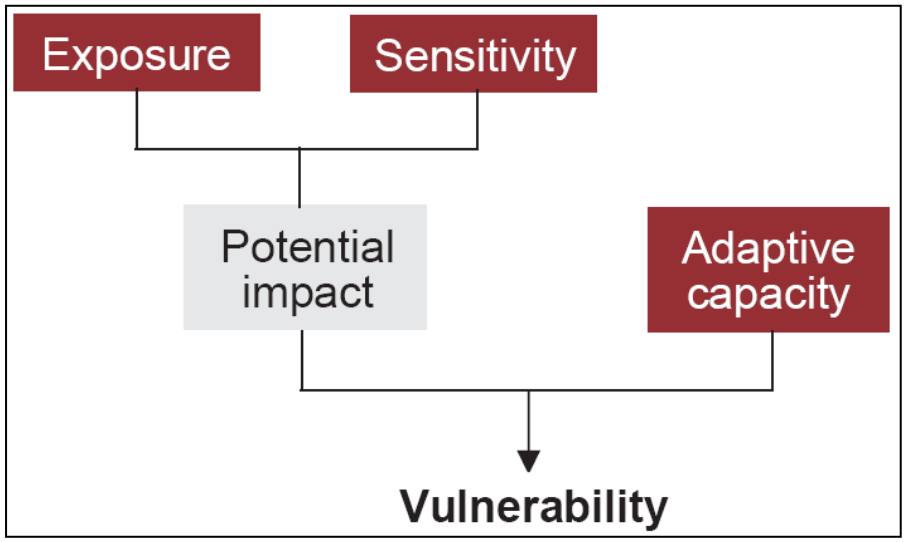
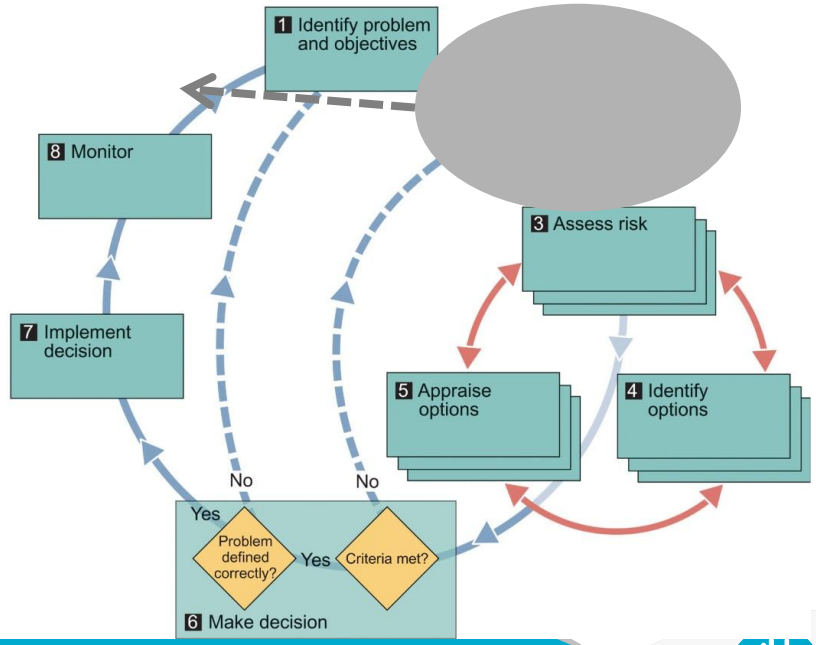
Climate or decision-centred??

