



THE CITY'S BREAKING AND EVERYBODY'S SHAKING: ¹

I Climate Change and its effect on contract risk in the construction industry

By Lydia Sharpe²

It is no exaggeration to say that climate change may be the biggest existential threat the human race has experienced. It is a phenomenon that communities and governments will be forced to face over the coming decades, to find ways to mitigate the effects of climate change and to adapt to them where those effects prove unstoppable. While the impact of these effects will be felt by a wide range of entities, they will have a particular impact on the construction industry. This essay analyses the impact of climate change on construction and construction-related insurance, and considers the ways in which the construction and insurance industries, as well as government and other entities, might avoid the worst impacts of climate change.

II Climate change and the construction industry

A Effects of climate change on the natural environment

By now, it is a truism within the scientific community that climate change will have tangible, significant effects on global weather patterns. The Intergovernmental Panel on Climate Change's (IPCC) 2019 report notes that future climate-related impacts may be long-lasting or irreversible.³ This section focuses on three major effects: increases in global average temperatures, increases in severe weather events, and sea-level rise.

Scientists have predicted that the global average temperature will increase⁴ between 2.9°C – 3.4°C by 2100.⁵ As a result, summers are predicted to become hotter by between 3 – 4°C. Some regions which currently tend to be dry or arid will likely experience a higher risk of drought, while other, more humid, regions will experience a higher risk of heavy rain and floods. This is a particular risk in several northern hemisphere or high-elevation regions, as well as areas of eastern Asia and eastern North America.

There is an increasing body of evidence to show that climate change is also exacerbating the intensity of severe weather events, such as cyclones and hurricanes. This is largely due to the increase in global temperatures: warmer temperatures mean more moisture in the air, which leads to increased rainfall during hurricanes. According to the IPCC, "the maximum intensity of hurricanes will increase by about 5% this century."⁶ Scientists have noted that "storms are intensifying more quickly [than in previous decades] but often stalling once they hit land, resulting in torrential downpours that cause horrendous flooding."⁷ This effect is already impacting insurers: Munich Re's natural catastrophe review for 2017 commented that the total natural catastrophe-related losses for that year were US\$330 billion, the second-worst in history

¹ Adapted from the Bee Gees' song *Stayin' Alive*, 1977.

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³ *Global Warming of 1.5°C: Summary for Policy-Makers* (Intergovernmental Panel on Climate Change, 2018 (IPCC)).

⁴ Compared to the pre-industrial period, between 1850 – 1900 CE.

⁵ "Climate change: How hot cities could be in 2050" (11 July 2019) BBC <www.bbc.com>.

⁶ Oliver Milman "Are hurricanes getting stronger – and is climate breakdown to blame?" *The Guardian* (online ed, 20 May 2019). See also Nick Kilvert "Climate change already affecting hurricanes and tropical cyclones, research shows" *ABC News* (online ed, 15 November 2018).

⁷ Milman, above n 6.

after the 2011 Japan earthquake and tsunami. Munich Re observed that “although individual events could not be linked directly to climate change, global warming is playing a role.”⁸

Finally, climate change is causing a rise in global sea-levels. This is exacerbating severe weather events including hurricanes, cyclones and floods. The IPCC has estimated that sea levels could rise by just under a metre by 2100.⁹ Globally, the effects of sea-level rise are significant: sea-level rise is likely to create hundreds of thousands of displaced people as a result of low-lying islands becoming inundated; Kiribati and Tuvalu are already feeling the effects as the sea rises and erosion becomes more pronounced.¹⁰ Within the local context, this would impact several coastal areas around Auckland, most severely a large swathe of Helensville, parts of Omaha, Warkworth, Devonport and Mangere.¹¹

B Effects on physical infrastructure

As well as influencing other effects of climate change (such as increased cyclones and hurricanes), higher average temperatures may necessitate changes to buildings. As heat waves become more frequent and longer-lasting, buildings which are not built to a standard which can adequately regulate indoor climate may significantly affect occupants’ health. In early April this year, for example, Auckland was in the middle of a “severe drought”,¹² leaving water reservoirs at 53% of their total volume, far lower than the 78% average for this time of year.¹³ The kind of heatwave which caused this drought¹⁴ can lead to soil shrinkage and subsidence, faster deterioration in concrete, and internal overheating of some buildings such as traditionally constructed high rise apartments.¹⁵

Those who are particularly vulnerable to heat-related illness and death include the elderly and individuals with underlying health conditions. Buildings which are not built to cope with increasingly extreme weather conditions, whether increased heat, which may lead to overheating, or increased rainfall, which can increase dampness, may not be adequately able to protect inhabitants, particularly vulnerable individuals. Finally, where construction crews are expected to work in increasingly hot conditions, work may need to progress slower than normal to avoid workers experiencing heat stroke and dehydration. This will cause delays to the construction timeline and will likely increase costs.

