Insurance and climate change

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Key points

- Climate change threatens the viability of insurance in Australia and across the globe.
- Despite a number of recent 'quiet' years, a trend of increasing losses is apparent in Australia and globally due to extreme weather events.
- Insurers are covering at a loss some parts of Australia that are considered disaster-prone.
- Already a key driver of loss, increasing concentration of wealth and population in geographical areas such as the Australian coastline further exposes people and insurers to devastating losses from extreme weather events.
- Changes in the magnitude and patterns of extreme weather events hamper risk calculation and can increase the geographical extent and magnitude of loss, resulting in reduced availability and affordability of insurance. This, in turn, will result in shrinking markets available to insurers and will expose consumers and governments to additional financial burdens.
- The insurance industry is also exposed to the negative consequences of climate change due to the assets it manages.
- The insurance industry increasingly recognises that adaptation measures to reduce risk of insured loss due to climate change are in the best interests of both the insurance industry and the insured entity.
- Through carefully crafted policy and support, governments can fill insurance gaps and help motivate consumers to reduce their exposure to extreme weather events.
- Hazards such as tropical cyclones and sea-level rise create added risk for coastal communities in Australia. Innovative solutions and approaches from both the insurance industry and government will be required if current limits of insurance coverage for these coastal hazards (particularly sea-level rise) are to be broadened.

Some definitions

Ambiguous risk: Probability of this risk cannot be calculated with precision, e.g. terrorist attacks, natural disasters and political upheaval. Research shows that ambiguous contracts are priced higher than unambiguous contracts with similar expected loss (Kunreuther and Michel-Kerjan 2009a).

Capital reserves: Insurers are required by law to maintain enough capital to cover a particular percentage of their aggregated expected losses. Costs related to these reserves can be substantial; they increase with increased risk and uncertainty and are generally recouped from consumers.

Moral hazard: The expectation by an insured entity of coverage in the event of a disaster can act as a disincentive to take proactive action to reduce the potential impacts of that disaster (Kunreuther and Michel-Kerjan 2009b). This ultimately increases societal risk, as current risk-reducing activity is curtailed in lieu of expectation of future assistance. A salient example, noted in Shearer et al. (2013), is a Queensland property developer who stated that they may not move air-conditioning units from basements because they would be due for replacement by the time of the next flood, and then the insurers would pay.

The climate context[1]

The main climate change risks to Australia's population and infrastructure are likely to arise from an increase in storm damage and episodes of inundation along Australia's densely populated coast. The most damaging events are likely to arise when inland flooding, storm surges and high tides occur concurrently. Projected increases in sea level have the potential to exacerbate the risks from such events.

Heatwaves are becoming hotter, longer and more frequent in much of Australia, with intensified risk of high fire danger, particularly in the south-east of the country. Should future emissions of greenhouse gases not reduce significantly, these trends are projected to continue. With less certainty, extreme rain events are also expected to intensify and droughts to increase in frequency and duration. Fewer, more intense tropical cyclones are expected, and these may track further south. The implications of all of these events are of interest to insurers.

Historically, by spreading risk such as that posed from extreme weather events across unrelated populations and long time frames, insurance has represented a critical element of risk management. Aptly crafted insurance products can also motivate consumers to reduce risk exposure in advance of events, thus reducing vulnerability and increasing resilience.

Through the very act of insurance, an insurer exposes itself to the risks from extreme weather events that it mitigates on behalf of its policyholders. This exposure applies broadly across insurer business lines (property, life, etc.) and arises with respect to both current weather and future climate change. Hence, the challenges of climate change to the insurance industry are significant.

[1] Climate-related statements are based on CSIRO and Bureau of Meteorology (2015).

Current effects, impacts and issues

Globally in 2014, weather-related catastrophes inflicted US$94 billion in damages. While these costs have been decreasing since 2010, the trend over the last 30 years (normalised for inflation) is of increasing total losses with a decreasing proportion borne by insurers (Figure 1) (Messervy et al. 2014).

