Sending Signals –

Can Insurance Fulfill Its Traditional Roles With Climate Risk?

Rade Musulin

30 April 2021

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Agenda

- The traditional role of insurance
- Climate change and catastrophic loss trends
- Using insurance to signal climate risk
- Building code and land use decision making; mitigation gaps
- Moving forward: Shifting our thinking in building codes and land use
- Engaging stakeholders
- Summary
- Discussion

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Economic role of insurance

- ***Transfer risk*** - Increases economic efficiency by reducing individual exposure to events
- ***Fund and adjust losses*** - Increases economic efficiency by accumulating capital resources to pay for losses
- ***Identify and price risk*** - Increases economic efficiency by helping consumers factor long term loss potential and risk into economic decision making
  - Premiums send a risk-based signal to consumers of the level of risk associated with their asset/activity
  - Higher premiums can inform mitigation initiatives, encouraging consumers to lower their risk exposure

Examples in practice

Higher premiums arising from previous car insurance claims, license suspension, or loss of points incentivizes careful driving

Experience based worker's compensation premiums provides an incentive to prevent accidents and promote safety awareness

Property insurance

- Mitigation credits are one example of how insurance can assist policyholders
- By retrofitting homes to be more resilient, homeowners can qualify for premium discounts
- With reduced damage, repair costs decrease and community resilience improves
- However, mitigation pricing is not always used in Australia, as noted by the ACCC:
  - Data issues
  - Lack of pricing knowledge
  - Price optimization

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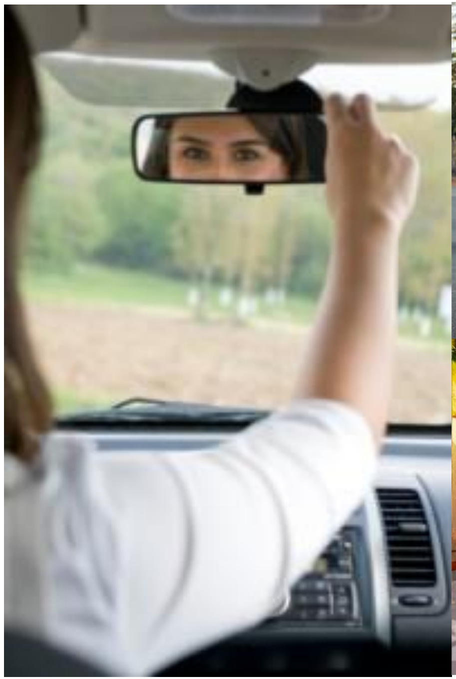
Past → future?

- Traditional pricing techniques were based on using historical experience to estimate future risk, assuming a straightforward projection of the future was possible through trending, etc.
- Climate risk poses a challenge, since the past may not be a good indicator of the future:
  - Long time periods
  - Complex weather patterns
  - Changing technology
  - Uncertainty



