

Climate Change and the Insurance Industry*

by A. F. Dlugolecki**

Even today, many sectors of the insurance industry do not regard climate change as a significant issue. However a certain amount of research and analysis has been performed by progressive companies who now see it as a fundamental which will affect not only the nature of insurance risk, but also public policy towards natural hazards. Additionally they expect climate change to have far-reaching impacts on asset management and in-house resource management because of international and domestic measures to reduce greenhouse gas emissions.

In parallel, there is a broader move within the industry to understand and cope with the insurance impact of extreme events, because of the growing exposure to catastrophic losses, and the increase in their actual impact in recent decades. Finally, there is a recognition that environmental issues will have to feature more prominently on the management agenda in future.

This paper will critically examine the reasons for the industry's tardy response to climate change and whether this is likely to change soon. It will consider how public policy might evolve, and how insurance can form a part of a broader programme for natural disaster reduction, incorporating climate research, land use planning, and information strategies. It will explore what problems and opportunities might then arise for insurance from climate change, within the wider context of the industry's own internal dynamics, and external global economic change, and how best to capitalize on the common elements in the industry's divergent views, so that the transition to a more strategic approach occurs with minimal disruption.

1. Introduction

This paper has been written with two main objectives. First, to give an assessment of where the insurance industry stands on climate change now, and second to identify what opportunities and problems will flow from it to affect the insurance sector. This seems an appropriate time for such an exercise, some ten years after politicians began to see climate change as an important issue, and on the threshold of a new millennium. Yet those same politicians are deadlocked in discussions about how to tackle the problem, and their advisers in the Intergovernmental Panel on Climate Change (IPCC) are unable to present a coherent picture of what the detailed implications will be, because of the complexity of the global weather system and its massive inertia.

Section 2 gives a summary of the current scientific and political positions on climate change in order to provide a foundation for the subsequent discussion. Section 3 reviews what the broad implications are likely to be for financial services. The wide range of attitudes

* This paper is based on an earlier paper, "Climate Change and the Insurance Industry", presented at the Aon Group Australia Conference, "The Changing Risk Landscape: Implications for Insurance Risk Management", Gold Coast, Australia 1999. The proceedings were edited by Neil R. Britton, and published by Southwood Press Pty Ltd, Sydney, Australia.

** CGU plc, London.

displayed within the insurance sector are then discussed in section 4, ranging from sceptics to active campaigners against fossil fuel emissions. There are many reasons for these divergent views, and these are investigated in section 5.

Despite the lack of consensus on climate change among insurers, there are two other drivers which are helping to create a general willingness to tackle sustainable development. Section 6 considers the various initiatives which have sprung up to tackle the issue of rapidly increasing exposure to catastrophe losses, and section 7 looks at the steadily growing pressure for businesses to formulate environmental policies to guide internal and external processes.

Before exploring the challenges of climate change for insurers in detail, the paper considers in turn some of the key dynamics which will shape the industry in future: internal market forces (section 8), global economic change (section 9) and public policy on natural disaster reduction (section 10). Section 11 develops a draft action plan to illustrate how the insurance industry might participate in a co-ordinated attack on natural disaster losses. Section 12 outlines the many other avenues of opportunity which could arise from the widespread consequences of climate change, and then section 13 summarizes the paper's conclusions.

2. Climate change in science and politics

There have been two major studies on climate change, under the auspices of IPCC, reporting in 1990 and 1995, with the Third Assessment Report (TAR) expected in 2001. It is now generally accepted that the Earth's temperature has risen about 0.6°C since 1860, with a corresponding rise in sea level. This is still within the range of historical variation, but most scientists ascribe this to man-made "greenhouse gases" like carbon dioxide, methane, and chlorofluorocarbons which retain the sun's energy. The Second Assessment Report concluded that the human influence on climate was now "discernible" (IPCC, 1996). Modelling these effects in a huge and complicated system, like the flows of the ocean and atmosphere, in order to gauge the changes over the next century, is at the limits of scientific ability, so there is considerable uncertainty, as well as scope for alternative scenarios depending on what mitigating strategies are adopted, and when they come into play. The "mainstream" view is that by 2100 the temperature will rise a further 1.0 to 3.5°C, with a sea level rise of around 60 centimetres. There will be major effects on ecosystems and the hydrological cycle (i.e. the natural world, and the pattern of evaporation and precipitation), with obvious consequences for agriculture. Strong regional variations are likely, with the potential for "surprises". It is still not possible to be precise about the effects on weather patterns, particularly storms, because they are too small-scale to feature in the current generation of General Circulation Models (GCMs) used by scientists. Indeed, we know that in some cases, e.g. hurricanes, they are dependent on a variety of factors, not just sea-temperature. However, the steady increase in sea level combined with shifts in rainfall indicates that some areas *will* suffer adverse effects.