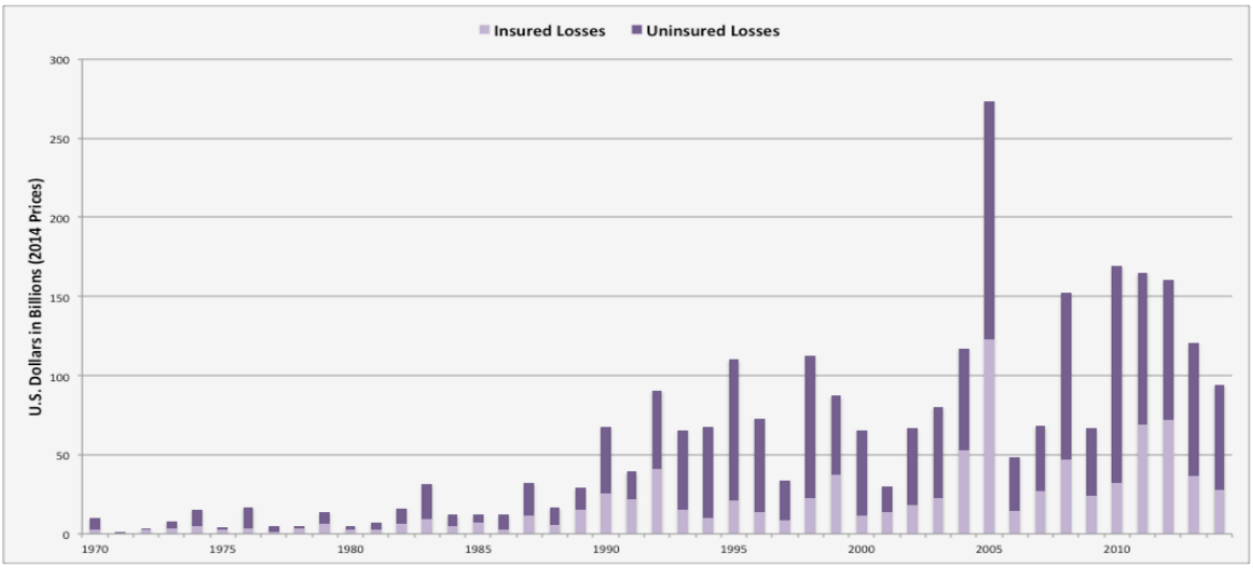

Figure 1: Insured and uninsured global weather-related losses (1970–2014). Graph generated from data downloaded from Sigma Explorer tool (Swiss Re 2015).

Australian extreme weather-related losses have also displayed an increasing trend:

- According to Munich Re, during the three decades to 2012 Australian weather-related insurance losses increased fourfold (Hannam 2012).
- Between 1994 and 2014, the Insurance Council of Australia (ICA) recorded 123 natural disasters that each caused more than AU$10 million insured losses. Over 99% of these damages were caused by weather-related events (Worthington 2015).
- Four of the five costliest disasters have occurred since 2007 (the outlier is Australia's costliest disaster to date, the 1999 Sydney hail storm) (Worthington 2015).

In parts of Australia, this trend has led to decreasing affordability of insurance for insured and insurer alike. For example, subsequent to the spate of extreme weather events that hit Queensland in 2011, premium increases of up to 1000% occurred in some disaster-prone areas of the state (Ma et al., 2012).

Some insurers are absorbing losses to maintain coverage, with the CEO of the ICA (2014, p. 1) stating that:

> *Over a long period, insurers have paid out $1.40 for every $1 they receive in premiums in North Queensland. They are losing money in an unsustainable fashion due to the fact communities in the region are frequently hit by cyclones.*

A fingerprint of a changing climate may be emerging, although the predominant driver of losses to date is considered socio-economic. As noted with high confidence by the IPCC (2012, p. 9):

> *Increasing exposure of people and economic assets has been the major cause of long-term increases in economic losses from weather- and climate-related disasters.*

This is particularly relevant to Australia, where a history of uninhibited development in coastal areas has resulted in concentrations of wealth and population exposed to potential future risks from coastal hazards (Musulin et al. 2009, McAneney et al. 2013).

Future effects, impacts and issues

A climate risk statement coordinated by The Geneva Association and signed by chief executives of 66 of the world's largest insurers echoes an increasing recognition by the industry:

> *The prospect of extreme climate change and its potentially devastating economic and social consequences are of great concern to the insurance industry.*
> The Geneva Association (2014)

As a 'threat multiplier' or 'threat syndrome' that has the potential to both amplify current risks and introduce new ones (Burgman et al. 2007, Preston and Stafford-Smith 2009, United Nations Global Compact 2011), climate change represents a significant risk to the sustainability of both the insurance and asset management divisions of an insurer. In recognition that this risk is increasing as time progresses, Mark Carney, Governor of the Bank of England, noted in a speech at Lloyds of London on 29 September 2015:

> *The challenges currently posed by climate change pale in significance compared with what might come. The far-sighted amongst you are anticipating broader global impacts on property, migration and political stability, as well as food and water security.*
> Carney (2015, p. 4)

Future sustainability of the insurance industry

The existing challenge of insuring natural catastrophes is further complicated by increases in the scale, scope and uncertainty of extreme weather predicted as a product of global warming, combined with higher concentrations of wealth located in disaster-prone areas (see Box 1).