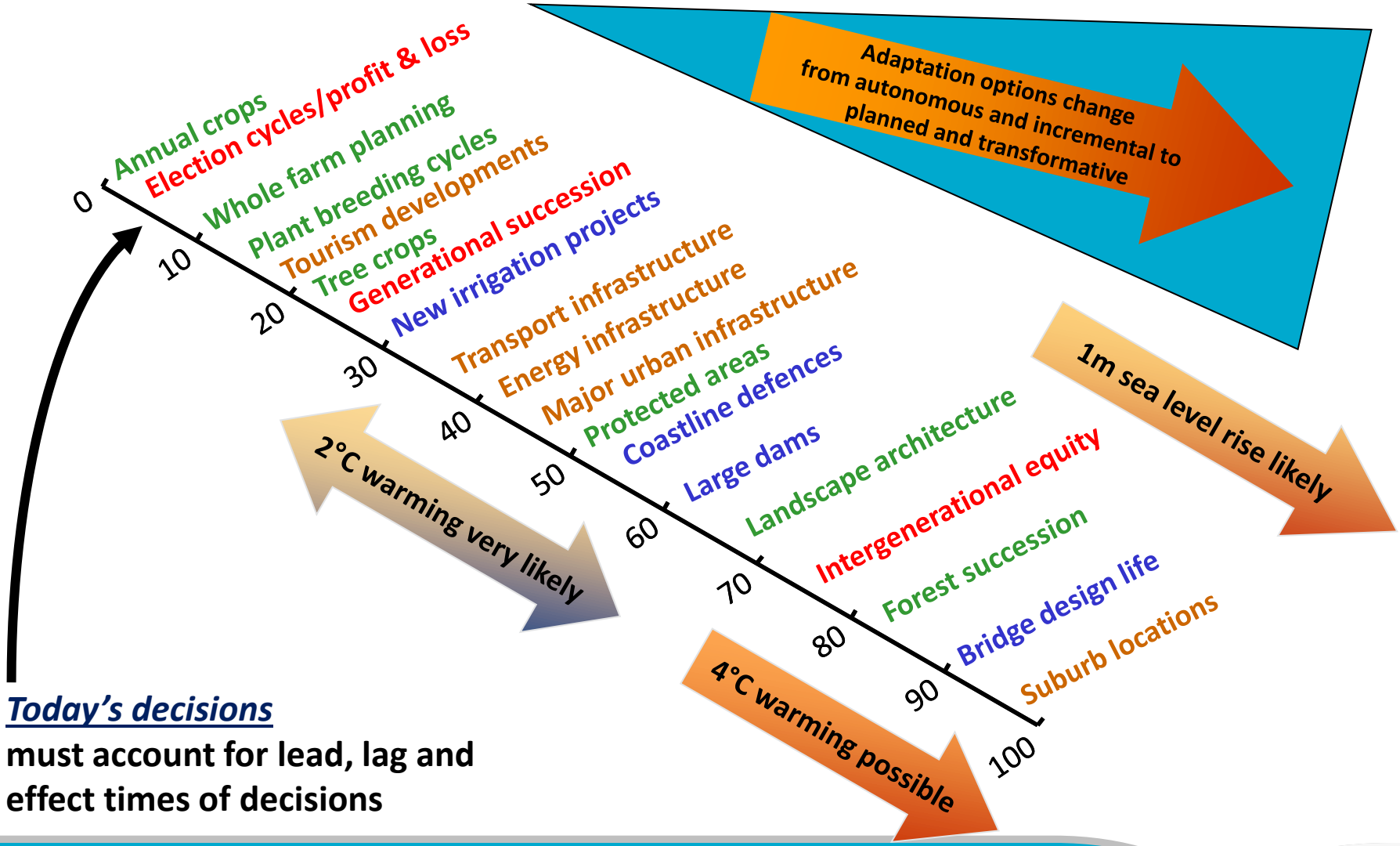


IPCC

Willows & Connell 2003 UKCIP



Adaptation timing and priorities

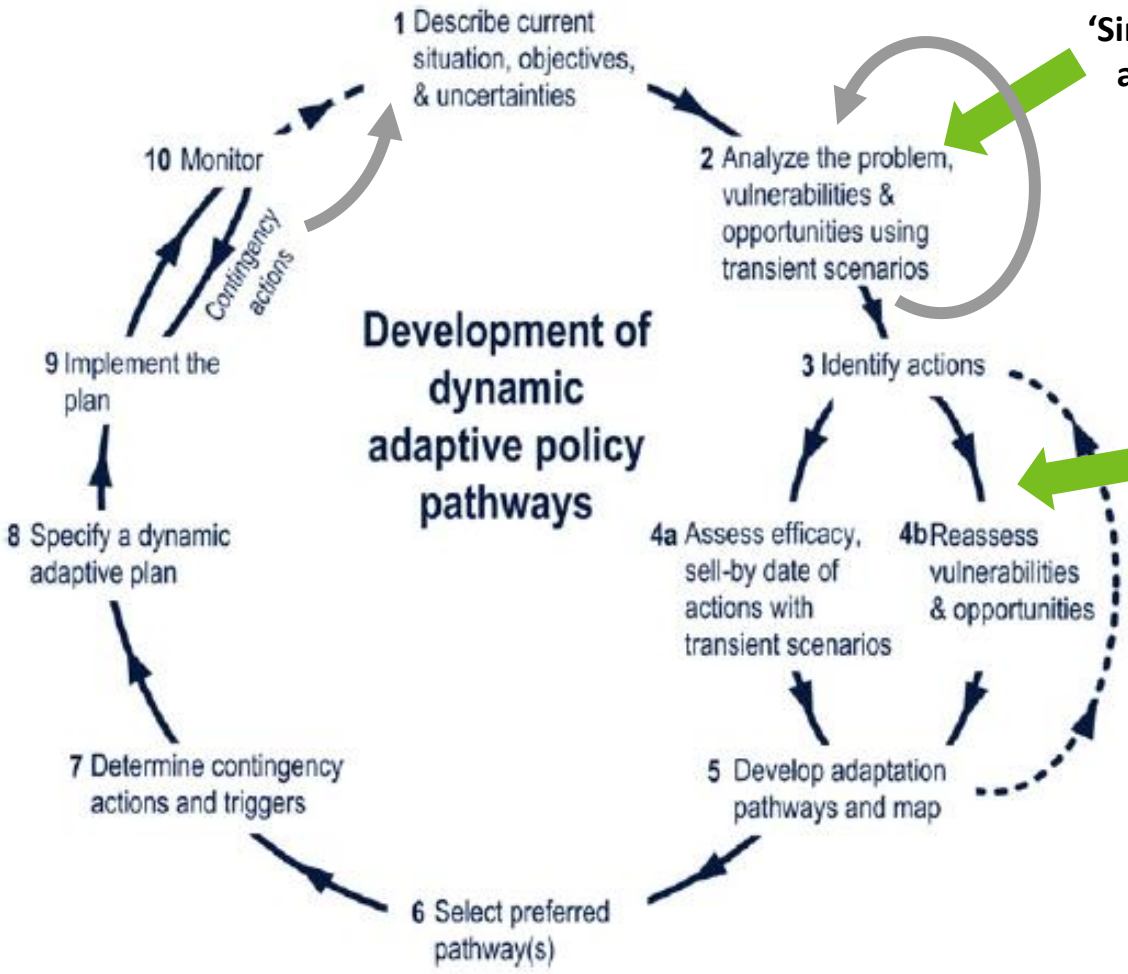


Today's decisions

must account for lead, lag and effect times of decisions

Stafford Smith et al, *PhilTransRoySoc* 2011 (after Jones & McInnes 2004)

“Dynamic Adaptive Policy Pathways”



‘Simple’ I.V. Assessment, against future *trends*

More detailed I.V. Assessment, for specific decision/ climate variables

Fig. 4. The Dynamic Adaptive Policy Pathways approach.

Haasnoot *et al.*, GEC 2013

Managing risk

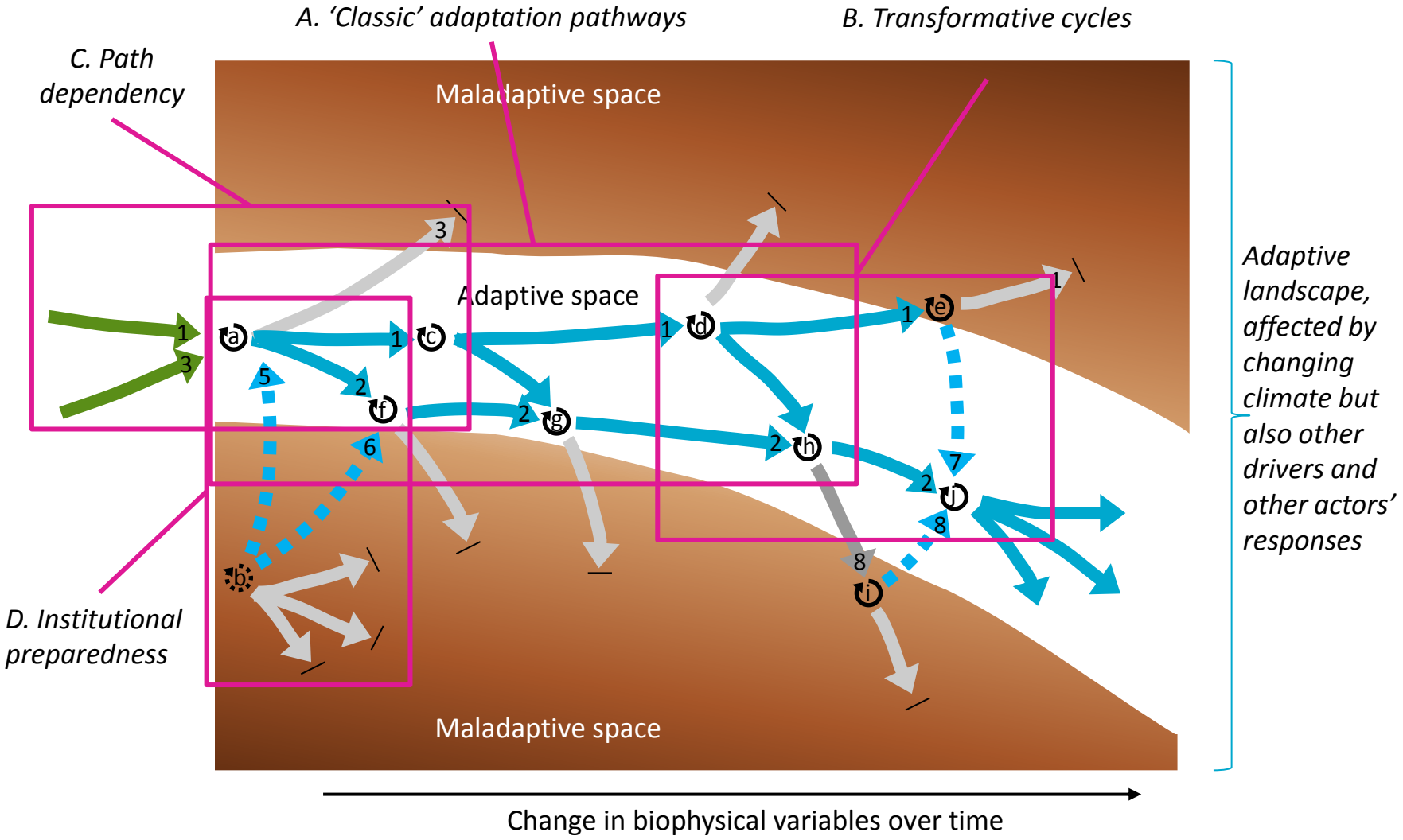
- Hallegatte (2009) *Global Environmental Change* **29**: 240-7
  - (i) selecting 'no-regret' strategies that yield benefits even in absence of climate change (*e.g. better disaster preparedness, 'CAR' principles)*)
  - (ii) favouring reversible and flexible options (*e.g. real options, delaying development*)
  - (iii) buying 'safety margins' in new investments (*e.g. heavier dam foundations*)
  - (iv) promoting soft adaptation strategies, including [a] long-term [perspective] (*e.g. social networks, insurance, water demand reduction*)
  - (v) reducing decision time horizons (*e.g. shorter lifetime buildings*)
- Dessai & van de Sluijs (2007)
  - 11 frameworks for decision-making; 12 tools for assessing uncertainty
- Ranger *et al*. (2010)
  - '*Adaptation in the UK: a decision making process*'