Despite the uncertainties regarding the role of cloud cover, the influence of solar variability, and local effects such as deforestation and low-level "haze", the considered view of IPCC is that the human influence on climate is already "discernible". Greenhouse gases have a long lifetime in the atmosphere and are increasing in volume due to global economic activity, so the changes will not cease by 2100, but will in fact accelerate. While there could be beneficial effects in some regions, e.g. a longer growing season for Northern Europe, the effects on less developed countries and ecosystems are potentially devastating. For that reason, IPCC recommended that governments should jointly agree to limit greenhouse gas emissions to mitigate the long-term changes. At the same time, they should continue to

research into climate change, carry out widespread education on it, and begin to plan to adapt to it, particularly in maritime areas, where IPCC has produced a series of studies on Coastal Zone Management (CZM) (IPCC, 1994).

As in the nursery story “Bell the Cat” it is easier to devise a plan than to implement it. At Kyoto in 1997, a set of targets for “Annex 1” countries (i.e. developed nations) was agreed for limiting emissions, after fierce argument. This framework has still not been implemented because the technical procedures for controlling and measuring emission have not been decided. Also the U.S. is unhappy that there is no timetable for the inclusion of developing countries (e.g. India and China), which will overtake Annex 1 emissions in the first decades of the 21st century. Other weaknesses are the false base-line for the former Soviet Union and related countries (since their heavy industry has now collapsed, they have a “bonus” credit in terms of non-existent emissions which may be tradable), the long time-frame for measuring the initial targets (it will be 2014 before they are validated), and the absence of any penalties for non-compliance. In the light of such difficulties, a more holistic framework such as “contraction and convergence” seems desirable (Global Common Institute, 2000).

3. The implications of climate change for the insurance sector

The most obvious impact of climate change in the insurance sector will be the increase in insured property losses from extreme weather events. However, there are also significant implications for asset management which are considered later in this section, as well as general issues relating to resource management (IPCC, 1996).

In the last seven years, the U.S., Poland, Canada, Australia, and France have all suffered record losses from weather events (August '92 hurricane, July '97 river floods, January '98 ice-storm, April '99 hailstorm, December '99 windstorms). This prospect seems likely to continue because of changes in the return periods of extreme events and the non-linear relationship between property damage and event severity. In some instances, e.g. summer temperatures in England, scientists are even prepared to be specific about the shortening of return periods. Generally, shifts in the water and wind cycles will alter the *location* of extreme events. In addition, it can be expected that the increase in atmospheric energy will give rise to an upward shift in storm activity. The net effect of these changes is to exacerbate property losses – the benefit from a reduction in losses in favoured areas will be outstripped by the additional losses in those regions where weather extremes become more common. This is because the newly affected areas will be unprepared for a disproportional increase in weather losses, and will not be able to adopt the higher design standards which were customary in the other areas for some time. Figure 1 illustrates this phenomenon for shifts in location or intensity of climate hazards. The only caveat for *insured* losses, is that currently they are dominated by U.S. hurricane losses, so these general trends in *economic* losses may not be exactly reflected for insurers. Section 6 illustrates that under reasonable assumptions the risk premiums could escalate 900 per cent by mid-century.

The non-linearity of property damage versus event severity is well known – increasing the speed of a 200kph storm by 10 per cent can magnify the damage 150 per cent (UNEP III, 1997). A practical example is given by the losses suffered in the October 1987 “hurricane” which hit England and France (see Figure 3). The postcode areas with higher windspeeds suffered disproportionate losses, although they were similar in nature to the other areas.

While there may be uncertainties about many regions, coastal regions will definitely be prone to greater problems, because of the rise in global sea-level. In some areas like East Anglia this is compounded by land subsidence due to drainage projects and glacial rebound