***Scale*:** Increased durations, frequencies and intensities of extreme weather events can result in an increase in loss magnitude and frequency of occurrence. Seemingly small changes may lead to significant impacts:

> *A more significant effect of climate change is found when considering that as much of 30% of the surge contribution to losses from Superstorm Sandy can be attributable to long-term changes in sea-level.*
> Lloyds (2014, p. 10)

Box 1. The challenge of insuring natural catastrophes

The magnitude and high variability of occurrence (termed by insurers 'volatility') of natural catastrophes complicate their insurability. The nature and scale of the associated risk is determined by the very large losses that are possible and by the potential to impact many things (e.g. businesses, people and assets) simultaneously. The rarity of these events makes it difficult to calculate their risk.

The probability of occurrence of natural disasters, such as tropical cyclones, declines slowly relative to the severity of the damage they inflict (Kousky and Cooke 2009). Natural disasters are often of such a magnitude that they impact vast numbers of policyholders across multiple types of insurance simultaneously (McAneney et al. 2013).

These characteristics combine to increase the cost of catastrophe insurance relative to other types of insurance:

- Volatility of natural catastrophes compels insurers to maintain higher capital reserves in low as well as high periods of disaster activity and hinders an insurer's ability to calculate both the probability and outcome of a particular event with precision, thus increasing ambiguous risk (Hofman and Brukoff 2006).
- Catastrophic events can potentially create unmanageable losses for insurers. As a result, insurers transfer considerable parts of their natural disaster exposure to external parties such as reinsurers (McAneney et al. 2013).

Overheads to maintain capital reserves, purchase reinsurance and compensate for uncertainty of ambiguous risk generate additional costs for insurers. These costs, in addition to spikes in reinsurance premiums subsequent to natural disasters as reinsurers rebuild loss- impacted capital reserves, can be significant and are invariably passed onto consumers (Hofman and Brukoff 2006).

Scope: Future extremes are expected to be larger in spatial extent and to impact across multiple lines of business (Mills 2009). As an example of the effects of large catastrophic events, when Hurricane Katrina struck the United States Gulf coast in 2005, insurers suffered significant losses from, among others, property, cargo, workers compensation, health and life insurance (Kousky and Cooke 2009).

Legal action is seen as an emergent risk, with insurers exposed both directly and via insurance cover such as directors' and public liability. A New York–based legal firm has advised about the potential for direct litigation due to operational deficiencies that may arise from increasing claims such as improperly denied claims, unreasonable payment delays and contested settlement amounts (Johnston et al. 2013). Potential exists for third-party liability on several fronts, including damages pursued as a result of failure of entities, both private and public, to disclose, manage and incorporate climate change risk in decision-making (Johnston et al. 2013, Bell and Baker-Jones 2014).

***Uncertainty*:** Changes in climate patterns make it more problematic to use historical observation as a basis for risk calculation and increase ambiguous risk (Phelan 2011).

Price rises in insurance premiums needed to compensate for increased risk and uncertainty have implications for consumers and insurers. Climate change further accentuates the cost of natural catastrophe insurance, driving premiums higher with predictable reductions in affordability and consumer uptake. Reductions in insurability lead to greater risk borne by both the consumer who

decides to reduce insurance and potentially the taxpayer by way of government disaster relief (Jaffee et al. 2008).

Reduction in affordability results in a shrinking and lower quality insurance market:

> *Lower demand for insurance reduces the potential size of the insurance market. As premiums increase with risk, there are fewer potential customers in the market. A smaller insurance market is less commercially viable as there are fewer policyholders to spread risk, resulting in more volatile losses. Higher premiums may also result in low risk policyholders leaving the insurance pool altogether, leaving only high risk policyholders and creating 'adverse risk selection'. Adverse risk selection occurs when an insurance pool consists of more high risk policies than low risk policies, this affects the efficient sharing of risk and further increases premiums.*
> Suncorp Group (2013, p. 11)

Future sustainability of the asset management division

In 2014, insurers globally managed over US$28 trillion in assets (OECD 2015). Funds raised through premiums are invested to both maximise return and meet capital reserve requirements.
Failure to incorporate climate change in investment analysis risks losses from assets negatively exposed to both the direct and indirect impacts of climate change. Direct impacts include physical damage to assets and investment operations such as real estate and supply chains. Indirect impacts include the potential for a rapid re-pricing of carbon-intensive financial assets, stripped of value due to changes in global and regional consumer preference and governmental regulation as societies transition to low-carbon economies (Prudential Regulation Authority 2015).