➢ *Classify in terms of decision types and future change risks faced*

Systematising responses

1. Short lifetime decisions
   - Mainly adapt incrementally, watch out for thresholds
2. Long lifetime decisions (where most risk falls to government)
   1. Monotonic, ~certain to occur, timing unsure
   – E.g. 2°C, 1m sea level rise, more hot periods, more extremes, more CO2
      – Plan for these, look for no regrets actions, use precautionary principle
   2. Direction sure but extent unsure
   – E.g. drying SW Australia and reduced water flows, fire risk in many areas
      – Use risk management, 'soft adaptations' to delay expensive decisions (but prepare for these), 'real options' analysis
   3. Even direction of response unsure
      – Robust decision-making, risk hedging against alternative futures, etc
3. And plan adaptation pathways, with critical decision-points
   - May include no action options, but deliberatively!

Adaptation pathways



1. From vulnerability to adaptation

2. **The CAPs projects – overview**

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4. Review of the CAPs

5. What's around the corner?

The CAPs projects were designed to demonstrate...

1. Approaches to decision-making that can cope with uncertainty
2. Leadership in new approaches to cost-effectively manage asset risk
3. Partnerships to position communities to drive the reform required to manage climate change risks
4. Adaptive capacity of governments, communities and infrastructure and service providers

Responding to the CAPs objectives...

- 13 projects
- 36 (+9 +1) case studies
- Strong evidence of tools, products & ongoing learning
  - New approaches & new information (demonstrated leadership)
  - Improved understanding of how to incorporate uncertainty into decisions
  - Established of new & enhancement of existing partnerships
- Generation of Flexible Adaptation Pathways was a distinguishing feature of 11 / 12 of the 13 projects
- 11 projects develop and/or tested economic/financial approaches
- Synthetic & applied project outputs
- Limited evidence of uptake at time of review, but positive signals
- National & international transferability, including to other domains
- Two independent project reviews extremely positive

Tasmania

Developing flexible coastal adaptation pathways for local communities

Strengthening relationships among coastal adaptation stakeholders

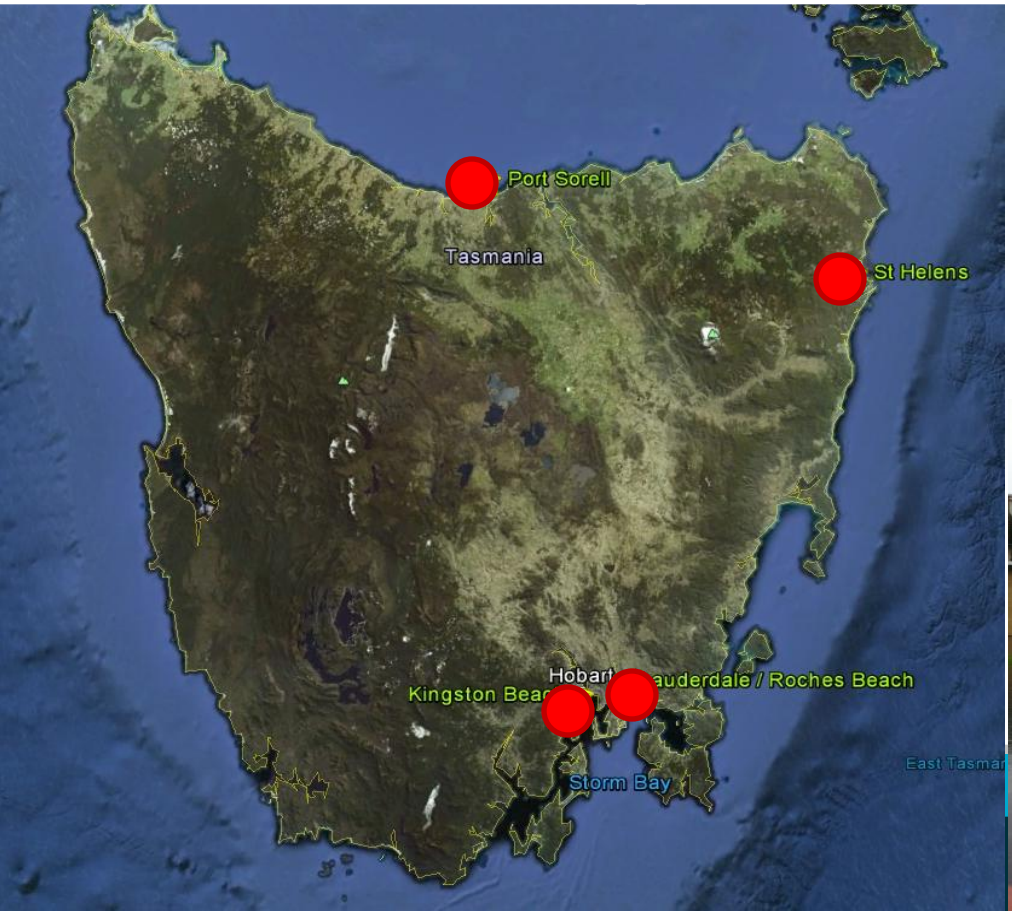
Benefits

- Costs of adaptation VS costs of no action
- Local understanding of coastal hazards and adaptation
- Identified adaptation pathways and responsibilities

