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science for global insight

What can we learn from past adaptations to extreme events

-From maladaptation to resilience in adaptation economics

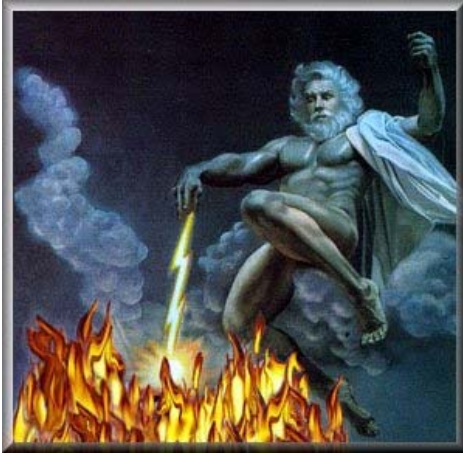
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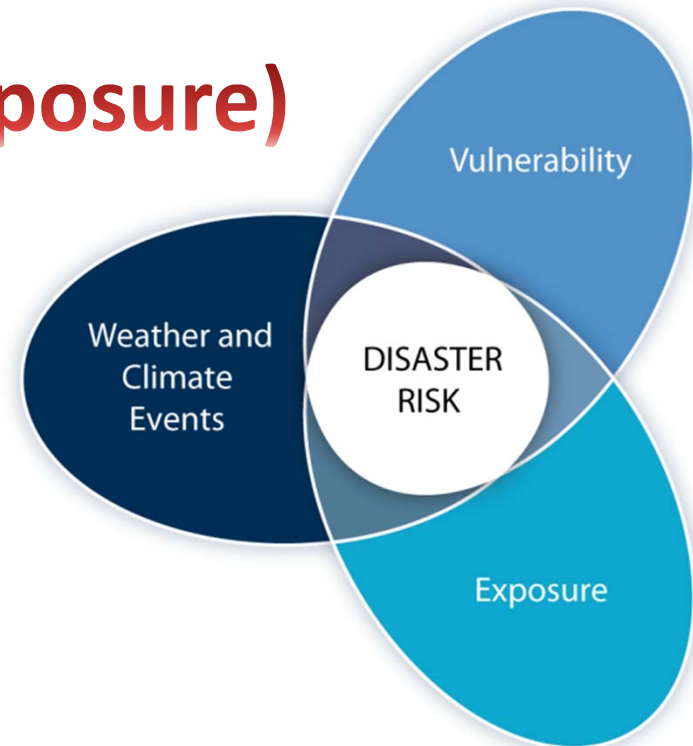
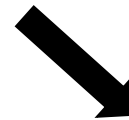


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Evolution of Disaster Risk Management

