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Centre for Climate Change Economics and Policy

INSURANCE INDUSTRY *brief*

The Munich Re Programme of the Centre for Climate Change Economics and Policy

AIMING FOR A 2°C GOAL: What does it mean for the insurance industry?

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Summary

- Many countries now agree on the need to limit global warming to no more than 2°C above pre-industrial levels.
- A warming of 2˚C would not be 'safe'. In a world that is 2˚C warmer, we are very likely to experience changes to the types and characteristics of extreme weather in many regions, as well as a global trend towards more intense weather-related events, including droughts, floods, storms and heat waves.
- It is clear that changes in extreme events will put additional stress on risk management procedures, particularly where exposures and vulnerabilities to extreme weather are high.
- Climate change means increased ambiguity over long-term risks. The impact on the insurance industry will depend upon its ability to anticipate and respond to changing levels of risk.
- Adaptation can have immediate benefits. Without adaptation to the impacts of climate change, the viability of weather-related insurance markets and products in some areas will be put under pressure.
- The insurance industry can play a leading role in promoting and supporting adaptation to climate change, with benefits from protecting and extending the market for property and casualty insurance.

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Introduction

An important outcome of the 15th Session of the Conference of the Parties (COP15) to the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen in December 2009 was an acknowledgement by many countries of the scientific and economic evidence supporting a long-term goal to limit global warming to no more than 2°C above pre-industrial levels. This Insurance Industry Brief by the Centre for Climate Change Economics and Policy explores what such a goal might mean for the industry, particularly in terms of the risks from extreme weather events.

The Brief also explores the importance of adaptation to the impacts of climate change, particularly in managing near-term changes in risk that cannot be avoided through reductions in greenhouse gas emissions. Finally, the Brief considers the role that the insurance industry can play in adaptation.

Global action, local risks

Global changes in climate will be accompanied by changes in the characteristics of local weather-related hazards across the world. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), published in 2007, concluded that the frequency of heat waves, heavy precipitation events and storm surges, and the area affected by drought in many regions, is '*likely*' (i.e. more than 66 per cent chance) to have already increased during the second half of the twentieth century and that it is '*more likely than not*' that human emissions have contributed to the observed trends (IPCC, 2007).

For some types of extremes, particularly rarer events such as tropical cyclones, it remains difficult to gauge the past and future effects of anthropogenic climate change (Knutson *et al.*, 2010). It is clear from the underlying physics of the Earth's climate that in a warmer world, globally, we can expect more intense weather, including flooding, droughts, storms and heat waves. It is also clear that without adaptation to reduce vulnerability and exposure, these changes in hazard would translate into changes in risk.

The changes in hazard that we will see in the coming two decades as a result of manmade global warming are now largely unavoidable. Climate change up to around 2030 will be chiefly determined by the high atmospheric concentrations of greenhouse gases that already exist and the lag in the response of the Earth's climate to them.

CLIMATE CHANGE UP TO AROUND 2030 WILL BE CHIEFLY DETERMINED BY THE HIGH ATMOSPHERIC CONCENTRATIONS OF GREENHOUSE GASES THAT ALREADY EXIST AND THE LAG IN THE RESPONSE OF THE EARTH'S CLIMATE TO THEM.

THE IMPACTS OF CLIMATE CHANGE AFTER 2030 CAN BE MITIGATED THROUGH COLLECTIVE INTERNATIONAL ACTION TO REDUCE GLOBAL EMISSIONS OF GREENHOUSE GASES.

The impacts of climate change after 2030 can be mitigated through collective international action to reduce global emissions of greenhouse gases. In the long-term, reductions in greenhouse gas emissions are the only currently viable option to limit climate change and avoid future impacts. Adaptation, by contrast, can only limit some of the impacts.

The case for action to limit future climate change has never been clearer. Emissions from the use of fossil fuels, agriculture and land-use changes have driven concentrations of carbon dioxide and other greenhouse gases in the atmosphere to levels not seen for 650,000 years at least.