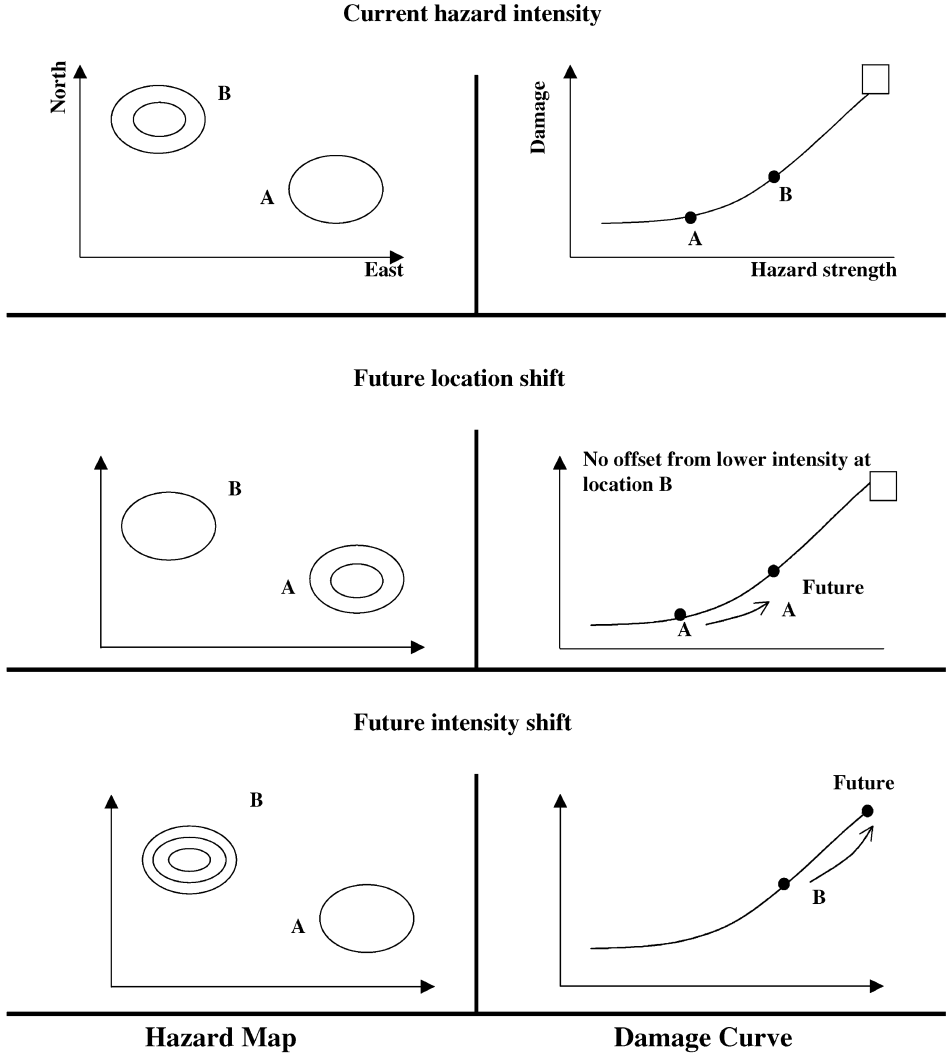


Figure 1: Future damage potential from climate shifts

(see Figure 4), and coastal storms could exacerbate the problem still further owing to shifts in their location and likely increased strength.

The second main area where climate change will affect financial institutions relates to investment, particularly long-term asset management. Over a period of decades, it is increasingly likely that political and public actions will be directed against conventional energy technologies and towards new energy technologies, greater efficiency in the use of energy, and substitutes for energy (e.g. teleworking for physical commuting). This will affect the economics of those technologies, and the prospects of whole regions and industries. There will be other major initiatives also, e.g. to prevent or adapt the threat to flooding by defence

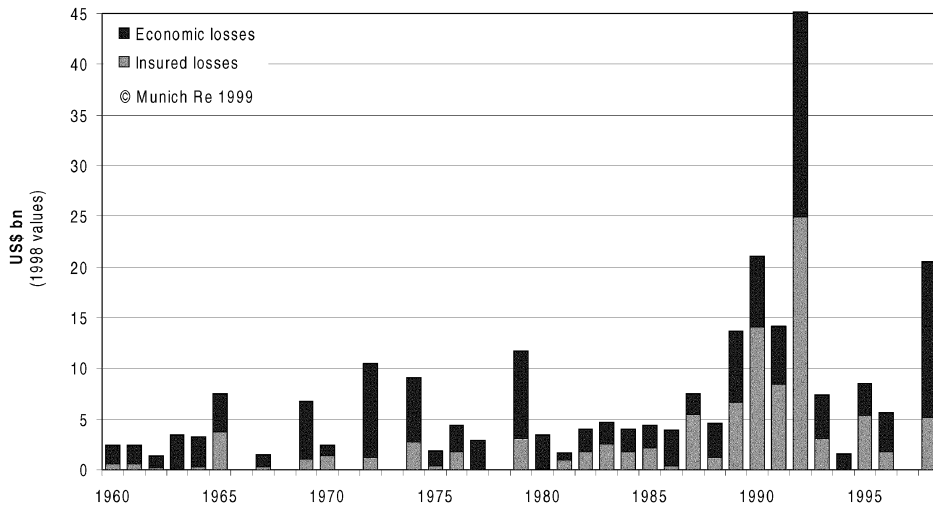


Figure 2: Great windstorm disasters 1960–1998

works, or through managed retreat. Major afforestation projects are likely since they will absorb carbon dioxide as well as assist soil retention and biodiversity. In addition, temperature and rainfall changes will impact lifestyles, agricultural practices and water resource management. In the extreme, entire populations may need to be relocated.

Such widespread changes are part of the reason for the diverse political reactions to climate change, but they have not really filtered through to the investment community, particularly pension funds and life insurers.