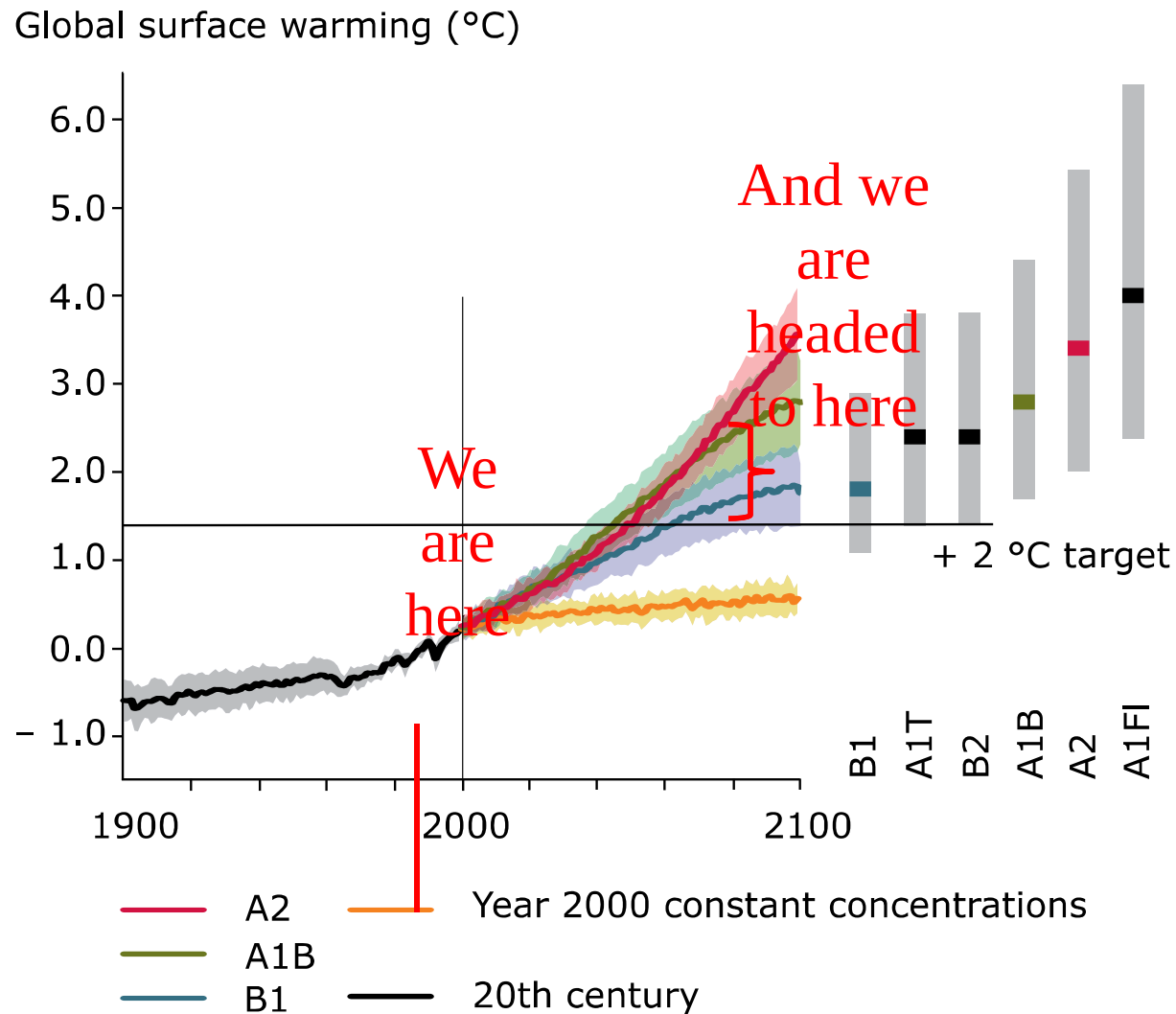


$$\text{Risk} = \text{Hazard} \times P(\text{Exposure})$$

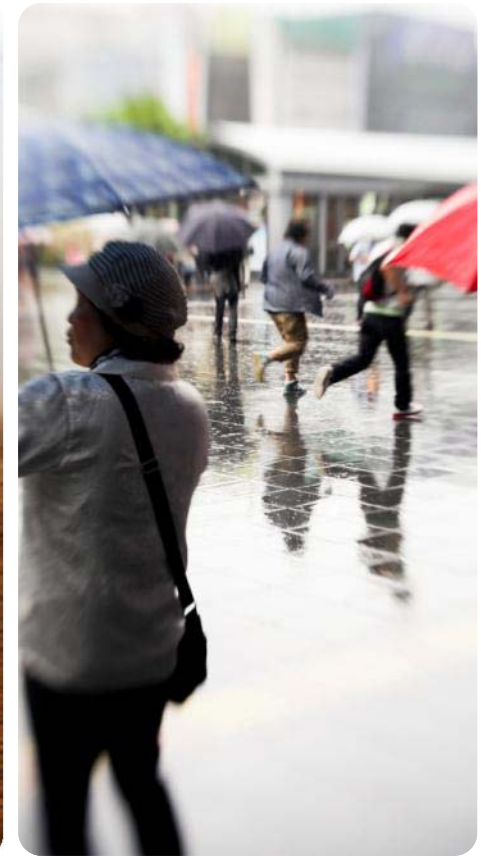


Source: Quarantelli 2000; Kuhlicke et al 2011

We are headed for 4 degrees



A changing climate leads to changes in extreme weather and climate events



There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes

Maladaptation

“Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead.”