Basic physics, established more than a century ago, indicates that increasing the concentrations of greenhouse gases in the atmosphere causes the Earth to warm. Since the pre-industrial period, global mean temperature has risen by around 0.8°C and this has been associated with increases in global sea levels and changing patterns of rainfall and extreme events in many regions.

The IPCC Fourth Assessment Report concluded that it is very likely (i.e. more than a 90 per cent chance) that most of the observed increase in global mean temperature since the mid-20th century is due to the observed increases in atmospheric concentrations of greenhouse gases (IPCC, 2007). The IPCC further concluded that

'*continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century*'.

The rigorous scientific research supporting these statements has been developed over many decades by thousands of scientists around the world.

An important outcome of the United Nations climate change conference in Copenhagen in December 2009 was an agreement by some countries to limit future warming to no more than 2°C above pre-industrial levels. The case for action was recognised at the international level in 1992 with the signing of the United Nations Framework Convention on Climate Change (UNFCCC), now adopted by more than 190 countries. The ultimate objective of the UNFCCC is the

'*stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system*'.

'Dangerous anthropogenic interference' is not defined by the Convention, though recent international discussions within and outside the UNFCCC have increasingly recognised the scientific and economic evidence supporting a goal to limit global warming to no more than 2˚C above pre-industrial levels.

The Copenhagen Accord, which was noted by the Parties to the UNFCCC in December 2009, states that:
'We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius, and take action to meet this objective consistent with science and on the basis of equity. We should cooperate in achieving the peaking of global and national emissions as soon as possible'.

A number of studies have shown that allowing roughly a 50 per cent chance of limiting warming to no more than 2°C above pre-industrial levels will require strong and rapid reductions in global greenhouse gas emissions (Figure 1). Recent research published by the Centre for Climate Change Economics and Policy and the Grantham Research Institute on Climate Change and the Environment in collaboration with the UK Met Office, (Bowen and Ranger, 2009) suggests that global annual emissions would need to peak within the next 5 to 10 years and fall to between 40 and 48 billion tonnes of carbon-dioxide-equivalent in 2020, before reducing to much less than 20 billion tonnes by 2050. Today, global annual emissions are at roughly 47 billion tonnes of carbon-dioxide-equivalent.

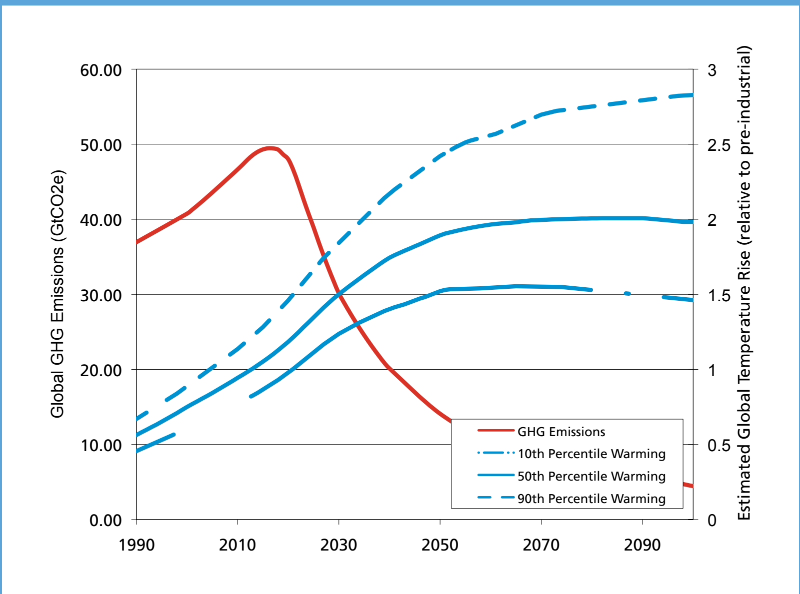

Figure 1: Global annual emissions of greenhouse gases (red) and an estimate of the range of global mean warming in the future (blue) from Bowen and Ranger (2009). The annual emissions path would give a roughly 50 per cent chance of limiting warming to no more than 2°C above pre-industrial levels in 2100. The path has emissions of 48 billion tonnes of carbon-dioxide-equivalent in 2020. Carbon-dioxide-equivalent (CO2e) is a measure of the total mass of greenhouse gas emissions defined in terms of the equivalent mass of carbon dioxide emissions that would cause the same warming over 100 years.