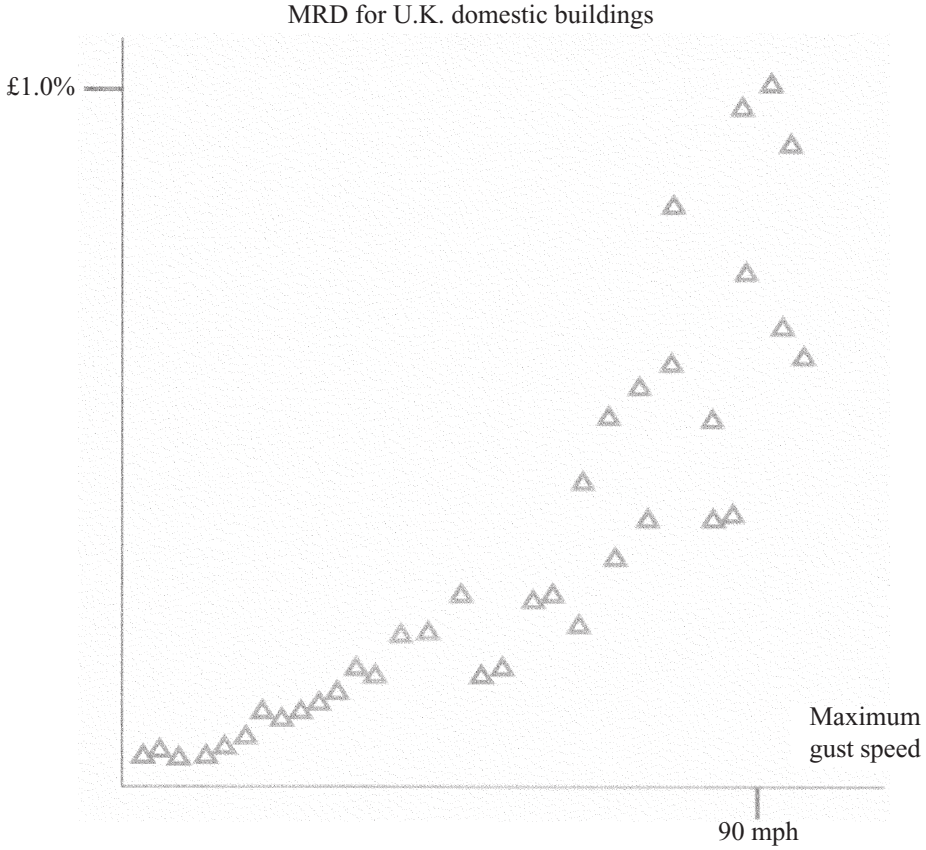
Finally, insurance companies will be affected in their day-to-day operations like other businesses, because resources (particularly energy and energy-intensive materials) and conventional personal transport will become more expensive.

4. Current attitudes towards climate change in the insurance industry

The insurance world runs the full gamut of opinion on climate change, from disbelief to disinterest to acknowledgement and then active involvement. While there are always exceptions to any rule, attitudes tend to be based on location (for property insurers) or function (for other arms of the insurance industry).

Looking first at property insurers, those in the U.S. do not subscribe to the idea of global warming. This is typical of the business climate in that country, which sees climate change almost as an environmentalist plot designed to undermine its competitive international position, which is heavily based on cheap energy. A factor which is specific to insurance is that weather loss experience is dominated by hurricanes, and those in turn are influenced by a number of factors, particularly el niño, which are apparently cyclical. This means that any underlying natural trend is camouflaged, apart from the widely recognized fact that there is a strong growth in exposure along the Atlantic seaboard anyway.

Japanese insurers are more sensitive to scientific opinion, and are very aware of their shortage of natural resources. However, they are culturally disinclined to bold action, and tend



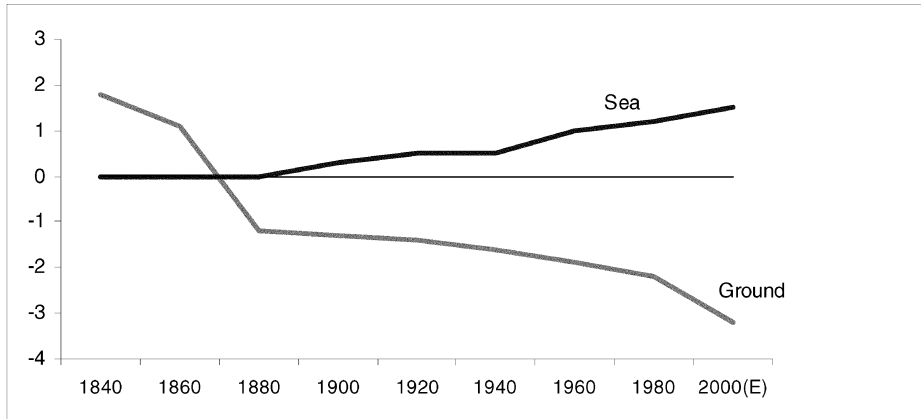
MRD is based on ABI data at postcode district level, of claims cost as a ratio of total value of insured property, for domestic buildings, Windspeed is interpolated from maps in Buller 1988.