Maladaptation – Victorian Desalination Plant



- Increase emissions of greenhouse gases
- Disproportionately burden the most vulnerable
- Have high opportunity costs
- Reduce incentives to adapt
- Set paths that limit the choices available to future generations

The 'levee effect'

Levees are intended to reduce vulnerability and losses. However they can sometimes have the opposite impact when they fail, as they are prone to do. This is because:

- a) The levee entices development, thereby increasing exposure
- b) The levee creates complacency to flood risk
- c) The levee impacts the hydrology of the area



Source: White 1945; Freudenburg et al 2008. Picture: Huffington Post DATE

The levee effect – Katrina



*“...federal policies have sought to make areas at risk from natural hazards safe places for urban development by reducing the degree of hazard and by shielding hazard-area occupants from financial risks of loss. Over time, these policies have facilitated the development of these areas, as illustrated by urban growth in New Orleans, but they have increased the potential for catastrophic losses in large disasters. In this sense, **Hurricane Katrina and the flooding of New Orleans could be viewed as an expected consequence of federal policy rather than an aberration that is unlikely to be repeated.**”*

Source: Burby 2006; picture: NY Times 01/09/2008

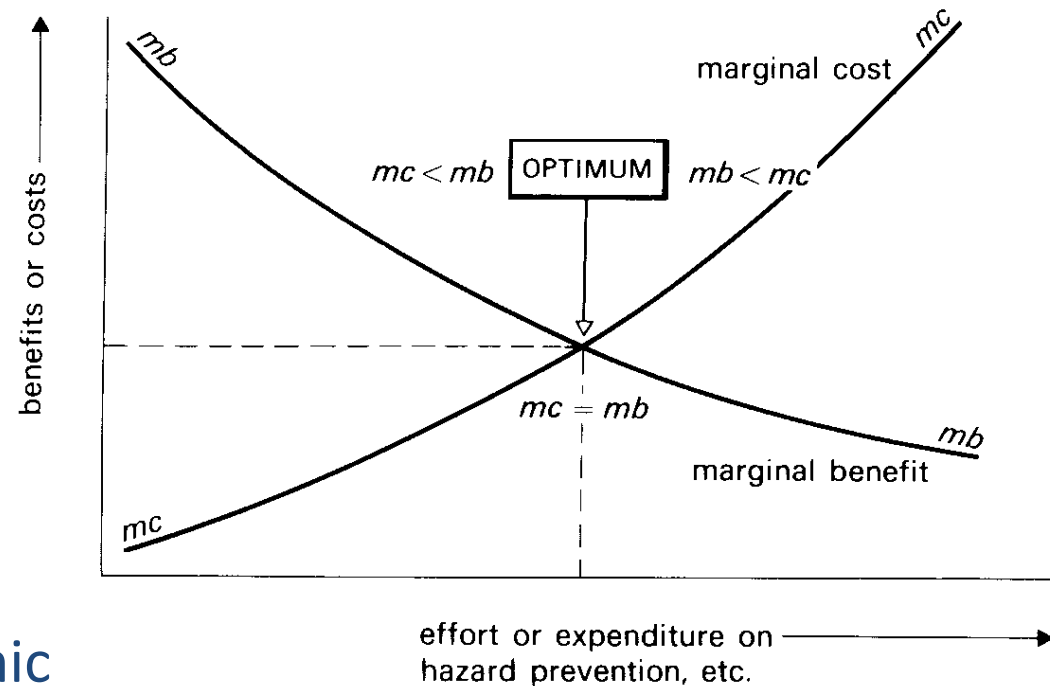
Flood mitigation policy

- US Flood Control Act of 1936. This Act formalised the use of benefit cost analysis specifying that flood control works were viable “...if the benefits to whomsoever they may accrue are in excess of the estimated costs...”
- Following WWII, national governments in the US and UK increasingly employed BCA for flood control assessment. In the US in particular legislation mandates costing exercises in many disaster and post disaster situations, for example large wildfires. The US-GAO (originally the General Accounting Office) has undertaken many economic analyses of disaster related programs and costings. In Australia the approach was applied, again primarily in flooding – and usually as an accounting rather than economic exercise - but as one input into decision-making.

The levee effect and economic methodology

The use of traditional optimization methodologies such as CBA may engender the levee effect (maladaptation) by:

- Ignoring substantial indirect and intangible impacts, especially of low probability/high impact events
- Focus on hard infrastructure
- Narrow spatial and temporal scale/static analysis ignores dynamic interactions



Resilience: Beyond the buzz

- ‘Resilience thinking’ provides a framework to understand the interactions between climate change and other challenges
- Resilience offers insight on following properties:
 - Reconciling and evaluating tradeoffs between short- and longer-term goals in devising response strategies (O’Brien et al., 2012)
 - the amount of change a system can undergo and retain the same structure and functions
 - the degree to which it can reorganize
 - the degree to which it can build capacity to learn and adapt (Folke, 2006)
- Focusses on dynamic process linked to human agency, as expressed in the ability to deal with hazards or disturbance, to engage with uncertainty and future changes, to adapt, cope, learn, and innovate, and to develop leadership capacity (Bohle et al., 2009; Obrist et al., 2010).