While challenging, there is strong evidence that such a target is not only technologically feasible, but also economically desirable, given the scale of the adverse, and potentially catastrophic, risks that would be avoided. For example, several recent studies indicate that the costs of achieving a 50 per cent chance of limiting warming to no more than 2°C range from less than 5 per cent of global GDP to 1 per cent or below, assuming a well-designed global policy framework (Bowen and Ranger, 2009).

Conversely, analyses by Stern (2006) concluded that the costs of unmitigated climate change could equate to a reduction in global average per-capita consumption of between 5 per cent and 20 per cent, now and forever. These estimates are likely to be a lower bound on the true risks (Dietz, 2009). Making one comparison with the impacts of climate change on a 'business-as-usual' path, the benefit of limiting warming to no more than 2°C is equivalent to preventing a reduction in consumption of 10.5 percentage points, now and forever.

Binding international targets for reducing annual emissions have not yet been agreed. National voluntary actions for 2020, pledged to the UNFCCC since the Copenhagen conference, are close to what would be required to meet a 2°C goal. As of 1 April 2010, the UNFCCC had received submissions of national pledges to cut and limit greenhouse gases by 2020 from more than 75 countries which account for over 80 per cent of global emissions from energy use.

Preliminary analyses by the Centre for Climate Change Economics and Policy and the Grantham Research Institute suggest that these targets and actions, if fully delivered, would equate to global emissions of around 48 billion tonnes of carbon-dioxide-equivalent in 2020 (Stern and Taylor, 2010). This is a significant reduction on projected 'business as usual' emissions, but is still above the 'climate responsible' level of 44 billion tonnes of carbon-dioxide-equivalent in 2020 proposed by Stern (2009).

Any delay in global emissions reductions is likely to mean greater costs of action to achieve the same goal, or a greater chance of higher levels of warming. For example, if action was delayed and global emissions did not peak until around 2025, emissions would need to be reduced at a far higher rate to limit warming to 2˚C. Several previous studies have shown that faster emissions reductions would be more costly (e.g. den Elzen *et al.*, 2007).

More rapid reductions later also means a higher likelihood of running up against constraints in time and costs, for example in installing new capital or developing new technologies, that could lead to a higher risk of breaching the goal of limiting warming to no more than 2˚C. A bigger rise in global mean temperature would translate into higher local temperatures and bigger impacts, including larger changes in the characteristics of local weather extremes.

Damages from Hurricane Katrina, © Munich Re

A warming of 2˚C should not be regarded as 'safe'; there would be adverse impacts in many regions and for many types of weather-related hazards. The adverse effects of warming will be felt particularly strongly and early by the most exposed and vulnerable, for example, the small island states and some of the least developed African nations. In light of this, some countries have argued that the aim of emissions cuts should be to limit warming to no more than 1.5˚C above pre-industrial levels.

A WARMING OF 2˚C SHOULD NOT BE REGARDED AS 'SAFE'; THERE WOULD BE ADVERSE IMPACTS IN MANY REGIONS AND FOR MANY TYPES OF WEATHER-RELATED HAZARDS.

Insurance whilst aiming for a 2°C goal

Climate change not only means changes in the global hazards from extreme weather events, but also an increase in long-term ambiguity in risk; that is, new types of risks, and existing risks with increasingly uncertain likelihoods.

When considering the implications of aiming for a 2°C goal, it is important to consider that reducing global emissions along a path that aims to have a reasonable chance (i.e. 50 per cent chance) of meeting a 2°C goal does not guarantee this outcome. In Bowen and Ranger (2009), the emissions paths that aim for 2°C also have a 50 per cent chance of exceeding 2°C by 2100; in fact, the 90th percentile warming is just under 3°C (Figure 1).

These probabilities are themselves highly uncertain. For decadal-scale planning and investment horizons, managing uncertainty and ambiguity in decision-making will be increasingly important in a changing climate (Figure 2).