Figure 3: Storm cost vs. windspeed (October 1987)

to follow the policies of the wider Japanese business community. In particular, this means support for nuclear energy as the preferred alternative energy source, which has its own environmental problems, as the recent accident at Tokaimura has shown.

Insurers in Northern Europe, particularly Germany and Scandinavia, are keenly aware of environmental issues, reflecting their social environment, and are therefore relatively well informed about climate change and its implications for their business.

Outside these three regions, property insurers do not recognize climate change as an issue, because often cover excludes weather perils. A similar position is reflected in the life insurance and pensions sectors worldwide, which is rather ironic, since their business is usually described as long term in contrast to property insurance which is short term, and the repercussions of global warming will accumulate over time.



Ground Level (Graph rebased to 1840 = 1.8 m)

Sea Level IPCC (Graph rebased to 1880 = 0 m)

Figure 4: Coastal hazard in East Anglia

Some other functions in the insurance market are more aware of and more involved in global warming, because they are more specialized. Either they stand to benefit from an increase in weather related transactions, or they are even more exposed than insurers. The former category includes brokers, reinsurance brokers and loss adjusters who are generally remunerated in proportion to the premium or claims flows. The second comprises reinsurance companies, who are often the true carriers of catastrophic losses even when the original losses are settled by a local insurer.

The most active insurance body on the issue of climate change is the United Nations Environment Programme Insurance Industry Initiative (UNEP III) which was founded in 1995. The author of this paper served on the Steering Committee from 1995 to 1998, and helped to draft various position papers and discussion documents which UNEP III has published relating to climate change (UNEP III, 1996, 1997, 1998a, 1998b, 1999). In particular, these have highlighted the issue of vulnerability to property damage when weather patterns change, and also the need to measure environmental performance in order to intensify corporate attention to global warming.

5. The drivers of attitudes to climate change

There are perhaps four significant reasons why the insurance industry is not currently more actively involved in climate change: the poor quality of information; the predominance of short-term thinking in business circles; peer group influence; and the nature of current institutions.

Poor quality information

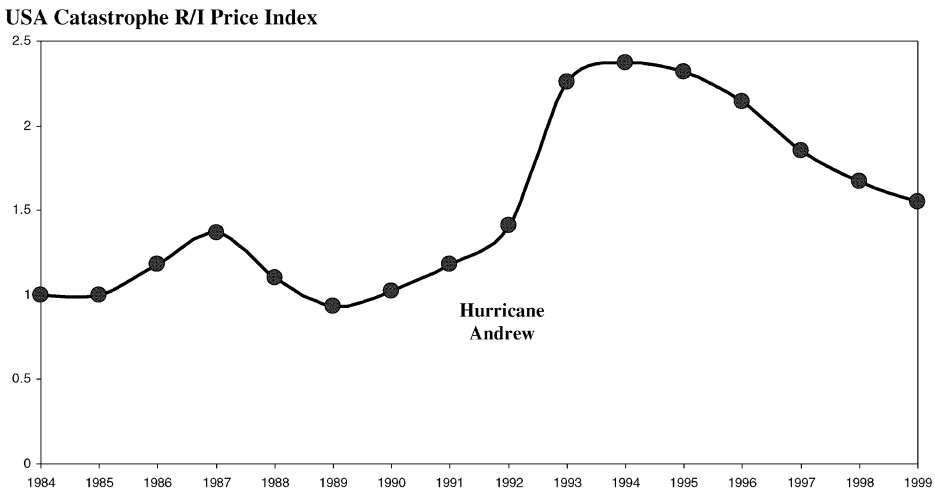
The flow of information about climate change to insurers is deficient in several ways. In the first place, the state of knowledge about the future weather is embarrassingly poor, because

the global weather system is so complicated that even three-day forecasts can be seriously inaccurate. General trends in temperature are not much help to insurers, who require detailed descriptions about extreme events to be able to consider the implications for property damage. A recent review of the implications of climate change for Australia considered six significant weather features (ENSO, rainfall intensity cyclones, hail, heatwaves, and bushfire), and concluded that almost nothing could be said about future trends! (Pitcock *et al.*, 1999). In addition, the basic information is provided in very technical, lengthy documents, and the more digestible “translations” are often coloured by the political attribution of the provider, e.g. Greenpeace may be seen as anti-business.