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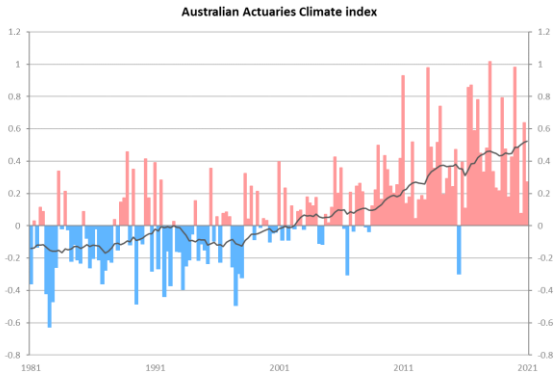
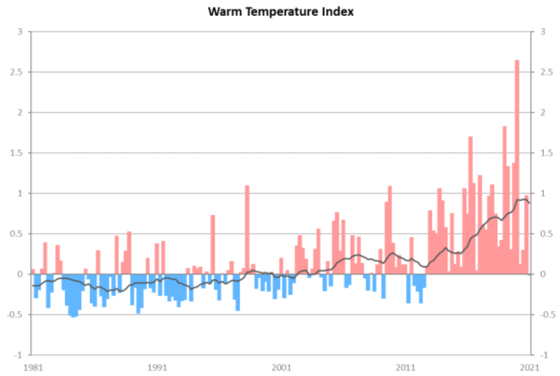
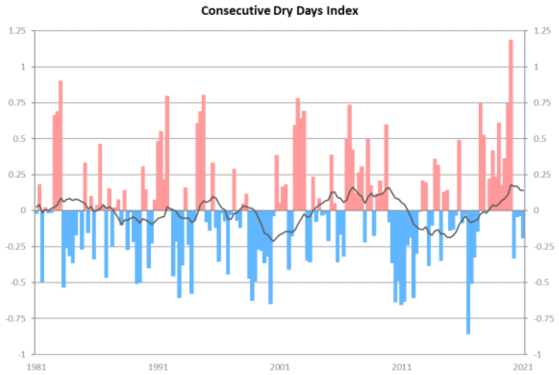
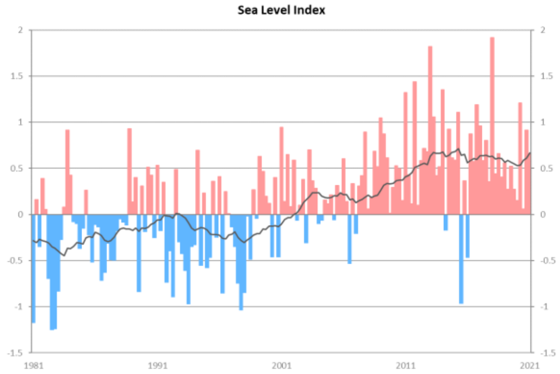
Historic climate trends - AACI



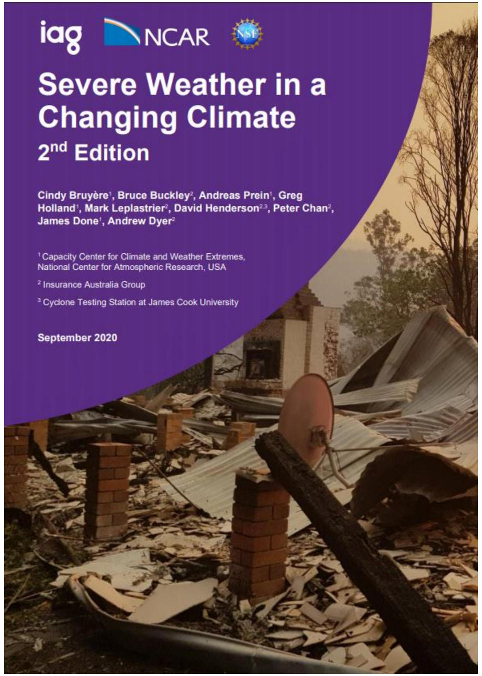






https://www.actuaries.asn.au/microsites/climate-index

Changing extremes



https://www.iag.com.au/severe-weather-changing-climate

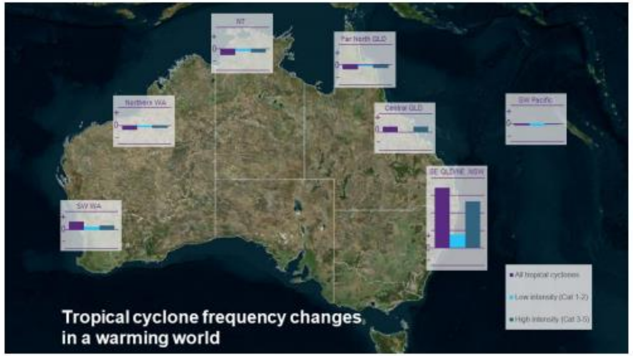
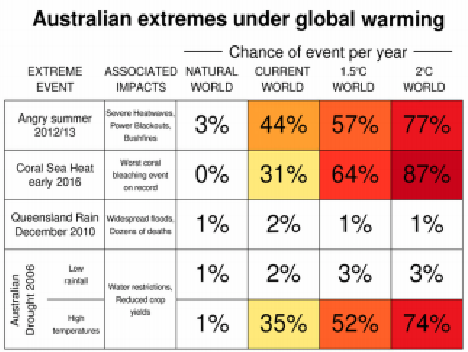


Figure TC13 The potential regional changes to the frequency of all TCs, low intensity TCs (Australian Categories 1 and 2) and intense TCs (Australian Categories 3, 4 and 5) in a +3°C warming world based on all available sources of information.