More severe, more frequent cyclones and hurricanes are also likely to have an adverse impact on buildings and construction work. Buildings hit by increasingly severe storms are likely to be more damaged than in previous storms. In the worst-case scenario, as extreme weather events become more common, buildings will be damaged more frequently, leading to increased costs to repair and likely enhanced performance requirements to enable them to resist multiple severe weather events.

Likewise, the increased frequency of floods will have a deleterious effect on buildings constructed on low-lying ground. If floods become so frequent in certain areas that their occurrence becomes less a risk and more a certainty, insurers may be reluctant to insure against flood damage in these areas.

Flooding will be exacerbated by rising sea levels, particularly in coastal areas. This is already a growing problem in some areas in New Zealand, including Tamaki Drive and its surroundings in Auckland, and low-lying areas in Kāpiti, Lower Hutt, Nelson, Tasman, Canterbury and Oamaru.¹⁶

⁸ Tom Sims and Alexander Hübner “Insurers to pay out record \$135 billion for 2017 after hurricanes” *Reuters* (online ed, 4 January 2018).

⁹ Chris Mooney “Scientists keep upping their projections for how much the oceans will rise this century” *The Washington Post* (online ed, 27 April 2017).

¹⁰ Eleanor Ainge Roy “‘One day we’ll disappear’: Tuvalu’s sinking islands” *The Guardian* (online ed, 16 May 2019). See also New Zealand commentary on the international legal aspect of this: Victoria Hallum “Beeby Colloquium on International Law: Sea-level rise and international law” (30 November 2018) Ministry of Foreign Affairs and Trade <www.mfat.govt.nz/en/media-and-resources/ministry-statements-and-speeches/sea-level-rise-and-international-law> and Bruce Burson “Beeby Colloquium on International Law: Sea-level rise and international law” (30 November 2018) Ministry of Foreign Affairs and Trade <www.mfat.govt.nz/en/media-and-resources/ministry-statements-and-speeches/sea-level-rise-and-international-law-bruce-burson>.

¹¹ “Regional Land Elevation Maps: Auckland” prepared in conjunction with *Preparing New Zealand for Rising Seas: Certainty and Uncertainty* (Parliamentary Commissioner for the Environment, November 2015).

¹² Our Auckland “Aucklanders overwhelmingly supportive of calls to save water as drought continues” (28 April 2020) Auckland Council <www.ourauckland.aucklandcouncil.govt.nz/>.

¹³ “Severe drought in Auckland continues” (9 April 2020) Stuff <www.stuff.co.nz>.

¹⁴ Scott Palmer “Heatwave weather: New Zealand could hit 40C temperatures” (1 February 2020) Newshub <www.newshub.co.nz>.

¹⁵ “People can experience different intensities of climate impacts as a result of the type of housing that they live in” ClimateJust <www.climatejust.org.uk/messages/adapting-buildings>.

¹⁶ Sally Blundell “Rising sea levels are putting our coasts in crisis – should we adapt or retreat?” *The Listener* (online ed, Auckland, 21 November 2018).

Meanwhile, in low-lying areas with significant infrastructure, sea-level rise is likely to overwhelm that infrastructure. Examples are likely to include South Dunedin,¹⁷ a low-lying reclaimed tidal flat and marsh, where the value of physical assets and infrastructure total around \$2billion. Extreme flooding in 2015 cost an estimated \$138million in damage, and because of the high water table in the area, future flooding is a virtual certainty, leading to increased repair and construction costs, increased insurance payouts and premiums. Eventually, inhabitants may have to face the very real possibility that it will become uneconomical for them to remain in the area.

To attempt to mitigate these consequences, future buildings may need to be constructed to withstand different types of weather conditions than those for which they are currently constructed, such as higher wind strength, higher average temperatures and increased rainfall. This will affect the types of materials and building methods used.