Short-term thinking in business

It is human nature to respond to recent or urgent stimuli, and insurers are no exception. In the early 1990s for example, reinsurance rates rocketed as a result of Hurricane Andrew, but since 1994 they have steadily declined (Figure 5). Given that climate change is described as a process that will unfold over decades, and that recent windstorms have been less costly in terms of insured damages, other more pressing issues take priority. (It is noteworthy that many serious natural disasters do not impinge on the insurance world, because flood damage is often excluded, as is much of the agricultural sector. This means that insurers are considering only a partial picture when they look at weather loss trends.)

There are of course many other calls on businesses’ attention, arising from competitors’ actions and external developments, and the urgency of such pressures often excludes other strategic issues. Given that market dynamics and global economic change will transform the face of business in the coming decades, these developments are examined more fully later in this article.



Source: Paragon

Figure 5: The market has a short memory

Peer group pressure

Well-managed companies pay close attention to other sectors of the business community. Practical ways in which this occurs include board appointments, stock holdings and diversification. Thus, if powerful sectors like energy and motor vehicles take up determined positions on an issue like global warming, this is bound to influence others without a strong stake, or who are less well informed. The author knows of this happening in the case of one major reinsurer which reversed its proactive stance on climate change. A similar situation arose in Kyoto in 1997, where Japanese insurers felt obliged to support the broad industry position on nuclear power as the preferred alternative energy source for Japan.

The institutional dimension

Climate change is a problem which needs to be addressed internationally. Many industries have international associations which lobby effectively on trade and other global issues, including climate change. Unfortunately, the insurance industry is not one of these, and until the creation of UNEP III, there was no channel at all for it to communicate with policymakers at the annual Conferences of Parties which are attempting to initiate measures to deal with climate change.

At national level, insurance industry associations do exist, but they are traditionally concerned with local regulation, e.g. taxation, accounting, product design, and consumer affairs. To lobby on environmental issues is quite foreign to such bodies, particularly when there is such a large degree of uncertainty about the likely impacts on their members' interests. On the other side, governments and scientists are not generally used to seeking the assistance of the business community on environmental issues, and have been slow to recognize that there may be allies in the insurance sector (and others, e.g. tourism) to counterbalance the antipathy from energy-intensive sectors.

On the other hand, there are two important drivers which will increasingly focus the industry's attention in this area: firstly the political momentum to inculcate environmentally sound principles, and secondly concerns about the increasing loss potential in many areas. What this means is that, even without a general belief in climate change, there are strong forces which are pushing in the direction of sustainability and disaster mitigation, strategies which underpin a successful response to that issue.

6. Managing natural catastrophe exposures

There has been a general rise in insured losses in recent decades, largely reflecting changes in exposure, rather than a fundamental trend in the natural hazards themselves (see Figure 2). The most significant drivers are: property has become more susceptible to damage, through the use of flimsy structures like trailers and the water-sensitive nature of modern business and personal equipment; populations have grown, have become wealthier, and are increasingly located in maritime regions or megacities (or both); and businesses are more vulnerable to interruptions following extreme events. Scientific knowledge will continue to accumulate at an accelerating rate, which will lead to advances in materials technology and medical techniques. In turn these are likely to give rise to larger exposures for insurers.

Figure 6 gives an example of how sensitive the risk premium for catastrophes is to the return period. Suppose currently extreme events have a 1/100 probability, costing 1 unit. This yields a risk premium of 0.01. It is anticipated that by mid-century, the return periods for high

| | Normal | Extreme | Catastrophe | Expected cost |
|------------------|--------|---------|-------------|---------------|
| Event cost | 0 | 1 | 5 | N/a |
| <i>% of Time</i> | | | | |
| Now | 99 | 1 | 0 | 0.01 |
| 2050 | 95 | 4 | 1 | 0.09 |

- Can be produced by a shift in locations even with a neutral overall shift in severity because damage response is non-linear. Increasing the speed of a 200kph storm by 10% increases the damage by 150%.

Figure 6: Loss potential numerical example

temperatures in the U.K., for example, will have shifted so that “extreme” events may have a 4/100 probability, and “very extreme” or catastrophic events a 1/100 probability. With a non-linear damage curve, the cost of a very extreme event could be in the region of 5 units, giving a new risk premium of 0.09, almost a tenfold increase.

Already it is estimated that there are several locations where a strong landfalling hurricane in the U.S. could cause an insured loss of \$50 billion, three times the actual loss in Hurricane Andrew. To place this in context, the insured cost of “Superfund” environmental damage in the U.S.A is likely to amount to \$100 billion (discounted for delays in settlement). These pollution losses accumulated over the course of 100 years and include substantial legal fees, whereas the hurricane damage would arise in approximately 100 hours and might be repeated several times in the one century! The problem is compounded by the fact that insurers do not have the freedom to underwrite the risk owing to state regulation. Although the regulatory issues are not always present in other countries, the uncertainty over the timing and size of losses has certainly become a serious issue for the insurance sector.