The potential for such a scenario to affect portfolio valuation and ultimately insurer valuations is demonstrated by Aviva Group CEO, Mark Wilson (2014, p. 6):

> *In my view, sustainability is arguably the world's most significant contemporary market failure. Some of the worst case scenarios coming out of the International [Intergovernmental] Panel on Climate Change are deeply concerning with potentially profound implications on the valuation of the companies listed around the world.*

The Bank of England emphasises that the risks posed by climate change to asset portfolios have particular consequences for life insurers, where investments are required to meet long-term obligations such as annuities and endowments (Prudential Regulation Authority 2015).

Adaptation and mitigation

Adaptation measures that reduce any risk of insured loss arising as a result of climate change are in the best interest of the insurance industry and the insured entity alike (e.g. Bagstad et al. 2007, Hecht 2008). Risk reduction may be necessary to offset increasing costs as loss events rise, thus enabling affordable insurance and ultimately sustainable market coverage (Ward et al. 2010). As noted by the Institute of Actuaries of Australia (2013, p. 23):

> *The price of an insurance policy reflects the level of risk that is being transferred from a policyholder to an insurer. As such, a high premium is a symptom of a real problem: a high level of risk. Concerns of affordability would be better framed as a discussion around the*

high level of risk, as this is something that can be actively managed over time through mitigation, adaptation and the appropriate usage of land.

Insurance as a mechanism can act as a 'point of pressure' to influence and motivate the very behaviour necessary to maintain its affordable provision (Wiltshire 2014). In the first instance, pressure can be applied through maintenance of a price signal. Where this fails, innovative policy tweaks and products may fill the gap.

- **Price signal:** Theoretically, premiums that reflect risk create a signal for policyholder action to reduce cost through reduction of that risk (Kunreuther and Michel-Kerjan 2009b). However, accurate pricing can be constrained by elements including price regulation, competition pressures, subsidies and availability of data (Maynard and Ranger 2012).

- **Innovative policy tweaks and products:** Appropriately designed and implemented insurance mechanisms may address many of the issues that hamper risk-reduction promotion (Table 1).

Table 1 Policy tweaks and innovative insurance products. Source: Based on Kunreuther and Michel-Kerjan 2009b, Mills 2009

Mechanism	Explanation	Examples of benefits
Policy tweaks		
Premium discounts	Reduce premiums commensurate to risk-reduction proactive action by policyholder.	• Motivates risk prevention in exchange for lower premiums • Reduces premiums to affordable levels
Shared costs	Include policyholders in meeting losses to provide incentive to minimise loss.	• May reduce moral hazard
Rebuild right	Leverage the insurance claim process to improve building subsequent to losses.	• Infrastructure is rebuilt in a more resilient manner to withstand future events
Long-term insurance	Increase insurance term beyond one year and couple it to property-improvement loan.	• Generates longer term outlook by policyholder tied to improvements
Directors' and officer Liability	Apply climate preparedness as one factor in determining cost of directors' liability.	• Enhances climate change implication awareness among corporate leaders • Increases focus on climate change exposure
Innovative insurance products		
Energy insurance	Protect energy efficiency and renewable energy practitioners in event that savings/energy generated falls short of expectations.	• Financial protection and confidence building of both supplier and consumer to engage in low-carbon energy activities
Green building and equipment insurance and warranties	Cover building and certification-related risks.	• Financial protection and confidence building of both supplier and consumer to engage in low carbon energy activities • Enhances legitimacy of green buildings

The insurance industry can influence and coerce proactive climate change mitigation and adaptation behaviour from societal actors such as individuals, governments and businesses in a number of ways, including:

- Investment: The scale of the industry's investments places it in an unparalleled position to motivate and directly support innovation and investment in low-carbon infrastructure and services (Mills 2009).
- Skill sharing: As risk management experts, insurers can play a role in providing leading-edge information, resources and risk expertise to emergency management agencies (King et al. 2013).
- Political influence: Associations and institutions such as The Geneva Association and the ICA can influence policy either through direct lobbying efforts or submissions to government inquiries and commissions.
- Leading by example: Companies such as Swiss Re are implementing zero-carbon policies within their own operations.