III The effects of climate change on risk and liability under construction contracts

A Risks deriving from changes to weather patterns

Weather conditions have long been recognised as a source of risk under construction contracts. Bad weather – whether floods or tropical storms, lightning strikes or constant rain – can cause delays to construction projects if the weather is such that it is not safe to continue work and the project cannot be reprogrammed to compensate for the weather. Delays, particularly if they affect critical path items, can lead to increased expenses for contractors in particular. To mitigate their loss and to avoid the imposition of liquidated damages, contractors often consider submitting claims for extensions of time. But it is not always clear whether weather-related delays are viable bases for extension of time claims. It is also not clear whether delays caused by weather exacerbated by climate change can be the subject of extension of time claims. The approach to this question varies between the common standard construction contracts used in New Zealand, and the term “weather-related delays” presents significant problems of interpretation.

“Weather” is specified as a ground for extensions of time under a number of New Zealand-specific contracts.¹⁸ “Unforeseen physical conditions”, which likely has a wider scope than ‘weather’ and can include “transient conditions”,¹⁹ is also included as a ground for extension of time under many of the same contracts.²⁰ Notably, absent specific qualification, the term ‘weather’ includes “even anticipated weather conditions”.²¹

Case law, however, is not always clear as to the basis upon which weather-related delays are to be calculated. The delays in *Millbrook Country Club Ltd v SFM Investments Ltd*²² were not quantified by the number of wet-weather days in the relevant period, but by the extent of remedial work which was necessary to counter the unexpected rock and topsoil conditions. On the facts of that case, this was appropriate, given that the delays were not exclusively caused by wet-weather days but by an accumulation of issues, including an unexpectedly high amount of R 2 type rock which had to be excavated, taking much longer than expected and causing expensive delays.²³

In contrast, in *Diploma Constructions Pty Ltd v Rhodgkin Pty Ltd*,²⁴ delay due to weather was assessed by “wet days [which were calculated according to] Bureau of Meteorology records in relation to the average and above average number of wet days per months in respect of the number of days claimed.”²⁵ This considered not the effect of the weather on the works, but the *objective* number of wet days per month versus the *average* number of wet days per month. At the risk of controversy, it is unclear whether this is the most precise test which could be used: speaking in terms of averages per month inevitably means that parties risk losing focus on the particular facts of their particular case.

Nor is this approach one that will necessarily be suitable as climate change intensifies. Comparing actual numbers of wet weather days to average numbers may be acceptable while the effects of climate change on inclement weather are (generally) confined to 1-in-100-years storms becoming 1-in-20-years; but it is important to note that outside of these storm events, the average weather is, more or less, comparable to what it was before climate change became so severe.

¹⁷ Charlie Mitchell “Down Under: The community most-exposed to sea-level rise is also one of the poorest” Stuff <www.stuff.co.nz>.

¹⁸ These include NZS 3910:2013, NZS 3916:2013 and NZS 3915:2005, cl 10.3.1(b); NZIA SCC 2018 and NBC 2018, cl 11.5.1(f).

¹⁹ *Humber Oil Terminals Trustee Ltd v Harbour & General Works (Stevin) Ltd* (1991) 59 BLR 1 (CA).

²⁰ NZS 3910:2013, NZS 3916:2013 and NZS 3915:2005, cl 10.3.1(a) read with cl 9.5; NZIA SCC 2018 and NBC 2018, cl 11.5.1(b), and SCC SF 2016 and NBC SF 2016, cl 11.4.1(b).

²¹ Tomás Kennedy-Grant QC and Michael Weatherall *Kennedy-Grant and Weatherall on Construction Law* (online ed, LexisNexis) at [210,860].

²² *Millbrook Country Club Ltd v SFM Investments Ltd* (2009) 11 NZCPR 139.

²³ At [34].

²⁴ *Diploma Constructions Pty Ltd v Rhodgkin Pty Ltd* (1990) 11 BCL 242.

²⁵ At 16.

Eventually, however, that will not be the case: over time, the average weather even outside of these extraordinary storm events will become more severe, with increased rain and heat. Once this occurs, comparing actual wet weather days to average wet weather days is no longer going to provide a meaningful metric because the average wet weather days will be far more severe than previously.