In the private sector, this has stimulated a growth in the modelling of extreme events by commercial consultancy groups like AIR, EQE and RMS, and consortia like Risk Prediction Institute (RPI) in Bermuda, and TSUNAMI in the U.K. Whereas the consultancies are mainly interested in providing simulations of historical events or “what if” scenarios, the consortia are also investigating the possibility of long-range or seasonal forecasts. Conventional forecasts are up to three days in advance of an event, and so insurers cannot generally alter their exposure. It is also difficult for them to initiate emergency risk protection, because of the

focus on public safety measures, but they can mobilize their claim-handling network as a preparatory step.

If reliable seasonal forecasts were available, then insurers could modify their underwriting policy to reflect the anticipated severity of the weather. This could mean annual fluctuations, up and down, in rates, deductibles, and policy conditions as far as the end-consumer is concerned. It could also entail variable accumulation limits for high hazard areas, and significant adjustments to reinsurance programmes.

Currently, work at RPI is generating five-year forecasts of hurricane activity using a mechanistic statistical model, which derives cyclical behaviour from historical data, broadly reflecting known phenomena like the Quasi Biennial Oscillation (QBO), and el niño (Malmquist, 1999), with more basic research looking at prehistoric natural records of hurricane activity. The TSUNAMI initiative also uses statistical techniques, but only one year ahead, and intends to supplement these with physical modelling (i.e. projecting atmosphere/ocean conditions based on present conditions). Both groups predicted an active 1999 season, but they diverge for 2000, with TSUNAMI expecting it to be less active than average, while RPI is forecasting an average season.

The forecasts will need considerable refining to be truly useful, since the critical issue is the location and strength of *landfalling* storms. For instance, 1992 was a very quiet season, with only one major storm, but unfortunately it was force 4, and made landfall in Florida (Hurricane Andrew) – creating record damage.

Similar forecasts are already proving valuable for the agricultural sector in many tropical countries, like Brazil, because rainfall depends critically on the el niño phase, and there are early signs that similar models may be possible for moderate latitudes also (Palmer and Anderson, 1994).

7. Environmental policy in the insurance sector

The second major influence on the insurance sector which is drawing attention to climate change is the issue of sustainability, which is affecting corporate governance in all industries. The industrial heritage of pollution has proved costly for insurers, but the Earth Summit in 1992 in Rio created an awareness of far more fundamental problems due to the limited resources on the planet, and produced Agenda 21, a series of initiatives to combat environmental degradation.

As a result, environmental pressure groups like Greenpeace and the World Wide Fund have conducted successful, focused campaigns to persuade businesses and politicians to change their policies on issues like decommissioning oilrigs (Brent Spar) or global warming. All large businesses have therefore set up environmental management functions to instil best practice in core operations, as well as routine “housekeeping”. The media have also picked up this theme responsibly: a keynote U.K. survey is the *Financial Times/Business in the Environment* analysis of the “Footsie 100” companies’ environmental policies. The U.K. Government has recently advised major quoted companies that it is likely to introduce mandatory environmental reporting, and from next year U.K. Pension Fund Trustees will be required to comment on how they take environmental and ethical criteria into account. Once information on environmental performance is available, it will be used to supplement corporate ranking techniques by rating agencies.

The most proactive initiative in the insurance sector is the United Nations Environment Programme Insurance Industry Initiative, founded in 1995, and closely associated with the issue of climate change. It has always advocated early action, because of the uncertain nature

of the impact on weather patterns, and the enormous potential for property damage. Scientific research has conclusively shown that at the time of the last deglaciation, the climate oscillated wildly even on a decadal timescale, which confirms that the Earth’s climate system is sensitive to disruption. One of the most notable outputs from the Initiative is their Global Warming Potential indicator, which estimates the emissions of carbon dioxide for which a company has been responsible (UNEP III, 1998a). However, the initiative recognizes that a wide range of environmental issues are relevant to insurers, including responsible investment. Currently the membership is largely European and Japanese, but it is hoped to extend this to other continents, and to develop closer co-operation with the banking industry, which has a separate UNEP initiative.

8. Insurance industry dynamics

One of the most striking features of the industry recently has been the speed of consolidation in all sectors – broking, insurance, and reinsurance – although this has yet to occur in all countries, and there may even be a temporary proliferation of new companies in freshly liberalized markets. This development has led to a huge increase in the scale of individual companies (see Figure 7). The market capitalization of the top insurance companies is still well behind that of the mega-corporations in other industries, but if this trend continues then the largest insurers will have the clout to engage in policy-making at the international level as a credible force, because they will (a) have the resources to acquire information, and (b) have the network to deliver results when decisions are taken.