Other sources: Berks & Ross 2013; IFRC 2012; Holling 2001, 1973; Adger *et al* 2011; Folke, 2006; Bohle *et al*, 2009; Obrist *et al*, 2010

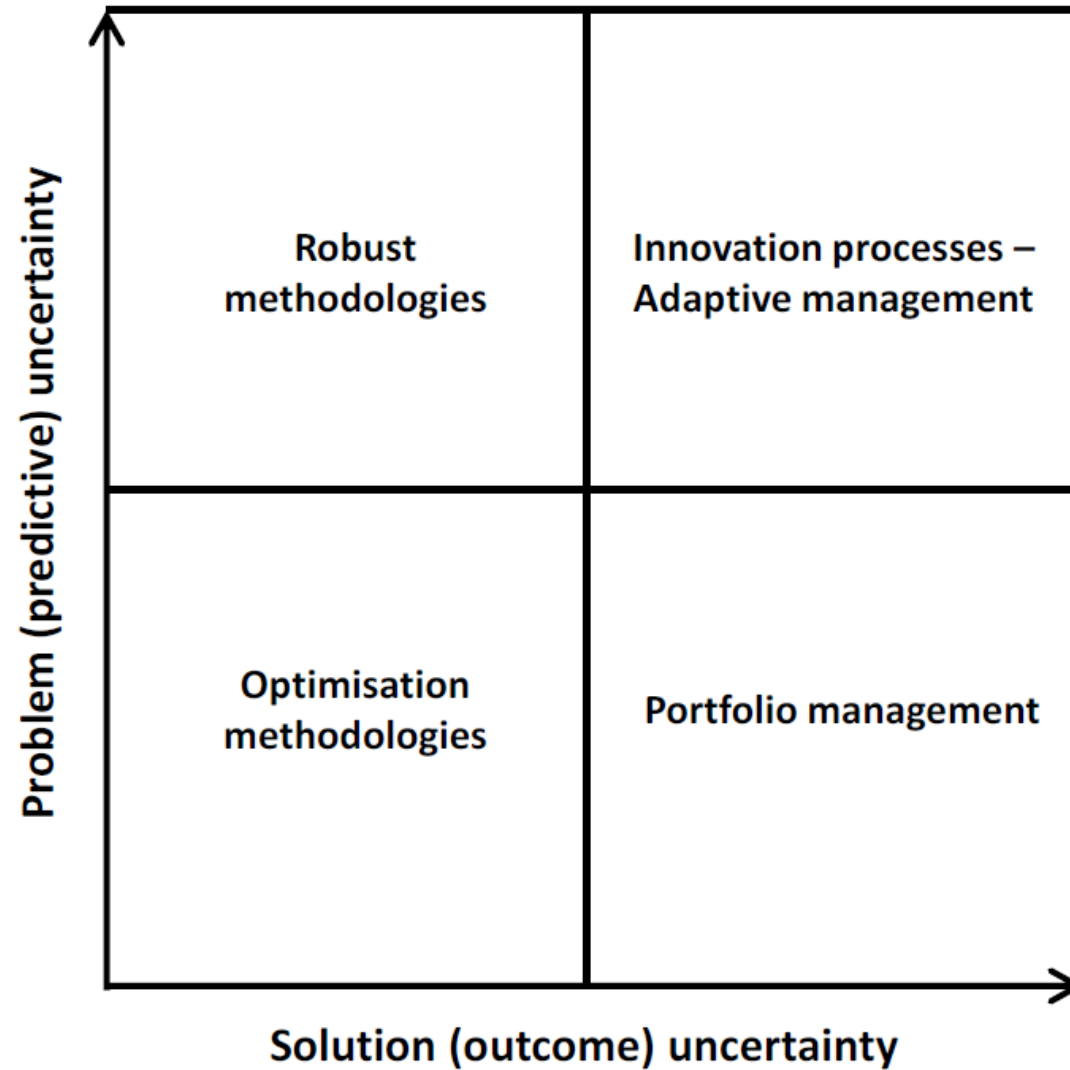
Low-regrets

- Uncertainty is increasing due to climate change
- Non-climatic factors driving risk today

→ Low-regrets

- Benefit regardless of future scenario
- Increase general resilience
- Limit path dependencies
- Limit maladaptation

Economic tools under uncertainty





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Thanks!



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