There is currently no clear answer to the problems caused by using these metrics in this manner. What is currently known, however, is that these problems will inevitably be exacerbated as climate change progresses.

B Climate change risks and consultants' liability

In New Zealand, the work of consultants – professionals such as architects, surveyors, and geotechnical (or other) engineers – is usually governed by contracts separate to the main construction contract. These consultant-specific contracts include the NZ Institute of Architects' Agreement for Architect's Services, as well as the short form agreements established by Engineering New Zealand and the Association of Consulting Engineers New Zealand.

Since the 1980s the Courts in New Zealand have been willing to hold consultants liable for latent defects in their construction projects. In *Bowen v Paramount Builders (Hamilton) Ltd*,²⁶ the Court of Appeal held that consultants are liable to subsequent owners of a building for the cost of remedying a negligently created latent defect which causes or threatens damage to the structure of the building itself. The fact that the consultant may have discharged his contractual duties to the original owner does not necessarily protect him from tortious liability to subsequent purchasers. This law is still current.

Although this protects subsequent owners from the costs of remedying defects which were not created 'under their watch', it imposes a significant and ongoing risk of liability on consultants. To protect themselves against this risk, most consultants take out professional indemnity insurance.

The likely effects of climate change on the insurance industry will be discussed below, in section IV. However climate change is also likely to negatively affect the exposure of design consultants to negligence claims.

This will be largely because weather events will become more severe and less predictable, meaning that buildings designed and constructed to a standard which would currently provide an adequate level of protection against adverse weather may well no longer be sufficient.

The risk is, of course, that the liability exposure may eventually become so high that smaller consultants may be unable to afford sufficient insurance to cover it. This could have a significant effect on the engineering and architectural professions and could eventually force smaller consultancies out of the market.

C Climate change risks and local councils' liability

Currently, where local councils/building consent authorities (BCAs) are joined as respondents in negligence-based building defect disputes, they are often held jointly and severally liable for the full amount of damage. Where other parties are unable to pay their share of the damage costs, BCAs may be required to pay the full amount.²⁷ Because the plaintiffs in these types of cases are often 'mom-and-pop' homeowners who need somebody to be held responsible so they can afford to repair their damaged homes, if the respondent builder or developer is insolvent and/or in liquidation, the BCA is often the last party standing and thus takes on a higher proportion of the damage than that for which it is in fact responsible. Where climate change exacerbates both risk and liability exposure, it is likely that BCAs will be required to take on increasingly higher amounts of liability in these types of cases.

D Future effects

Overall, climate change will likely necessitate significant developments in the construction space. It is currently difficult to tell what the full extent of these developments might eventually be. However, there are some possibilities which are already being considered.

Consumers will likely raise demands for more ecofriendly products. The best example of this in building construction is concrete, the production method of which releases a lot of carbon dioxide into the atmosphere. Already, overseas companies are seeing a gap in the market for less-carbon-intense alternatives, including pozzolans and other natural concrete alternatives. Pozzolans are siliceous materials which, when powdered and mixed with water, react with calcium hydroxide at ordinary temperatures to form a cementitious material.²⁸ They can be made from natural (such as pumice) or artificial materials (such as fly ash). Because most pozzolans are waste byproducts from other processes, they are both

²⁶ *Bowen v Paramount Builders (Hamilton) Ltd* [1977] 1 NZLR 394.

²⁷ "Discussion Paper for Building System Legislative Reform" (April 2019) Ministry of Business, Innovation and Employment <www.mbie.govt.nz> at 130.

²⁸ "What is a pozzolan?" American Concrete Institute <www.concrete.org/tools/frequentlyaskedquestions.aspx?faqid=688>.

inexpensive and environmentally friendly.²⁹ The pozzolan production process also avoids the release of greenhouse gases which are commonly emitted during cement production.³⁰

As new, more environmentally-friendly building products and methods are developed, the regulatory regime will need to develop with them. It is likely that MBIE will, over time, make significant changes to the Building Code to cope with these new building products and methods. This could be done through MBIE's biannual Building Code update programme, although it is likely that if more extensive reforms are necessary, MBIE might start a programme of consultation with industry and other affected groups specifically for climate change-related issues.

Climate change-related changes to the Building Code could build on some of the changes which are currently being considered, such as the amendments to clauses C, on protection from fire, and clause E1, on surface water.³¹ These are both areas in which changes to weather patterns caused by climate change may require higher levels of protection for buildings.