Partners

- DCCEE
- Local Government Association of Tasmania
- Tasmanian Climate Change Office
- Tasmanian Planning Commission
- Break O'Day Council
- Clarence City Council
- Latrobe Council
- Kingborough Council

CSIRO

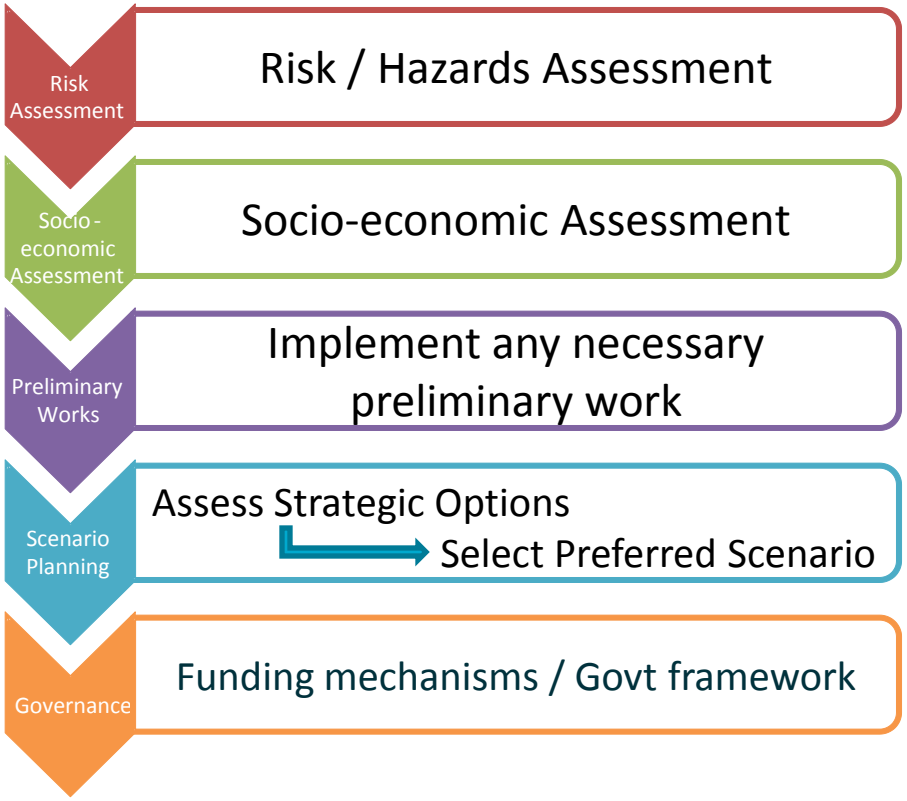


Case Study Locations

- Kingston beach (Kingborough Council)
- Roches beach / Lauderdale (Clarence City Council)
- St Helens (Break O'Day Council)
- Port Sorell (Latrobe Council)

TCAP Community and policy and planning processes

Community process



Policy and planning process

Draft planning amendments for hazard areas

Framework for roles and responsibilities

Revise final planning scheme

Implementation

Review

Sunshine Coast

Pilot council and insurance partnership on climate adaptation methods

Non-traditional partners working together to adapt to climate change and protect the insurability and property values within low lying coastal areas

Maroochy River Estuary, Sunshine Coast

Benefits

- Protected private asset values
- Shared decision making → Efficient adaptation planning
- Improved adaptation pathway selection

Project partners

- Sunshine Coast Regional Council
- Insurance Council of Australia
- Climate Risk Pty Ltd
- Edge Environment Pty Ltd

Issues at stake

- Flooding (Between 1 in 2 & 1 in 5 year AEP event - 10 Jan 2011)

- King tide (25 August 2011 HAT)

Inundated boat ramp

Note the new Mercedes sedan

- Exacerbated by increase in sea level due to La Nina related thermal expansion - up to 400mm during 2010/11

Sydney

Assessment and Decision Frameworks for Sea Wall Structures

Developing criterion for investigating and evaluating coastal seawalls

Benefits

- Templates for assessing seawall suitability, monitoring and maintenance
- Information and data necessary for decision making
- Material to guide decisions on the effectiveness of an existing structure for coastal protection
- Improved Council understanding to evaluate the robustness and condition of existing seawalls

CSIRO

Hunter

Decision support for adaptation action

Providing a consistent and transparent approach to land use and asset management adaptation in vulnerable coastal locations