The role of government in natural catastrophe insurance

The government plays a crucial role in insurance. In some jurisdictions, including Australia, this can involve data provision, physical mitigation activities (e.g. see Figure 2 below) and regulation via institutions such as the Australian Prudential Regulation Authority (e.g. nature of insurance contracts, minimum investment requirements, annual reporting, mandatory levies, etc.).

As illustrated by the US (National Flood Insurance Program) and UK (Flood Re) case studies included in CoastAdapt (see Table 2 below), government can play a more intrusive role in the market, intervening to ensure availability of affordable cover where it otherwise may not be commercially viable. Intervention can take several forms that either indirectly or directly impact the availability of affordable cover, some of which include:

Incentives for risk mitigation activities: As an example, governments could provide or encourage financial institutions to offer loans or innovative financial products that could help homeowners retrofit their properties with more weather/flood-resistant materials (Bell 2014).

Data provision: Extreme weather/flood-related data (e.g. storm surge maps) coordinated at a government level ensure consistency across sectors and participants and reduce redundant insurance industry costs. These costs would otherwise be passed on to consumers (Bell 2014, Wiltshire 2014). A role for government to provide information is particularly relevant where additional 'public good' benefits accrue. Benefits from data on hazards, including bushfires, cyclones and floods, can accrue beyond insurers to include households, businesses and local government (Productivity Commission 2012).

Consumer understanding of insurance contracts: Consumers' understanding of their insurance contracts is integral to their ability to manage risk (Productivity Commission 2012). In Australia, reviews such as the Financial System Inquiry (Murray et al. 2014) recommend that insurers provide

additional resources (e.g. tools and calculators) to enable consumers to make informed insurance decisions. Insurers (e.g. see Suncorp Group 2015) assert that current regulation provides impediments to such efforts, and that further regulatory reform is required.

Reduced transactional costs: Specific to Australia, a number of insurers (e.g. Suncorp) and commissions (e.g. the Henry Tax Review) note that insurance affordability could be enhanced by dissolution of state-based insurance duties and taxes (Environment and Communications References Committee 2013). In an inquiry into barriers to effective climate change adaptation, the Productivity Commission (2012) recommended that state and territory taxes on general insurance should be phased out as a priority.

Property mitigation activities: Construction of engineering solutions such as levees and revetment walls has re-enabled insurability of otherwise uninsurable areas such as Roma in Queensland's south-west (see Figure 2). Such solutions must be applied with care, however, to ensure unintended negative consequences do not arise for other areas (e.g. flooding occurring further downstream) (Bell 2014). Additionally, an ICA submission to the Northern Australia Insurance Premiums Taskforce (see Box 2) has proposed that short-term Australian Government subsidies targeted at improving the cyclone resilience of older homes in North Queensland are the most cost-effective way to protect communities in the area and reduce insurance premiums (ICA 2015).

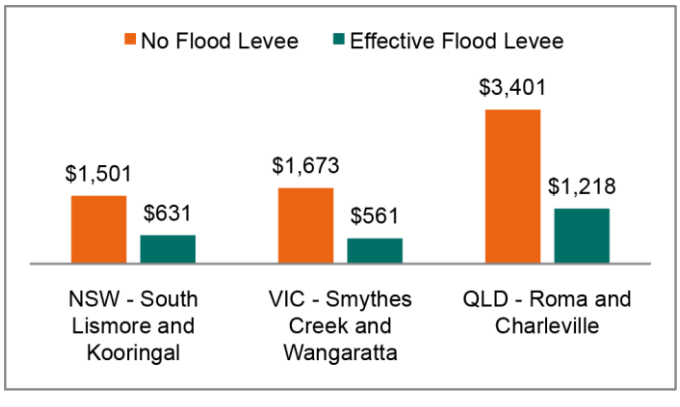

Figure 2: Average home insurance premium comparison. Source: Suncorp Group 2013, Figure 4. The impact of effective disaster risk management on insurance premiums is clear: towns that have mitigated flood risk through levees enjoy substantially cheaper premiums than similar towns without.