IV Climate change and the construction industry: the effect on insurance

A Climate change is an insurance risk

There is a growing awareness among the insurance industry that climate change poses an insurance risk. Deloitte's *Insurance Regulator State of Climate Risks Survey* found that "a majority of US state insurance regulators expect all types of insurance companies' climate change risks to increase over the medium to long term [and] more than half of the regulators surveyed [...] indicated that climate change was likely to have a high impact or an extremely high impact on coverage availability and underwriting assumptions."³²

Deloitte notes that "the inherent uncertainty of a changing climate, combined with the diversity and rising frequency of perils, may render the historical loss data that catastrophe models rely on less useful for future loss projections."³³ If this occurs, insurance companies could struggle to set premiums and put together realistic responses to natural emergencies exacerbated by climate change.

The more immediate concern is that, once extreme weather events become more frequent and thus their occurrence more certain, insurance providers will become increasingly reluctant to insure buildings in those areas, and may decide to withdraw entirely. In New Zealand, these areas include the Canterbury, Southland and Waikato Plains, because of the high risk of floods in these locations.³⁴ Although this may be a sound commercial decision, on a sociopolitical level it risks withholding insurance from those individuals who may be least able to pay for their own repairs without insurance.

It is unclear the extent to which insurance providers in New Zealand are focusing on climate change's likely effect on insurance. However, reinsurance providers overseas paint a different picture: both Munich Re and Swiss Re agree that "by mid-century ... climate change will be a major driver of increased risks and losses" for the insurance industry.³⁵ Analysts at Swiss Re have a high degree of confidence that "events that result directly from higher temperatures [such as sea-level rise, storm surges and landslides] will increase as a result of climate change."³⁶

Aware that many weather catastrophes like hurricanes have an indirect relationship to climate change, these analysts are currently attempting to recalculate their current insurance models. Part of the difficulty is that current models utilise data derived from previous hurricanes to model hurricanes that are likely to occur in the future. In a world in which climate change is having a continued and unpredictable effect on previous weather norms, historical data is not an accurate representation of future hurricanes. It is likely that premiums will be raised, although the high level of scientific uncertainty means that, out of an abundance of caution, they may be increased more than is currently necessary. On a worldwide scale, this will negatively impact businesses' and individuals' ability to obtain policy coverage.

²⁹ Ruwan Rajapakse "Concrete Construction" in *Construction Engineering Design Calculations and Rules of Thumb* (Butterworth-Heinemann, Oxford, 2017) 15.

³⁰ Deborah D L Chung "Cement-Matrix Composites" in *Carbon Composites: Composites with Carbon Fibers, Nanofibers, and Nanotubes* (Butterworth-Heinemann, Oxford, 2017) 333.

³¹ "Building Code Update June 2020" (10 February 2019) Building Performance <www.building.govt.nz>.

³² "How insurance companies can prepare for risk from climate change: Industry regulators sharpen their focus" (2019) Deloitte <www2.deloitte.com/us/en/pages/financial-services/articles/insurance-companies-climate-change-risk.html>.

³³ Above n 31.

³⁴ Belinda Storey, Ilan Noy, Wilbur Townsend, Suzi Kerr, Rhian Salmon, David Middleton, Olga Filippova and Vanessa James "Insurance, Housing and Climate Adaptation: Current Knowledge and Future Research" (May 2017) Motu Deep South Challenge <www.deepsouthchallenge.co.nz> at [4].

³⁵ Jeffrey Ball "Climate change is hitting the insurance industry hard. Here's how Swiss Re is adapting" (24 October 2019) Fortune <www.fortune.com>.

³⁶ Above n 34.

If the situation gets worse, insurance providers may elect to exclude certain types of risks (such as climate-change-related flood risks) from their policies. While this may preserve insurance companies' ability to respond to natural disasters which are not caused by climate change, it also means that companies will have to create policies which distinguish between weather events which are related to climate change and those which are not. This could be an exceptionally difficult task: while it is clear in the aggregate that many storms are worsened by climate change, it is not so easy to prove that any one individual storm is worsened by climate change. Alternatively, insurance companies may decide to exclude all extreme weather events (or all extreme weather events of a certain type, such as hurricanes) on the basis that their increased intensity is caused by climate change.