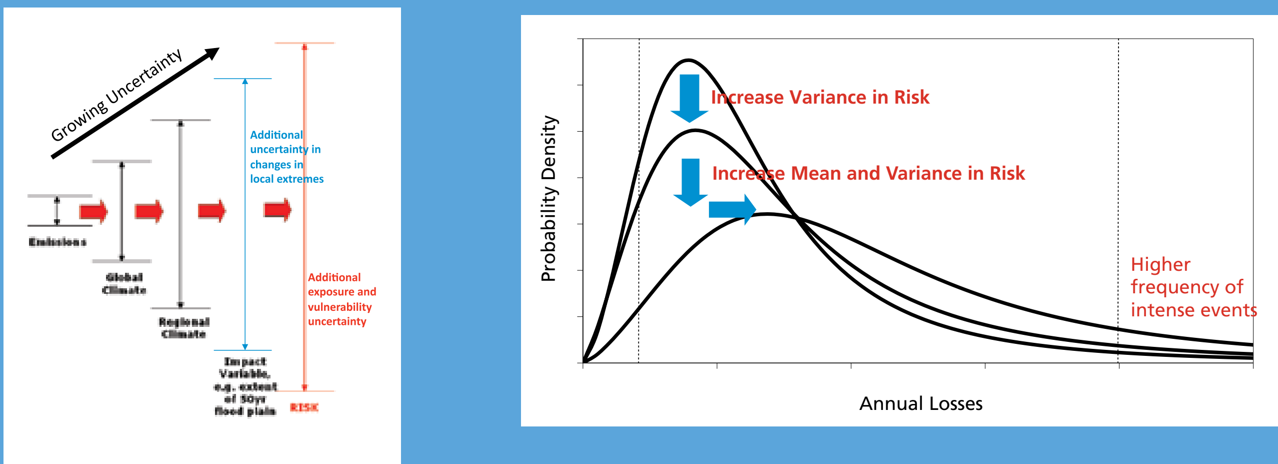

Figure 2: Schematic showing (left) the increase in uncertainty in the estimation of future risk and (right) the effect on annual losses of an increase in the variance of risk and the average annual loss. Climate change means an increased level of ambiguity in risk on longer timescales – it is still not possible to estimate exactly how a probability density function of losses will change over time; taking account of ambiguity in long-term planning horizons will be increasingly important.

Climate change also means growing uncertainty in the future operating environment for businesses. A warmer world will mean global changes to water availability, food production, the natural environment and risks associated with extreme events. For example, evidence presented in Stern (2006) suggested that a warming of 2°C could result in a 20–30 per cent decrease in water availability in some vulnerable regions like southern Africa and the Mediterranean region, sharp declines in crop yields in many tropical regions (e.g. 5–10 per cent in Africa) and up to 10 million more people affected globally by coastal flooding every year.


Damages from Hurricane Katrina, © Munich Re

Again, these numbers are subject to uncertainties, but when the many impact analyses are aggregated, they create a clear and consistent (though geographically inhomogeneous) picture of non-linearly increasing levels of risk with temperature across multiple sectors. Globally and locally, these impacts will affect patterns of wealth, trade and economic growth, influencing the operating environment for the insurance industry. With around US$19 trillion in funds under management (2008 estimate, IFSL 2009), the global assets of the insurance industry could have substantial exposure to these impacts.

Climate change may also lead to new opportunities for insurance coverage and investment, for example in the growing sectors associated with adaptation and mitigation, such as water management and low-carbon technologies. These opportunities are likely to emerge more rapidly than the risks related to climate change impacts.

The largest direct potential threat to the insurance industry is likely to be posed by unanticipated changes in levels of weather-related hazards and risk. The impact of climate change on the insurance industry will depend on its ability to anticipate and respond to these changing levels of risk.

The insurance industry has traditionally based its view of risk on historical records of hazard occurrences; Herweijer *et al.* (2009) concluded that climate change means that weather-related hazards and risk can no longer be considered statistically stationary. Underwriters can no longer rely on the past as an adequate guide to future risk and, consequently, there is an increase in uncertainty in risk in a warmer world.