Australian extremes under global warming

EXTREME EVENT		ASSOCIATED IMPACTS	Chance of event per year: NATURAL WORLD	CURRENT WORLD	1.5°C WORLD	2°C WORLD
Angry summer 2012/13		Severe Heatwaves, Power Blackouts, Bushfires	3%	44%	57%	77%
Coral Sea Heat early 2016		Worst coral bleaching event on record	0%	31%	64%	87%
Queensland Rain December 2010		Widespread floods, Dozens of deaths	1%	2%	1%	1%
Australian Drought 2006	Low rainfall	Water restrictions, Reduced crop yields	1%	2%	3%	3%
	High temperatures		1%	35%	52%	74%

Figure SC3 Changes in the likelihood of Australian extreme events in the current, 1.5°C and 2°C warmer world compared to a natural (pre-industrial) world. Modified from King et al. (2017).

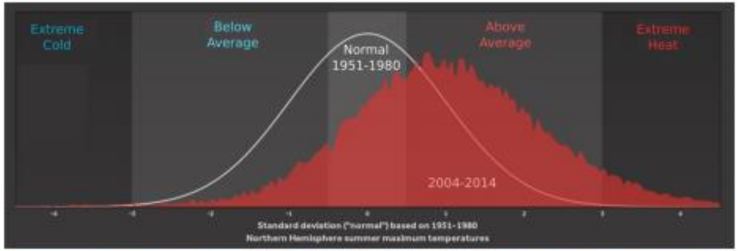


Figure SC4 Climate change has shifted the likelihood of extreme heat for the Northern Hemisphere as shown by the maximum summer temperature anomalies to climate normal average (1951-1980). Modified from WXshift: http://wxshift.com/climate-change/climate-indicators/extreme-heat. (March 2018).