B Climate change risks' effects on insurance related to construction

Among the people who will feel the impact of climate change risks on insurance related to construction are property owners and contractors, who under various standard form contracts may be required to purchase various types of insurance. Under the NZS3910:2013 design-only standard contract, for example, either or both of the contractor and the principal may be required to take out insurance. If the parties have agreed that it is the contractor who will obtain insurance, the standard conditions under the contract provide for contract works insurance (CWI), plant, public liability, and professional indemnity insurance. If it is the principal who is required to obtain insurance, the contract enables them to specify CWI and public liability insurance. The same regime exists under the under the NZS3916:2013 design and build standard contract.

If insurance providers increase premiums too high, or if they exclude weather damage from their policies,³⁷ builders may experience difficulty in obtaining insurance to cover their works. This will disproportionately affect smaller construction companies.

Alternatively, builders may continue to be able to obtain insurance, but premiums may rise. While this is unlikely to affect larger construction companies to the extent that the continued viability of their business is at risk, smaller builders may not be so fortunate. Even if builders pass the cost on to homeowners in the form of higher quotes for works, this will likely affect homeowners' ability to afford to build.

Often, however, the contractor requires the principal to provide CWI. In this scenario, the increased cost of insurance will fall on the development, and thus on the principal. They may, theoretically, be in a better financial position to bear increased insurance costs than contractors or subcontractors, however these costs may still represent a significant burden.

It is notable that the construction industry has been experiencing multiple problems over the last few years, including unfair risk allocation,³⁸ issues with cash flow,³⁹ unsustainably low gross margins,⁴⁰ and increased numbers of construction businesses failing. In this context, increased insurance premiums might represent too great a financial burden on contractors and principals.

C Possibilities for mitigation

At every step there exists the possibility that well-considered central regulation and policy could mitigate the impact of the actions the insurance industry is likely to take to cope with climate change. It is unclear whether the requisite political will exists to craft regulation. Such regulation could, for example, require insurance providers to continue covering weather damage, even if it is exacerbated by climate change.

However, it is not clear whether regulation is the best response to this problem. Can insurance providers realistically be expected to bear the high costs associated with repairing damage exacerbated by climate change? In large part insurance providers have not created the problems caused by climate change, and it may be commercially unfair to expect them to wear the cost of fixing them. But the contractors, subcontractors and building owners who are likely to be out of pocket from climate-change-related weather events also did not individually cause climate change, and thus should not be expected to pay for the damage caused.

Insurers which are currently considering issues of climate change are generally focusing on encouraging individual or small-scale actions by a large number of policy-holders. Inevitably, this focuses insurers' attention on adaptation, not mitigation.

³⁷ Roxanne Libatique "Climate change could drive up weather damage claims – report" *Insurance Business NZ* (online ed, 5 March 2020).

³⁸ Nikki Mandow "Seeking solutions for construction's 'profitless boom'" (7 November 2019) Newsroom <www.newsroom.co.nz>.

³⁹ Stephen Forbes "Local government grappling with construction sector challenges" (8 March 2019) Interest <www.interest.co.nz>.

⁴⁰ "Challenges for the construction industry – BDO Construction survey 2019" (10 October 2019) BDO New Zealand <www.bdo.nz>.

In terms of the adaptation⁴¹/mitigation⁴² dichotomy, climate change policy has traditionally been skewed in favour of mitigation, partly because focusing on adaptation has been viewed as a sign that states have given up on mitigation efforts, and partly out of a concern that fossil-fuel companies could use it as an excuse not to work on reducing their emissions. As a result of this, adaptation efforts have been left behind compared to mitigation strategies.⁴³ Insurers encouraging their policyholders to promote adaptation strategies could build a consensus over time in favour of increased adaptation measures.

As Deloitte's *Insurance Regulator State of Climate Change Risks Survey* proposed, one way to mitigate risks from climate change could be for insurance carriers to incentivise policyholders who invest in mitigating climate-related risks and containing related claims through adaptation measures.⁴⁴

Although it is unlikely to completely resolve companies' exposure to insurance risks from climate change, Deloitte also recommends that companies include climate risk assessments in their broader enterprise risk management frameworks, and conduct organisation-wide stress tests covering a "broad range of plausible climate change scenarios to determine capital and liquidity implications and prepare for any eventuality."⁴⁵ Deloitte notes that "this would give [insurance] carriers a holistic view of climate risk exposure, thereby helping top management with decision making."⁴⁶

Deloitte is aware that, continuing under the status quo, increased risk from climate change will force insurers to raise premiums to unaffordable levels. To mitigate this, it suggests, insurers, administrative agencies and builder associations could work together to discourage development in high-risk zones. It proposes that building design and materials used for development should be able to withstand the likely climate change threats in their regions and government programs could be created which would incentivise homeowners to retrofit their homes to promote climate resiliency.