An example of the impact of unexpected changes in weather hazards was demonstrated over the past 20 years in the provision of coverage against wind damage by hurricanes along the Atlantic and Gulf coast lines of the United States. A period of relatively low hurricane activity between 1970 and the early 1990s (Figure 3) coincided with rapid population growth along many parts of the United States coastline, particularly in Florida (Pidot, 2007). After 1995, the frequency of hurricanes increased markedly; a shift that was largely unanticipated by property developers and owners, policymakers or the insurance industry. The particularly active seasons in 2004 and 2005 led to record insured losses.

THE LARGEST DIRECT POTENTIAL THREAT TO THE INSURANCE INDUSTRY IS LIKELY TO COME THROUGH UNANTICIPATED CHANGES IN LEVELS OF WEATHER-RELATED HAZARDS AND RISKS.

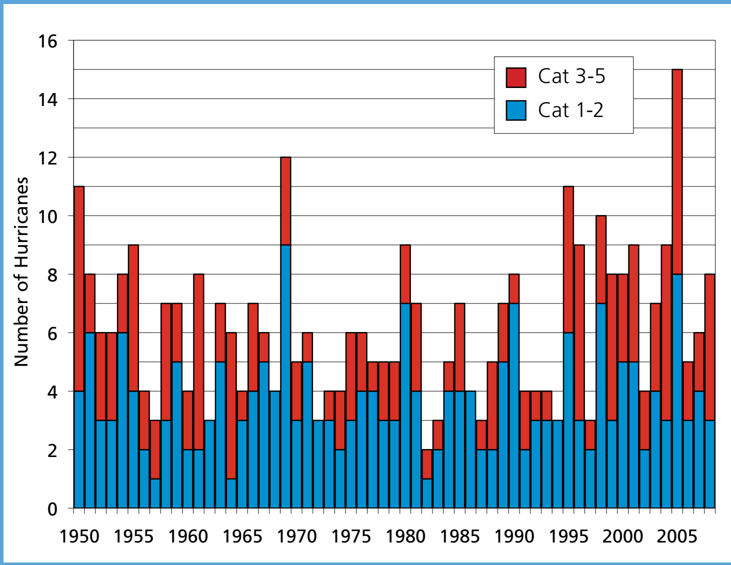

Figure 3: Atlantic basin hurricane activity from 1950 to 2008 (source: NOAA HURDAT). The bars show the total number of hurricanes in the Atlantic basin in that year; the light red component of the bar indicates the number of these storms that were intense hurricanes (Category 3 to 5 on the Saffir-Simpson scale).

While it is not clear to what extent, if any, climate change has contributed to the increase in hurricane frequency in the North Atlantic Basin since 1995 (Knutson *et al.,* 2010), the impact on the insurance industry may be an indicator of the challenges that will be faced in the future.

From an industry perspective, long-term solvency could depend on the ability of insurers and reinsurers to anticipate and respond rapidly to changing levels of hazard and risk in relation to hurricanes and other extreme weather events. Risk managers could see benefits from incorporating appropriate flexibility into long-term strategies to allow for the rising ambiguity in hazard and risk on decadal timescales.

It is still not possible to predict exactly how hazards will change, particularly at a regional or local level; in fact, due to their localised and rare nature, changes in extreme weather are amongst the most difficult impacts of climate change to predict.

A number of research groups have used climate modelling and climate-catastrophe models to explore possible future scenarios. For example, new research by Bender *et al.* (2010) suggests that while overall annual numbers of Atlantic tropical cyclones could decrease, the numbers of the most intense (category 4 and 5) hurricanes could increase significantly. For the 18-model ensemble-mean climate change, they found an increase in the frequency of category 4 and 5 storms that corresponds to a 10 per cent per decade linear increase over this century.

These numbers are subject to uncertainty, but there is a growing number of studies that point towards the same picture for future hurricane activity in a changing climate (e.g. Emanuel *et al.*, 2008; Meehl *et al.*, 2007).