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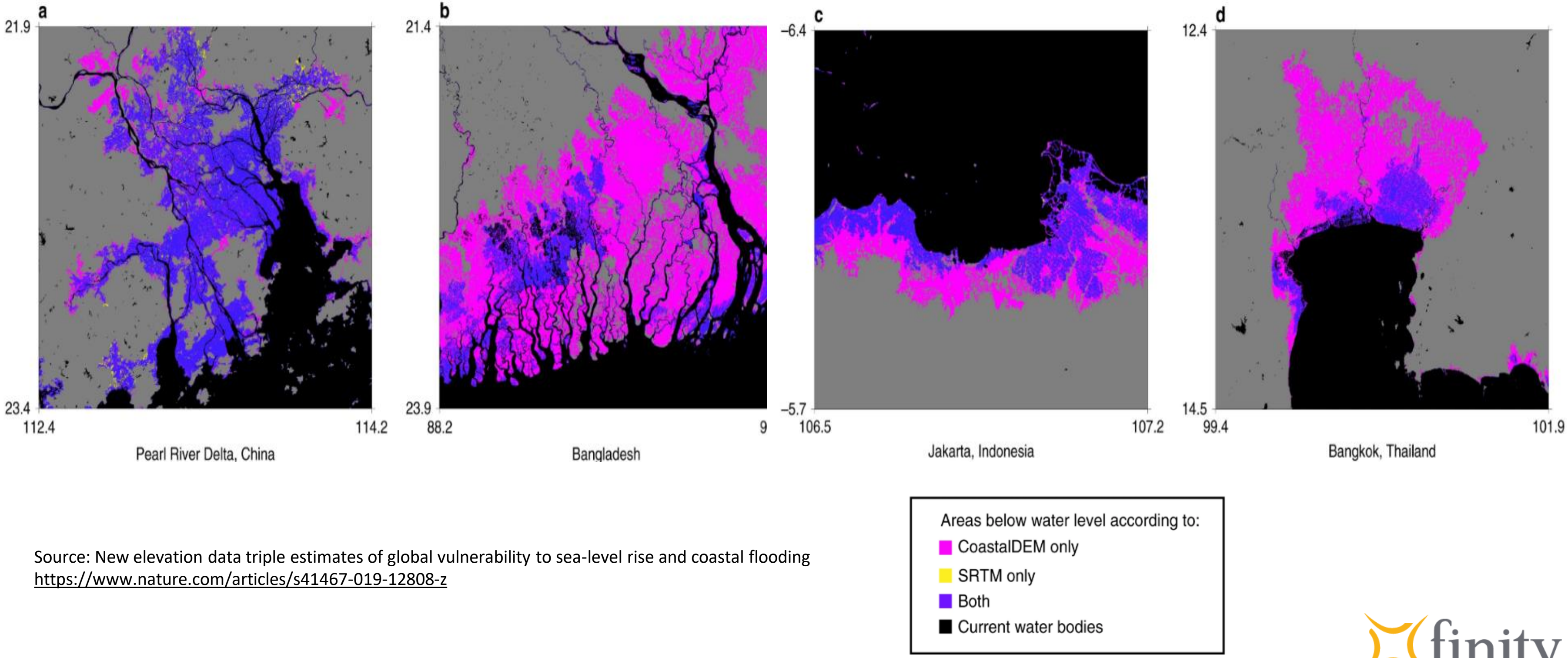
Global flood risk under 2100 sea-level projections



Source: New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding
https://www.nature.com/articles/s41467-019-12808-z

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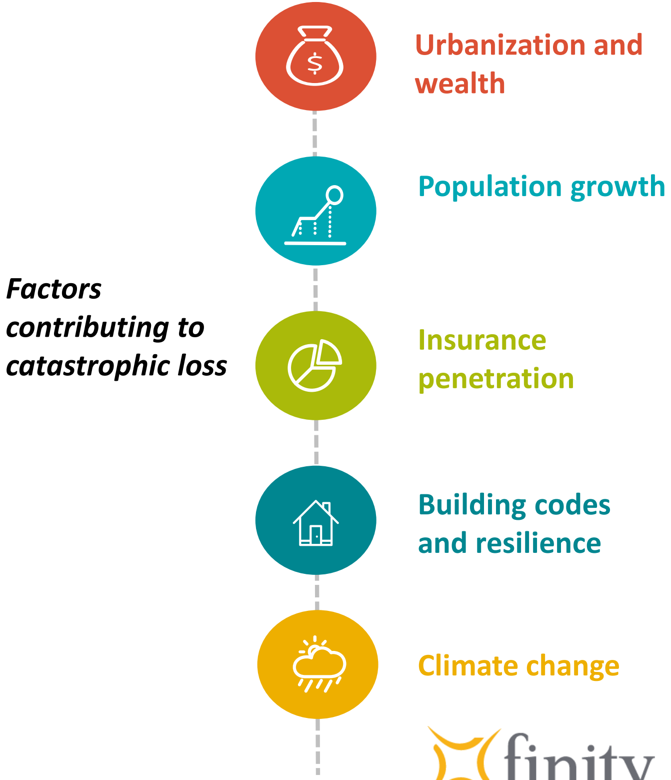
Demographic and urbanization are important

Shanghai Pudong, 1990 vs. 2015

Climate change and historic catastrophic loss

- The magnitude of insured loss a function of
  - how vulnerable a structure is
  - the surrounding impact on the community
- While climate change will lead to an increase in severity and frequency of events, climate change has had a limited impact on natural disaster losses to date
- Possible explanation: other signals such as socioeconomic conditions, mitigation measures, insurance penetration, increased asset values etc., overwhelming signals like climate change
- **Historic trends of loss are not necessarily a good indicator of the future to come**