Hunter and Central Coast member councils

Benefits

- Clear, structured & consistent decision support system to clearly identify options and adaptation pathways
- Consistent approach within and across councils = political, legal and liability benefits
- Greater engagement (& ownership of decisions & chosen pathways) by community & elected officials

Peron Naturaliste

Developing flexible adaptation pathways for the Peron Naturaliste coastal region (WA)

An economic analysis of coastal climate change adaptation for the Peron Naturaliste coastal region of Western Australia

Peron Naturaliste Partnership

Benefits

- Establishment of key partnerships at a regional, state and national level
- Regional risk profiles
- Understanding of adaptation pathways and options at local government scale
- Economic analysis of regional adaptation costs compared to 'business as usual'
- Material and knowledge in a format for broader application and use by end-users

Project Partners

Local governments (nine) of the PN region

Department of Environment and Conservation (DEC)

Department of Transport (DoT)

Department of Planning (DoP)

Department of Water (DoW)

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Project Phases

I
Regional Vulnerability Assessment

II
Testing Adaptation Options at a Regional Scale

II
Case Study Analysis: Flexible Local Adaptation Pathways

IV
Formulation and Delivery of Final Reports

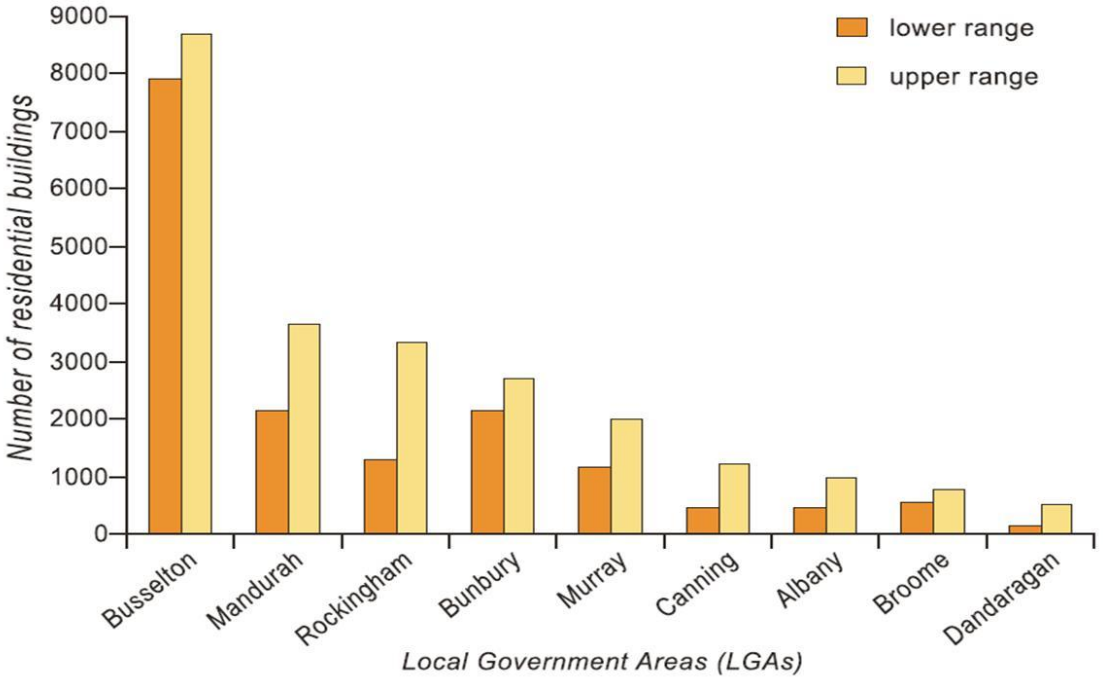

Figure 5.42 Estimated number of existing residential buildings in Western Australia at risk of inundation from a sea-level rise of 1.1 metres.

Issues at Stake

- Highest level of sea level rise risk in the State
- 11,200 and 17,300 'at risk' dwellings, valued at between $3billion & $4.6 billion
- Significant coastal infrastructure also at risk

Economic approaches

Tas	Assessment of assets at risk (NPV of risk, value of occupation)
MAV	Assessment of net value of occupying hazard zone; cost benefit analysis (reports both NPV and BCR; Monte Carlo analysis). Described as the net present value of undertaking adaptation option.
PNP	Regional economic overview (examination of costs and benefits of 3 sets of adaptation options at the regional level); CBA (ROA using an adapted Monte Carlo approach) – value at risk.
LGASA	Financial modelling (ROA + Monte Carlo)
DSE/WCB	Contingent valuation study (Willingness to Pay, through a choice modelling experiment) n=750 approx
WSAA	Probabilistic, temporal Monte Carlo techniques to develop projections of future risks (also viewed spatially)
Sunshine Coast	CBA for housing adaptation options (connecting insurance with losses for a single building + a stock of buildings)
SCCG – Seawalls	Coastal protection option appraisal tool (CBA)
SCCG – Water	Economic analysis (investigation of options and proxies but not full CBA)
SCCG – MCA	Bayesian Belief Network platform Multi-Criteria Analysis (incorporating economic values)
LGAQ / Townsville	Multi Criteria Analysis to refine options, then BCA

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How well did the projects land...