Subsidising private insurance premiums: Subsidisation may be applicable where insurance is otherwise unavailable or unaffordable (King 2013). It is generally frowned upon by the insurance industry due to its distortive effect on price signals and, as illustrated by the case studies below, should be utilised with care, as premiums that do not reflect inherent risk can hinder risk mitigation behaviour (moral hazard) and generate significant budgetary shortfalls.

Government-backed insurance: Where commercial insurers refuse to provide insurance, there may be a need for governments to fill the insurance gap (Bell 2014). The National Flood Insurance Program (NFIP) provided by the US Government, considered below, is such a scheme. In Australia, the Northern Australia Insurance Premiums Taskforce (see Box 2) has been established by the Australian Government to consider the feasibility of government-supported insurance (i.e. a government-backed reinsurer and mutual insurer) to reduce the cost of cyclone risk coverage in North Australia.

Where governments provide natural disaster relief, they can inadvertently assume a role of 'insurer of last resort' with implications, in particular, for the citizens they represent. For example, Australia's

joint state- and federal-funded National Disaster Relief and Recovery Arrangements (NDDRA) have been criticised for reducing risk-reduction incentives for affected residents and government agencies alike, thus leaving taxpayers to foot the bill for an otherwise uninsurable risk (Productivity Commission 2014). Conversely, it is arguable that the solitary involvement of the Dutch Government (Table 2) in disaster relief has created a more equitable, distributed and economically efficient means of disaster insurance. Table 2 illustrates that there is no one-size-fits-all solution to the provision of insurance for natural catastrophes such as flooding, with careful consideration of government and consumer moral hazard paramount to any scheme's ability to proactively reduce risk.

Table 2: Comparison of flood mitigation strategies in the US, Netherlands and UK

Scheme	**US National Flood Insurance Program (NFIP)** (Based on Bell 2014)	**Netherlands Government Flood Compensation Scheme** (Based on Botzen and Van Den Bergh 2008 and Surminski et al. 2014)	**United Kingdom Flood Re** (Based on Flood Re 2015 and Surminski and Eldridge 2015)
Nature	• Government subsidised	• Private insurers have no role in disaster insurance.	• Not-for-profit reinsurance body, run and managed by the insurance industry
Key objectives	• Provides affordable insurance to property owners • Motivates responsible land management and development practice by government • Promotes mitigation of flood risk among property owners	• The Calamities and Compensation Act (WTS in Dutch) provides for compensation for individual damages as a result of extensive flooding.	• Provides affordable flood insurance to property owners in flood-prone areas, estimated at 350,000 households • Provides time for the transition to fully privatised insurance coverage within 25 years of scheme establishment

Scheme	US National Flood Insurance Program (NFIP) (Based on Bell 2014)	Netherlands Government Flood Compensation Scheme (Based on Botzen and Van Den Bergh 2008 and Surminski et al. 2014)	United Kingdom Flood Re (Based on Flood Re 2015 and Surminski and Eldridge 2015)

Scheme synopsis	• Properties constructed prior to the NFIP are not automatically subject to scheme requirements and pay subsidised rates not reflective of risk.
	• Full market rate is paid by:
	  ○ new properties
	  ○ substantially improved properties (50% pre-improved property market value)
	  ○ properties rebuilt that have sustained flood damage worth over 50% of pre-flood value.
	• To be eligible for NFIP inclusion, a person must reside in a community that has joined the scheme and agreed to promote and enforce floodplain mitigation behaviour.
		• Highly reliant on Delta Works program that provides and maintains an extensive system of flood defences as a public good.
		• The scheme has no predefined allocation or eligibility criteria but draws discretionary funds from tax income and state loan.
			• Flood Re is funded by a levy applied to all policyholders (collected by insurers), and a levy is applied to insurers based on their market share.
			• Premiums for at-risk policyholders are capped based on council tax band (these risks are assumed by Flood Re). All other policyholders pay risk-relevant premiums.
			• Industry provides flood insurance as a standard compulsory feature of domestic policies required to maintain a mortgage.
			• Government invests in flood defences, flood information services and better planning.
			• Limited cover provided, i.e. flooding due to and beyond 1-in-200-year events is not covered, as it is assumed that these damages will be covered by government.