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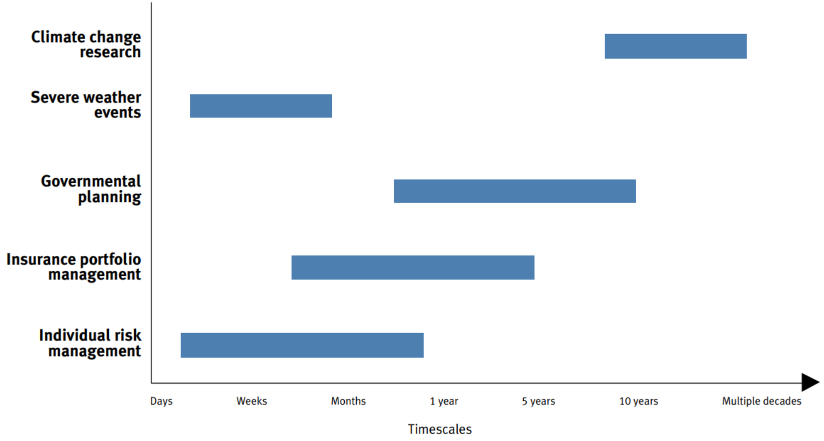
Some things break down in climate/perils (I)

Mismatch of time horizons

Insurance policies are priced annually, while climate change impacts manifest over decades. As the risk exposure of a building changes with climate change, pricing today does not accurately reflect expected loss over the building lifetime.

Figure 3: Contrasting Timescales in Climate Impacts



Different timescales in managing climate impacts.
Source: https://www.cii.co.uk/media/4043795/ch4_catastrophe_modelling.pdf

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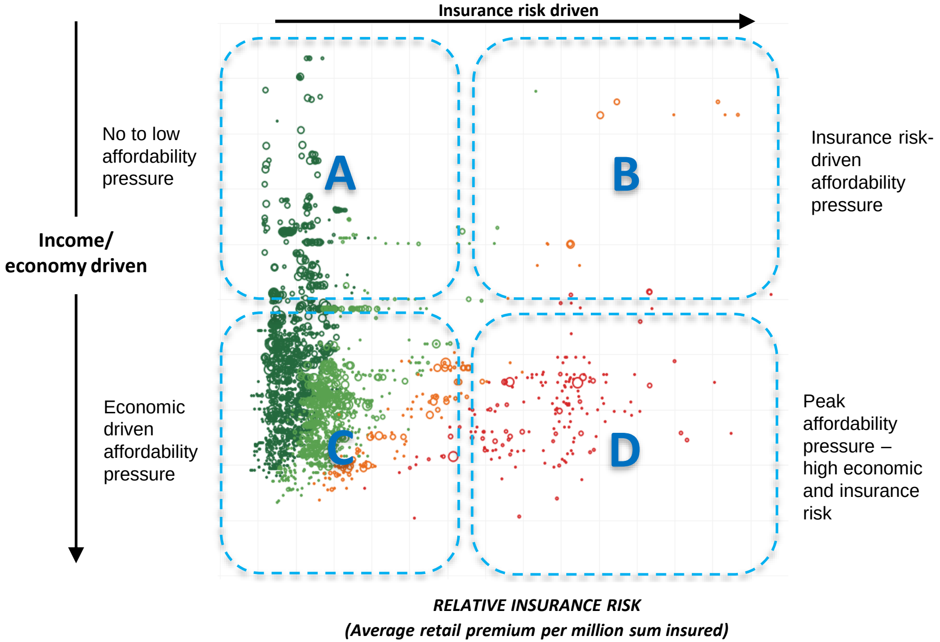
Some things break down in climate/perils (II)

Affordability

Charging risk based premiums based on climate risk can make insurance unaffordable. This can lead to government pools which compels low risk policy holders to subsidize high risks holders or hold premiums low without a subsidy.