- The generation of suites of options for the management of asset/s or locations (or a process to get to this point) was a central output for all FAPs - multiple options & preferred pathways.
  - Approaches varied across FAPs, but many similar features
  - Vulnerability assessments varied as did the manner in which they were treated e.g. one or a limited number of hazards (risk of extremes)
- Adaptation options (PAR-DN) – assumptions about the benefit of occupying the hazard zone
- Improved timing & coordination of decision-making can reduce costs – e.g. interconnected assets and infrastructure
- Data limitations / gaps identified in most projects (e.g. hazards, asset condition). Workarounds developed to test models relied on assumptions to fill data gaps or reduce uncertainty - important to separate the process from the products - synthetic, data driven, one-many hazards capability, externalities, scale

How well did the projects land... cont

- Economic / financial approaches varied across the projects (what was monetised, discount rates, which assets were valued & in different ways)
- Reframing of adaptation as a public policy challenge – recognition of the importance of governance processes, good governance, deliberative processes & politics.
- Decision-relevant analyses
- Scenario planning - challenging

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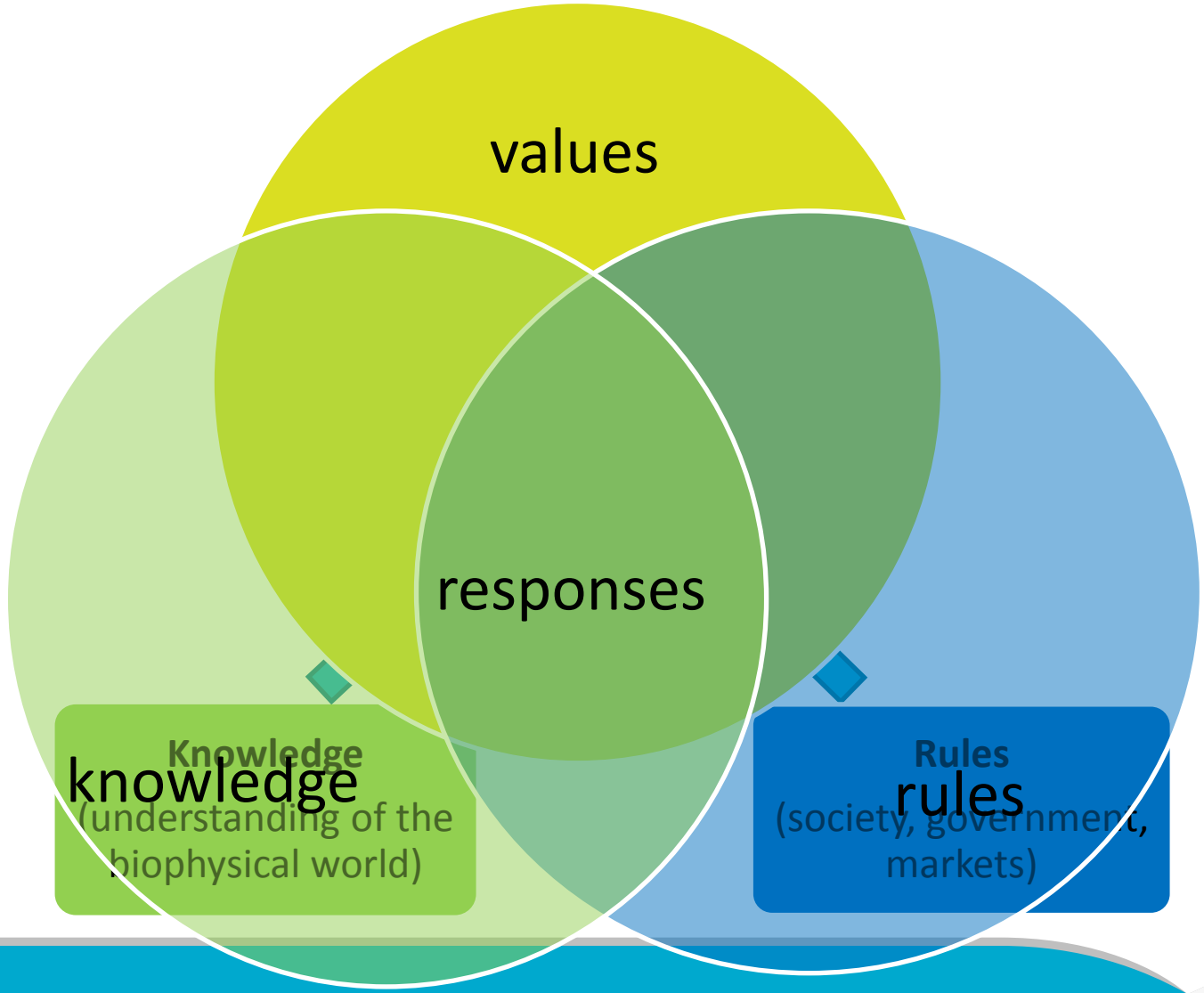
Moving forward (how fit are the FAPs...)