Scheme	US National Flood Insurance Program (NFIP) (Based on Bell 2014)	Netherlands Government Flood Compensation Scheme (Based on Botzen and Van Den Bergh 2008 and Surminski et al. 2014)	United Kingdom Flood Re (Based on Flood Re 2015 and Surminski and Eldridge 2015)
Effect	• In some instances, failure to maintain accurate flood mapping has resulted in a false sense of security for property owners and underinsurance in high risk areas. • The scheme is deeply in debt (US$20 billion at the end of 2012).	• Discretionary nature of the WTS exposes its utilisation and allocation to political expedience as opposed to economic rationale. • Administrative uncertainty risks operational confusion that could hamper reconstruction and relief efforts. • There is little incentive for individuals to undertake preventative measures (e.g. install electrical and heating equipment above ground floor, flood shields, water-resistant ground floor covering) where government provides compensation.	• Regarded as an interim solution that will transition to risk-reflective pricing, as government flood alleviation engineering works are completed. • Criticism of the design of the scheme is that it emphasises affordability and availability at the expense of individual efforts to enhance the resilience and reduce the risk of flood-affected properties. However, as it does not apply to new builds it provides an incentive not to construct in high flood risk locations.
Lessons	• Subsidised property owners have little incentive to improve their properties, as no insurance cost saving ensues. • Application of full market rates is rarely triggered by substantial improvement because homeowners rarely spend +50% home value on improvements and/or damage rarely exceeds 50% value of property. • Premium rates do not reflect actual risk, which contributes to a shortfall of funds required for the scheme to fund itself.	• Combination of compensation and responsibility for flood defence motivates government to maintain defences. • The magnitude of the flooding risk for the Netherlands is so broadly spread across society that expenditure by hundreds of thousands of citizens at an individual level is not as cost efficient as expenditure by the state. • Responsibility is difficult to avoid and arguably equitable, as it is mandatorily applied via the tax system.	• Flood Re will launch in April 2016.

Coastal hazard insurance cover in Australia

> *We know we are heading for trouble in terms of more exposure to extreme weather events and we will need to upgrade our building standards. The Insurance Council does meet with us occasionally and their constant request is that we do this. Their argument is that if we do not have higher minimum standards then insurance will become unaffordable for communities because damage will be so frequent and expensive.*
> Mr Smith (NSW Department of Environment and Climate Change) as quoted in House of Representatives Standing Committee on Climate Change (2009, p. 113).

Apart from the hazards that primarily affect the coast, such as tropical cyclones, East Coast Lows and sea-level rise, the significant population that lives on Australia's coastline creates unique challenges for coastal managers (DCCEE 2011). As argued by Mr Smith above, to a large degree the capacity of insurers to contribute positively to these challenges will be determined by factors such as planning regulation and building standards. Leaders in the insurance industry have also voiced concerns about the added risks that climate change represents to coastal communities and the implications for insurers. Research indicates that, in the absence of adaptation action, global coastal insured losses could double by 2030 (Lloyds 2008).

While the implications of events such as tropical cyclones on insurer and insured have begun to play out in regions such as North Queensland (see Box 2), how the insurance industry may adapt and innovate in the face of gradual sea-level rise remains to be seen.

Present-day insurance for coastal hazards

Insurance coverage of coastal hazards in Australia is currently limited. An extensive study undertaken of over 40 general insurers found that although some offered partial coverage for erosion and seawater inundation due to storm surge, no insurers offered products that cover loss or damages due to gradual sea-level rise (see Table 9.1 of Bell 2014). A replication of this study, specific to 12 insurers listed on the Australian Government's North Queensland Home Insurance aggregator website, produced consistent findings (see Table 3).

Insurance for future sea-level rise

An absence of coverage of sea-level rise is not surprising. Coverage required for gradual impacts over long periods of time fundamentally diverges from the principles that currently underlie property cover, that is, sudden uncertain impacts and losses:

> *Sea-level rise bears little similarity to the risks traditionally covered by property insurance, and is arguably more akin to the risk covered by life insurance. Life insurance provides coverage for a risk that is certain to occur (i.e. death), although the timing of when the risk will materialise is uncertain.*
> Bell (2014, p. 228)

Table 3 Coverage of insurers listed on North Queensland Home Insurance website. Source: Australian Government 2015