Affordability pressure: Weeks to pay retail premium

- High pressure: 6+ wks
- Medium pressure: 4-6 wks
- Low pressure: 2-4wks
- No pressure: 0-2wks



Drivers of affordability pressure according by postcode

Source: Finity research

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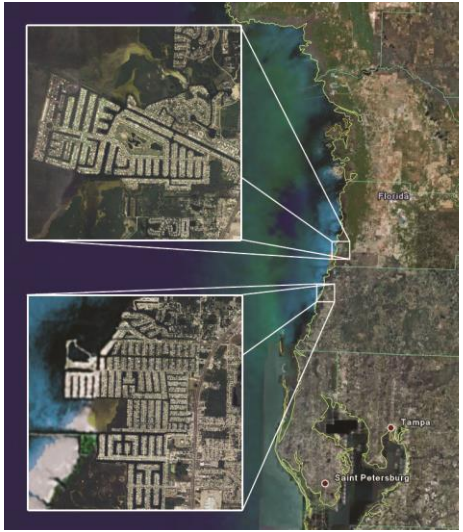
Some things break down in climate/perils (III)

- Historical data may not be applicable
- Extreme events may become more extreme
- Losses can be affected by things not evident in insurance data:
  - Demographic trends (e.g. population, wealth)
  - Technology
  - Macroeconomic events
  - Building practices
- Result → traditional tools to set insurance prices may not work



Gulf Coast Florida

Gold Coast Australia

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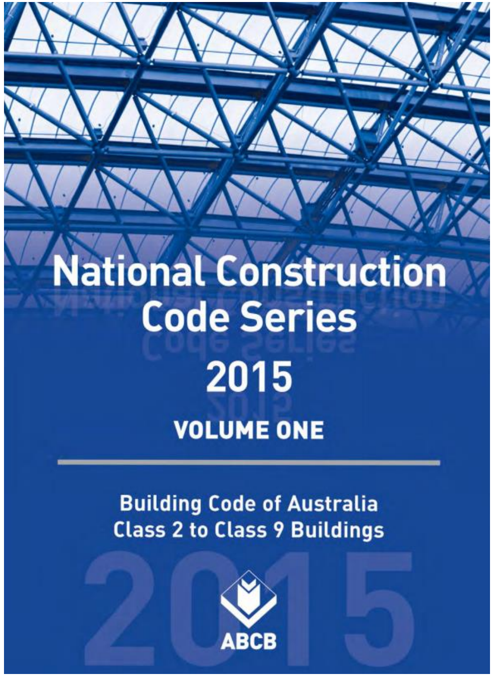
Traditional building code thinking

- Developed largely by structural engineers
- Focused on life safety
- Considers the current state (or possibly recent past state) as to demographics (concentrations) or climate
- Little consideration of macroeconomic issues or community resilience
- Lenses through which we can view the problem:
  - Life safety
  - Protection of individual properties
  - Management of overall economic impact, both near and long term



Building codes from different perspectives

A focus on the threat to life

"The appetite for building code changes to increase the resilience of new and renovated buildings currently appears low, with the Australian Building Code Board (ABCB) advising the purpose of the ABCB is to set minimum standards for construction that are proportional and cost effective *for health and safety, not for property protection.*"

"We approached the ABCB [about]…building code changes to better protect interiors and contents…*the ABCB advised that this recommendation sits outside of its objectives.*"

ACCC Second Interim Report, page 253, emphasis added
https://www.accc.gov.au/focus-areas/inquiries-ongoing/northern-australia-insurance-inquiry/second-interim-report

A focus on disaster risk reduction

Building code standards need to evolve to consider:

- economic cost (in addition to life safety);
- community resilience (in addition to single-building engineering); and
- a range of future conditions viewed stochastically, including both hazard and risk concentration

If things we build are designed for a century of use, then our planning horizon must consider conditions during the next century

Rade Musulin, Rising Tides article

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Mitigation gap

- A mitigation gap occurs when buildings are constructed to standards that prove to be inadequate for the risk over the design lifetime
- Can occur due to inadequate codes, lack of economic signals in insurance pricing, technological advances, or all of these
- Sources of mitigation gaps:
  - Exposure growth leads to area becoming a peak zone
    - Risk accumulation drives PML exposing insureds to higher costs
  - Better risk assessment tools (e.g. cat models) reveal poorly understood risk
    - Address level pricing exposes pockets of high risk
  - Climate change
    - Change in risk means past standards (such as flood elevation) are inadequate
- Closing mitigation gaps is key to affordable insurance in the future - Mind the Gap!