The effect of such changes on losses would be amplified as they are typically non-linearly related to levels of hazard. For example, research by the Association of British Insurers (2009) concluded that an increase of just 6 per cent in wind speeds could increase average annual insured property losses in the United States from hurricanes from US$5.5 billion to around US$9.5 billion. Further research has shown similarly large potential sensitivities for other types of losses, particularly windstorms in Europe and typhoons in China (Association of British Insurers, 2009).

Sea level rise will also be an important driver of future risk; for example, without adaptation sea level rise alone will increase losses related to storm surges in coastal regions. In this case, future changes are more certain (in direction, if not scale). Recent research by Risk Management Solutions and Lloyd's of London has indicated that even a sea level rise of 30 cm could drive a doubling of average annual losses from storm surge for individual properties in exposed coastal regions, and an increase of about 10 to 20 per cent in 1-in-200 year losses. Additional increases in hurricane activity would drive losses to higher levels.

Damages from the recent Dresden flooding, © Munich Re Foundation

While caution should be exercised in the interpretation of these types of studies, such analyses can be useful in indicating potential 'storylines' through which an insurer can explore the sensitivities of their business. Given that the uncertainties in future risk are unlikely to be significantly narrowed in the coming years (even with large investments in computing), risk managers could realise benefits from incorporating appropriate flexibility into long-term strategies to allow for the rising ambiguity in hazard and risk on decadal timescales.

The impact of such changes in hazard on the global risk of extreme weather events will depend on the effectiveness of adaptation, in particular, the extent to which reductions in exposure and vulnerability limit risks associated with weather-related hazards. If such reductions do not occur or are inadequate, risks will increase, and the number of people and properties that are considered uninsurable could grow.

Insurability depends on a number of criteria, including actuarial, market-based and societal factors. Table 1 is reproduced from Herweijer *et al.* (2009); it summarises these factors and estimates how these are likely to be affected by climate change. For example, an increase in the frequency and/or intensity of extreme weather events could mean a consequent increase in average and maximum potential loss if risks are not mitigated by adaptation.

In addition, with continued migration of populations to coastal regions, insurers and reinsurers could be exposed to potentially growing accumulations of risk. Without adaptation by limiting exposure and vulnerability of insureds, such increases in expected losses, uncertainty and capital demands (Figure 4) could have profound consequences for future affordability and availability of insurance cover. New insurance products (with different terms and conditions) may be required to maintain insurability in some regions.

Category	Criterion	Characteristic	Affected by climate change?
Actuarial	Risk/uncertainty	Measurable	Yes
	Loss occurrences	Independent	Possibly
	Maximum loss	Manageable	Likely
	Average loss	Moderate	Yes
	Loss frequency	High	Yes
	Moral hazard/Adverse Selection	Not excessive	Unlikely
Market-determined	Insurance premium	Adequate, Affordable	Yes
	Insurance cover limits	Acceptable	Possibly
	Industry capacity	Sufficient	Yes
Societal	Public policy	Consistent with cover	Likely
	Legal system	Permits the cover	Unlikely

Table 1: The effect of climate change on the insurability of risk (reproduced from Herweijer *et al.*, 2009). Columns 1 to 3 represent the central criteria of insurability and their characteristics. The final column indicates whether the characteristics could be affected by climate change, based on current scientific understanding and experience.

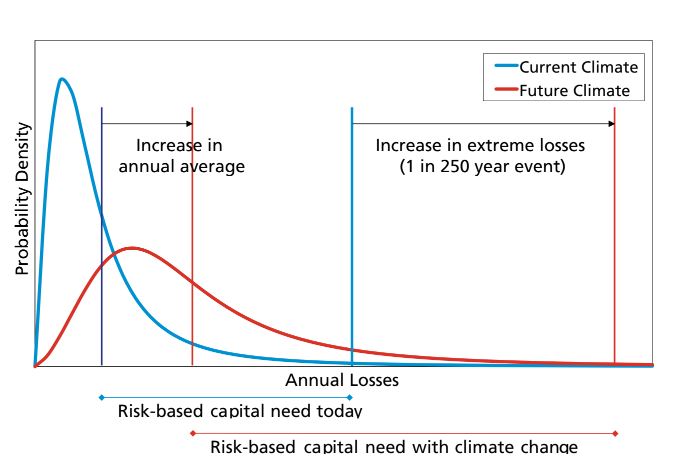

Figure 4: Schematic diagram illustrating the effect of changes in the mean and variance of risk on average annual losses and the risk-based capital needs of a (re)insurance company. Adapted from Association of British Insurers (2009).