COVERAGE	INSURERS
✔ Storm surge ✔ Erosion ONLY where tied to another insured event ✖ NOT sea-level rise	• RACQ (Storm surge covered, subsidence covered where damage occurs within 72 hours of a flood)
✔ Storm surge ✖ NOT erosion ✖ NOT sea-level rise	• Westpac General Insurance Limited
✔ Storm surge ONLY where tied to another insured event ✔ Erosion ONLY where tied to another insured event ✖ NOT sea-level rise	• AAMI, Suncorp (storm surge same time as storm damage, landslide/subsidence within 72 hours of flood or storm) • OnePath, ANZ (storm surge same time as flood damage, landslide/subsidence within 72 hours of flood or storm)
✖ NOT storm surge ✖ NOT erosion ✖ NOT sea-level rise	• Allianz, CommInsure, Youi

Complexities arise, however, from applying a life insurance model to sea-level rise. For example, while life insurance provides coverage for a single life, properties may be sold any number of times prior to the materialisation of any risk (Bell 2014). Potentially, the issue of multiple ownership could be addressed by tying insurance to a property instead of to an owner. However, such an approach may not be sufficient to motivate the purchase of insurance where potential impacts are perceived to be far into the future. Leaving the uptake of coverage too close to expected events may render insurance unaffordable.

Insurance and future changes in extreme events

Although more consistent with general insurance principles, affordable coverage of storm surge is also likely to decrease as damages and losses are exacerbated from sea-level rise and more intense tropical cyclones.

Box 2: Home and contents insurance prices in North Queensland (unless otherwise noted, extracted from Martin 2014)

Between July 2005 and June 2013, home and contents insurance premiums in North Queensland increased by 80%. For the same period, premium increases across Australia averaged 25%. The Australian Actuary determined that two main drivers of the increase in price in North Queensland were (i) insurer reaction to losses (Figure 3) caused by natural disasters such as cyclones Larry and Yasi that hit the region in 2006 and 2011 respectively and the Mackay storms of 2008, and (ii) increases in the cost of catastrophe reinsurance.

The report differentiated between the nature of cyclone risk and other natural catastrophes, such as flooding. It noted that the impact of flooding can be largely localised, with higher premiums paid by those most at risk. Conversely, the geographical extent of cyclones means that while some policyholders are at greater risk than others, most policyholders are at some risk. This results in a much more significant upward impact on premiums across the region for all policyholders for cyclones than flood.

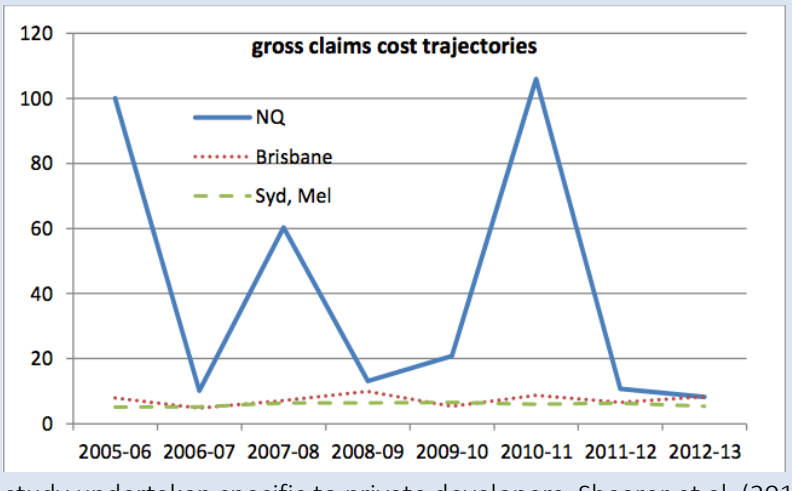

Figure 3: Comparison of gross claims between 2005–06 and 2012–13. Source: Martin 2014.

In a study undertaken specific to private developers, Shearer et al. (2013) found that premiums for strata title property in the region increased by over 300% for the same period. This has possibly contributed to decreased saleability of units, with prices in some areas materially reduced and a significant inventory of unsold stock. Edwards (2014) found that only one insurer provides industrial special risk cover to North Queensland local government authorities (LGAs), the cost of which has increased to an extent that some LGAs were reducing insurance coverage to maintain affordability.

The extent of premium increases in North Queensland and other north Australian regions has led to the establishment of a North Australia Insurance Premiums Taskforce. The Australian Government established the taskforce on 30 March 2015 to explore:

> *… the feasibility of options that use the Commonwealth balance sheet to reduce home, contents and strata insurance premiums in those regions of Northern Australia that are experiencing insurance affordability concerns due to cyclone risk.*
> Josh Frydenberg MP (2015)

The taskforce's final report is due to be released in November 2015 (Australian Government 2015).

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