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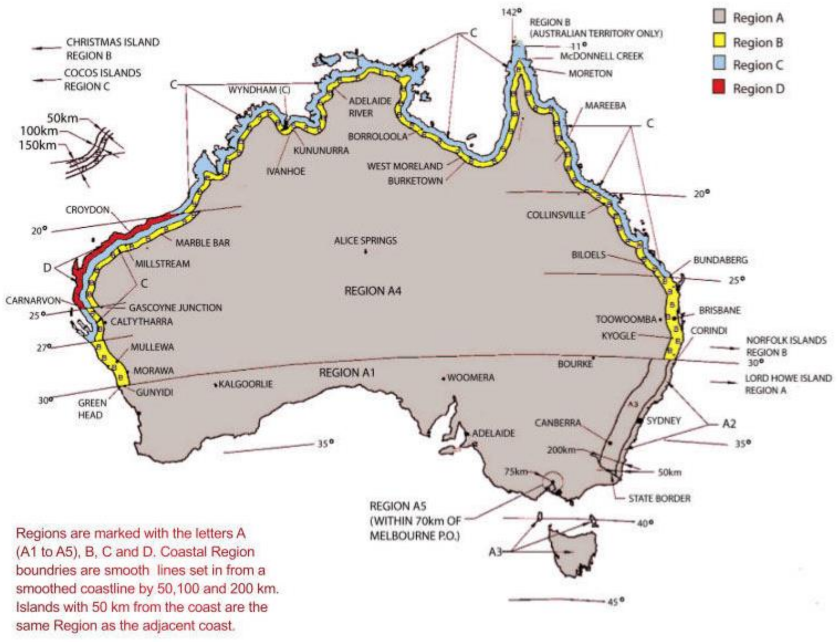
Mitigation gap example



- Ocean temperatures are rising, and warm water is being transported southward
- Tropical cyclones feed on warm water
- The current Australian building code's strong requirements stop at Bundaberg in eastern Australia
- Even if strong codes were enacted today, it would take decades for the housing stock to be strengthened
- **This could (will?) lead to a mitigation gap, where wind hazard changes faster than the housing stock can be fortified**

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Embracing uncertainty in planning

Uncertainty related to the future impacts of climate requires a shift in thinking

Policy planners should focus on managing the uncertainty in a range of future outcomes rather than focusing on a single certain outcome

These future outcomes must consider a holistic view of the future building stock under a range of demographics, climate, and land use scenarios

Insurance risk-pricing tools can be leveraged for public policy development, analyzing the optimal level of investment in mitigation and/or land-use planning

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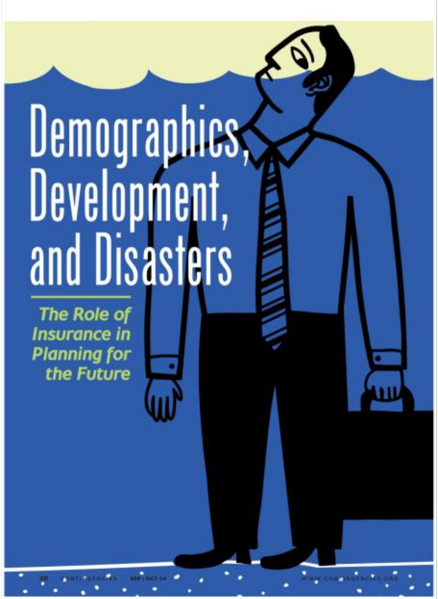
Overcoming issues with traditional thinking