Promoting and supporting societal adaptation could increasingly become a strategic imperative for the insurance industry. The traditional response to changing levels of risk by the insurance industry has been adjustments to insurance premiums, policy conditions and coverage. However, Herweijer *et al.* (2009) pointed to recent evidence from the United States where major and rapid changes in policies offered by private insurers to cover homeowners' properties can create negative public and political reactions that may affect other lines of business. This suggests that a new approach may be required to help in managing changing levels of risk.

For example, the record hurricane-related losses in 2004 and 2005 resulted in the coverage for many properties being withdrawn or increased in price. This caused much debate between

Rebuilding in Grenada. F Ranger


Damages from Hurricane Katrina, © Munich Re

homeowners, their political representatives and the industry and led to significant changes in the regulatory environment of the insurance industry. In Florida, for instance, regulators attempted to prevent private market insurers from withdrawing coverage for wind damage by making licences to write automobile insurance contingent on maintaining adequate provision of homeowners' property insurance.

While the USA does represent a specific case of strong insurance regulation, Herweijer *et al.* (2009) suggested that this demonstrates that the industry is likely to face increased regulatory scrutiny and action if it does not respond appropriately to the threat of rising uninsurability due to climate change. An alternative response by insurers and reinsurers may be to guide and contribute to public policies that reduce exposure and vulnerability in order to promote insurability. An important strategic element of adaptation for the insurance industry may be to explore ways of promoting and supporting societal adaptation.

Societal adaptation as a strategic imperative

Adaptation, through reducing vulnerability and exposure to extreme weather, can have immediate benefits today, for both the insurance industry and society in general.

Mitigation through reductions in greenhouse gas emissions is by far the most economically effective approach to limiting long-term risks posed by climate change. However, whatever the outcome of the international policy negotiations over the coming months and years, the world is already committed to further warming that is likely to lead to adverse impacts in many regions and changes in many types of weather-related hazards. Adaptation is the only viable option to limit the impacts of these unavoidable near-term changes in hazard.

Adaptation includes disaster risk management, but applied with a view to managing future risks as well as present-day risks. Adaptation strategies should aim to reduce exposure and vulnerability to weather extremes through a combination of risk reduction (including, for example, strengthened building codes, risk-averse land development and planning, and flood defences) and also disaster preparedness (including early warning systems, research into risk and climate change, evacuation procedures and emergency response).

Well-designed adaptation strategies can cost-effectively reduce risk and, in some cases, in the near term may help to offset increases in risk due to rising levels of hazard (Lloyd's of London, 2008). For example, the United States Geological Survey and the World Bank estimated that an investment of US$40 billion would have prevented losses of US$280 billion in the 1990s (cited in Kryspin-Watson *et al.*, 2006).

Adaptation can also be effective in managing simultaneous drivers of increasing risk, such as increases in exposure due to the rising concentrations of populations and assets in high-hazard areas associated with urbanisation.

Nicholls *et al*. (2007) concluded that more than half of the increased asset exposure to coastal flooding expected in the 2070s could come from population growth and economic development in coastal areas, with the remainder due to climate change and, to a lesser extent, local subsidence. The most significant increases in exposure are expected in the Asian megacities, such as Kolkata, Mumbai, Dhaka, Guangzhou, Ho Chi Minh City, Shanghai, Bangkok and Hong Kong. Risk-averse land-planning policies implemented today could potentially avoid such increases in exposure.