V Looking to the future: what should we do now to avoid this future?

This section examines a range of options for various stakeholders: short-term, medium-term and long-term; and for construction companies, insurance providers and the government.

In the short term, the way forward for the construction industry seems clear: companies must urgently review their insurance policies to ensure they are adequately protected against weather-related delays.

In the medium term, the construction industry, in conjunction with government, should focus on developing more eco-friendly building products and methods. Some examples could include developing and using eco-friendly products such as pozzolans in construction, as well as considering construction methods which protect against more severe weather events such as floods and fires.

In the short- to medium-term, the Ministry of Business, Innovation and Employment should continue its biannual reviews of CodeMark, and its current review of the building regulatory system. MBIE's review of the building regulatory system is slated to result in two bills which are due to be introduced to Parliament this year. It is unlikely that either bill will explicitly consider issues arising from climate change, but this could be a topic for future reviews.

Alongside this, it is imperative that governments continue to pursue science-based adaptation and mitigation efforts to tackle climate change more broadly. These remain an integral part of the fight against climate change, regardless of the additional steps taken by the construction industry.

As for governments and the insurance industry, they will need to resolve a particularly vexed question: who should fund the repairs for damage caused or exacerbated by climate change? As discussed earlier, there is an argument that insurance companies should not be expected to do this, given that they have contributed relatively little to climate change. It is also likely that, given their far greater resources, it is equitable that the financial burden of funding repairs for climate change damage should land on governments. However, this might represent such a high financial cost that governments may become unwilling or unable to fund other programmes necessary to tackle climate change or inequality more broadly. Such a chilling effect would be counter-productive overall.

In the medium term, the insurance industry will need to consider how companies can encourage their policyholders to do business in increasingly sustainable ways. This could be done through incentives included in their insurance policies (for

⁴¹ Mitigation involves "the reduction in emissions of any greenhouse gases that contribute to climate change." (Loreley Fortuny "Climate change mitigation and adaptation" International Association for Impact Assessment <www.iaia.org/wiki-details.php?ID=6>.)

⁴² Adaptation involves "the process of adjustment to actual or expected climate and its effects." (IPCC Working Group II "Fifth Assessment Report: Glossary" (2014) Intergovernmental Panel on Climate Change <www.ipcc.ch>.)

⁴³ See for example "Mitigation vs. Adaptation: Which one matters more?" (2014) Road to Paris <www.roadtoparis.info>.

⁴⁴ Deloitte, above n 31.

⁴⁵ Deloitte, above n 31.

⁴⁶ Deloitte, above n 31.

example, giving discounts on premiums in return for using a certain level of ecofriendly building materials in new builds). Alternatively, insurance companies could provide policies which incentivise property owners to rebuild or repair existing buildings to ecofriendly standards rather than rebuilding/repairing strictly to the previous standard, as is generally provided in current insurance policies. This could enable policyholders to upgrade buildings without effectively restricting implementation of eco-friendly standards to new buildings only.

On the research side, companies like Munich Re and Swiss Re are both already funding climate change research. Other re/insurance companies should get involved to further this work.

Realistically, it is too early to forecast with any certainty what the long term future might hold for the construction industry in dealing with the impacts of climate change. Too much depends on the actions of other entities – notably central governments and the insurance industry – and the actions the construction industry takes today. The progression of climate change in ten or twenty or fifty years' time, and thus the necessary response by the construction industry, is in a state of flux and is heavily dependent on political and policy moves made today, by a wide variety of actors. Outside of some events which currently appear to be near certainties, it is impossible to attempt to predict eventual outcomes; far less is it possible to construct a comprehensive roadmap to help the construction and insurance industries navigate these difficulties. Nevertheless, the construction and insurance industries will need to be highly responsive to events as they arise so each industry can take steps to respond to events in ways which will minimise, as far as possible, the progression of climate change.