- Focused on life safety
  - Expand goals to include property protection, community resilience, and adaptation
- Considers current state or recent past state
  - Include forecasts of future state(s)
    - Requires stochastic view since the future is uncertain
    - Requires a way to compare costs/benefits at different times
- Takes an engineering approach
  - Expand thinking to include macroeconomic analysis, community resilience planning, and economic capital modeling



http://www.ozgator.com/publications/Musulin%20Contingencies%200914.pdf
http://www.ozgator.com/publications/Rade_Musulin_Contingency_Paper_Chinese_Version_FINAL.pdf

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An economic view of mitigation

- Assume the economic value of mitigation is defined to be the present value of expected savings in insurance costs over a building's design lifetime
- Future insurance costs will reflect evolving risk concentrations, climate change, and mitigation
- Various future scenarios can be created and assigned probabilities, yielding a distribution of costs and benefits over time
- Economic capital models can be adapted to simulate various future states for an economic mitigation value
- **Building code and land use decisions should reflect future conditions, uncertainty, and cost/benefit of mitigation strategies**

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Multiple stakeholders have a role to play

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Social issues – this is about more than math

- If the threat assessment changes—for example, climate change leads to more flooding in a river catchment—how much burden should fall on people who had built there in the past? What about people who continue to build there?
- How should new technology be used to price risk?
- How should the costs of climate change be allocated:
  - Those causing the change (most participants in the economy).
  - Those affected by the change (coastal or near the bush).
- When is risk a community issue?
- Who should pay the price for subsidies and or mitigation?
- How can we achieve a just transition?

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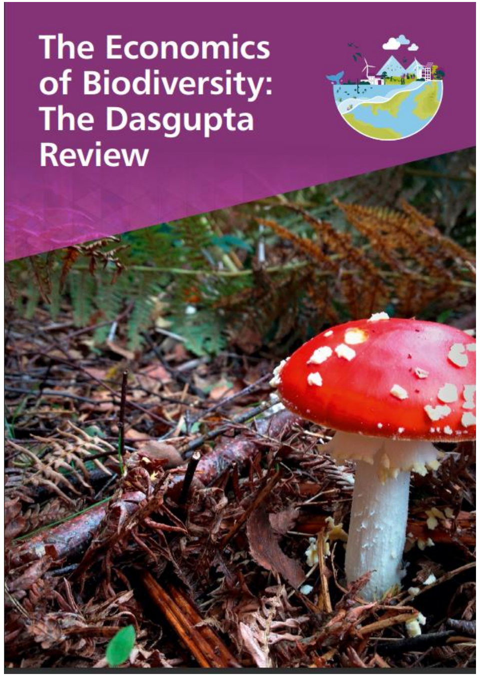
Are our risk metrics fundamentally flawed?

- *We have collectively failed to engage with Nature sustainably, to the extent that our demands far exceed its capacity to supply us with the goods and services we all rely on*
- *Our unsustainable engagement with Nature is endangering the prosperity of current and future generations*
- *We need to change how we think, act and measure success*
  - *Ensure that our demands on Nature do not exceed its supply, and that we increase Nature's supply relative to its current level*
  - *Change our measures of economic success to guide us on a more sustainable path*
  - *Transform our institutions and systems – in particular our finance and education systems – to enable these changes and sustain them for future generations*



https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review

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Can Insurance Fulfill Its Traditional Roles With Climate Risk?

- The short answer is “no, but…”
- Traditional insurance tools may break down in climate, primarily due to the difference in risk timeframes
- Existing insurance risk management tools and frameworks can be leveraged to simulate future states and calculate the economic value of mitigation
- To keep insurance affordable and protect against loss, building codes and land use policies must evolve to “future-proof” structures
- These must include a stochastic view of the future, considering a range of future scenarios
- Stakeholder engagement is critical; the correct answer and the right one may be different!
- Fundamental changes are required, including in the tools we use to measure economic success and send signals about risk

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Discussion

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