- Leading practice example worth sharing – engagement, PAR-DN, treatment of hazards, economic / financial approaches
- Further integration of tools/products/approaches across projects
- Timing & coordination of decision-making (path dependency)
- Roles & responsibilities
- Externalities still not dealt with well
  - Ongoing challenges / strategic planning
  - Managing interconnected assets, scale
- Third generation adaptation planning
  - Intersectoral, inter-jurisdictional, incorporation of non-climate factors, regional economic focus
  - Legitimate perspectives for multi-stakeholders

Systematising a *decision*-centred approach…

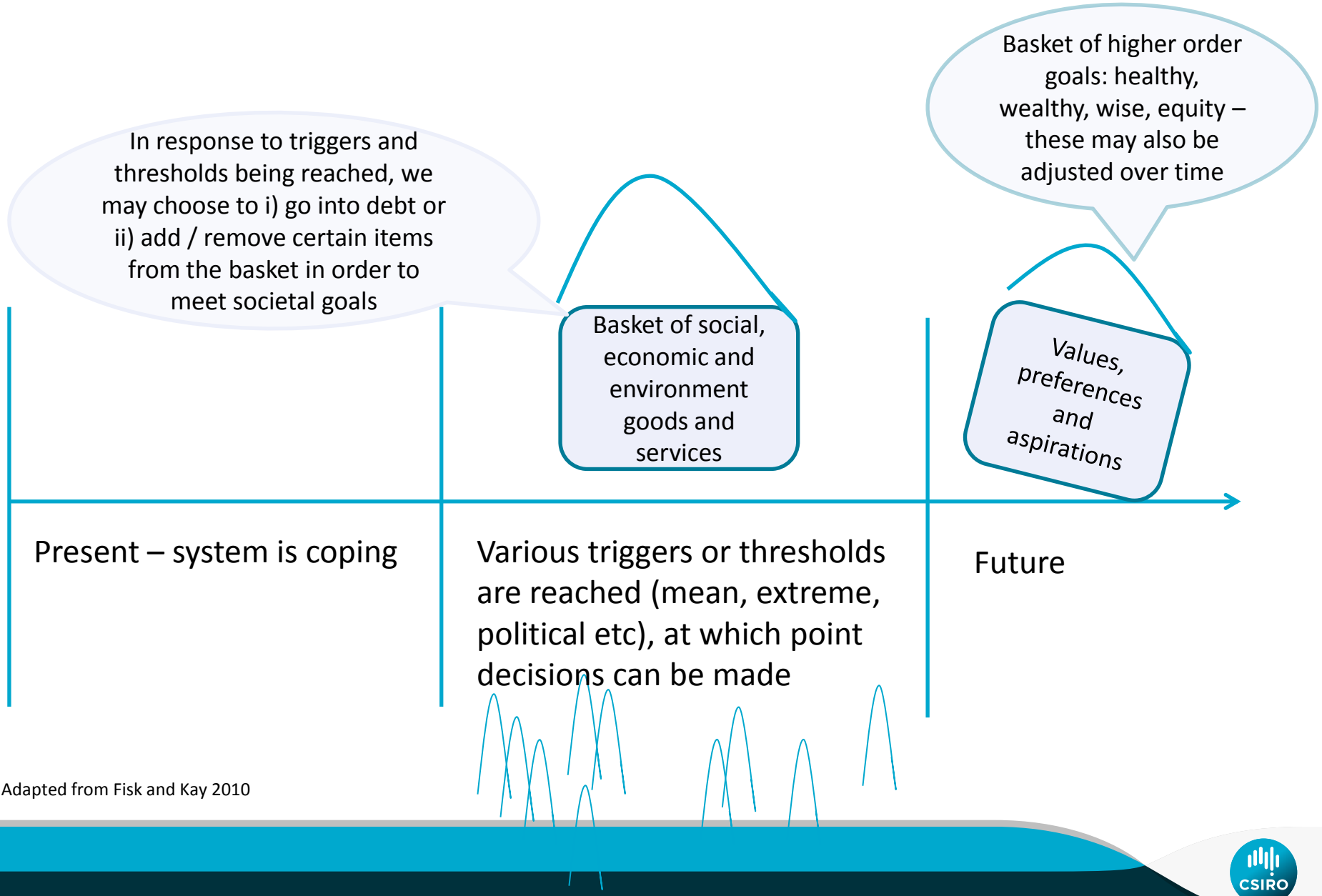


Gorddard et al.
(under review)

Assessing options, and related processes

1. Clear values and future risk profiles
   - Simple cost:benefits analyses, can be top-down study
2. Clear values but risk profiles uncertain
   - Real options with possible value of delay; can be fairly top-down
3. Values and risk profiles uncertain
   - Economic analysis flawed, need adaptive management/governance approaches, possibly MCAs; engagement processes essential
4. Values and risks uncertain, and institutions in contention
   - Analysis not yet possible, engagement and conflict resolution needed first

Improving our understanding of community values and preferences



Adapted from Fisk and Kay 2010

Thank you

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References (from the presentation)

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The reference to the vulnerability framework developed by the IPCC (slide 3) is the one above by McCarthy et al., (2001).

Useful references

(A couple of publications that provide examples of coastal specific economic studies)

Lazarow, N., Raybould, M., Anning, D., 2013. Beach, Sun and Surf Tourism, in *The Handbook of Tourism Economics: Analysis, New Applications and Case Studies*, Tisdell, C. (ed). World Scientific Publishing Company.

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