Estimates from more recent studies of the global cost of adaptation have ranged from around $25 billion a year to well over $100 billion by 2015-2030. Fankhauser (2010) concluded that this wide range is *'symptomatic of the poor state of knowledge'* and that, given the important knowledge gaps, *'It is likely that adaptation costs have been underestimated so far'.*

These estimates for 2015-2030 are to a large extent independent of the course of greenhouse gas emission reductions. After 2030, adaptation costs will become far more sensitive to the strength of our mitigation efforts over the next few years, with delayed action requiring a greater reliance on adaptation to manage the impacts of climate change and therefore, higher adaptation costs in the longer term.

From an insurance industry perspective, well-designed adaptation strategies could maintain and extend the insurability of weather-related risks. An upgrade to a drainage system could reduce the level and volatility of risk for a town exposed to surface water flooding. Risk-averse land development and planning regulations could limit the accumulation of risk in a high-hazard area. For these reasons, supporting adaptation may be a strategic imperative for insurers in maintaining the long-term sustainability of weather-related insurance markets.

Insurance and the insurance industry can play a role in enhancing risk reduction directly through business practices. This includes, for example: raising risk awareness through differentiated pricing and information; supporting research on risk reduction and providing information to policy-holders and local decision-makers; and engaging with policy-makers to promote the societal benefits of adaptation and insurance.

INSURANCE AND THE INSURANCE INDUSTRY CAN PLAY A ROLE IN ENHANCING RISK REDUCTION DIRECTLY THROUGH ITS BUSINESS PRACTICES.

The insurance industry has a history of fostering practices and technologies to reduce risk, such as: promoting home security and fire prevention through policy terms and conditions (e.g. Ward *et al.*, 2008); bringing forward innovations in building codes (e.g. funding of the Institute for Business and Home Safety in the United States and lobbying for the adoption of improved building codes; Mills, 2007); raising risk awareness and distributing information on risk reduction options; lobbying for investments in flood defences and risk-averse land development and planning (e.g. the 'Statement of Principles on the Provision of Flood Insurance' of the Association of British Insurers) and incentivising vehicle safety through premium prices.

The benefits for the insurance industry of promoting and supporting adaptation could be:

- protecting the market for casualty and property insurance by continuing and extending insurability;
- playing a bigger role in designing and implementing policies and decisions about current and future vulnerability and exposure (e.g. planning and development applications, building codes, etc.);
- showcasing the industry's understanding and knowledge of risk and its drivers; and
- providing leadership within the private sector and society on an issue with profound consequences for future generations.

Insurance as part of adaptation

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Insurance itself is a potentially important component of adaptation in helping to manage residual risks that cannot be eliminated through disaster risk reduction, both in the developed and developing world.

An important outcome of the United Nations climate change conference in Copenhagen was recognition of the need for new and additional international financial support for adaptation and mitigation activities in developing countries. The Copenhagen Accord indicated that developing countries should receive US$30 billion for the period 2010-2012 and US$100 billion per year by 2020. A High-Level Advisory Group on Climate Change Financing has been established by the United Nations Secretary-General to study the contributions of new potential sources of revenue.

A significant portion of funding for adaptation will be focused on reducing vulnerability and building resilience in the most vulnerable nations: the least developed countries, the small island states and Africa.

The increased importance and recognition of the changes in weather-related risks that arise from climate change could bring opportunities for new markets and products for the industry. The potential benefit of insurance as part of adaptation in developing countries has also been explicitly recognised by Parties to the UNFCCC.

Successive drafts of negotiating texts in the lead up to the conference in Copenhagen called for the establishment of insurance and alternative risk transfer mechanisms as part of comprehensive adaptation and disaster risk management strategies in developing countries.

Two leading proposals were put forward by the Alliance of Small Island States (2008) and the Munich Climate Insurance Initiative (MCII) (Warner *et al.*, 2009). Each proposal included elements of disaster risk reduction, regional risk pooling and local insurance mechanisms, such as micro-insurance. The role of private and public insurance in such mechanisms is still a subject of much discussion. The coming months will reveal what progress can be made on such mechanisms within the context of the UNFCCC.

The MCII, which is a collaborative initiative between private insurers, academics, international agencies and non-governmental organisations, provides a further example of how the private insurance industry can utilise its risk management expertise in support of societal adaptation.

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