Another epochal change in the industry is the convergence of financial services, with banking and insurance increasingly blending, either through mergers, acquisitions and greenfield subsidiaries, or through joint venture partnership arrangements. This will

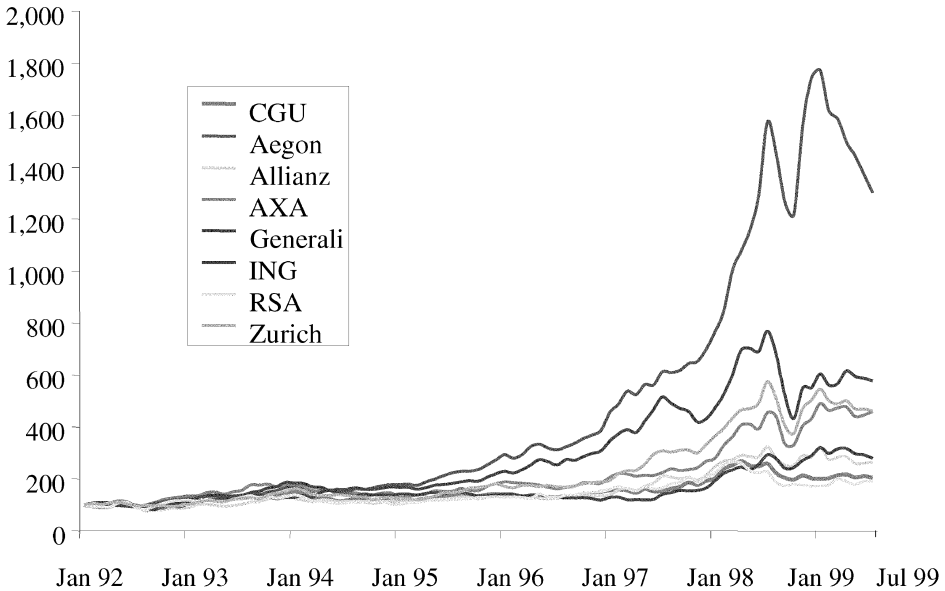


Figure 7: Growth of eight European insurers Share Price Index Jan 1992 = 100

obviously reinforce the trend towards scale, but will also lead to more innovation in the provision of financial services. For example, while insurers and banks are not under common ownership, it has been easy for an insurer to avoid risks like flood or growing crops which may constitute a major financial problem for a bank's customers, and therefore the bank. When the interests are united, it is more likely that a new service will evolve to protect them.

At the "wholesale" end of the insurance industry, there can be problems with a lack of supply of reinsurance, reflecting a shortage of capital. Sometimes this has occurred after a surfeit of claims, e.g. Hurricane Andrew in 1992, but it is also a persistent problem for areas with a serious localized catastrophe potential, e.g. the Tokyo earthquake, the Mississippi flood. The economic losses which would arise from such extreme events are relatively small compared to the movements which perturb the world's financial system through adjustments to currency and political factors. This has led to the realization that catastrophic risk can be used to create new financial instruments with almost no correlation to economic factors, which can be very attractive to investors. Currently there is considerable experimentation in this field of Alternative Risk Transfer (ART), although only a fraction of the global reinsurance demand has been diverted to them. However, this innovation could prove decisive if a major increase in insurance for natural hazards were to be required (Doherty, 1997).

9. Global change

As well as the internal dynamics of the insurance industry, external forces will have enormous effects on future operations. Section 6 considered socio-economic factors as they relate to climate change. Environmentalism was discussed in section 7. Another trend with major implications is the retreat of the state, which section 10 will investigate. Globalization is a factor which is directly affecting the insurance industry corporate structure. However, all industries and markets are experiencing this, and probably this will mean that financial services like insurance will increasingly have common features in all national markets. Therefore, it will be difficult to maintain product features like flood exclusions in some European Union countries when others have flood cover readily available.

The General Agreement on Tariffs and Trade (GATT) will extend to the bulk of developing countries soon. Among these are China and India, with vast economic potential, but also heavily exposed to extreme weather, in particular flood and drought. Possibly this will refocus financial services' geographical preoccupation with the U.S. and Europe, and so give a higher priority to dealing with the problems of less developed countries.

The other development which will revolutionize commerce and the private world is electronic technology. Already the Internet is impacting on the way we work and learn, and virtual reality is becoming the latest leisure craze. Satellite television, mobile telephones and electronic pagers have revolutionized communications, and interactive television will continue this process. Collectively, these inventions will enable faster access to richer data-sources, and also rapid outreach to large or scattered interest-groups, with obvious benefits from the management of natural hazards, in terms of preparation beforehand and response afterwards.

10. Public policy on natural disaster reduction

The mounting toll of human casualties and property losses motivated the United Nations to declare the 1990s the International Decade for Natural Disaster Relief (IDNDR). The two

basic planks in a disaster policy are mitigation, to reduce the impacts, and response to reduce suffering and hasten recovery (Board of Natural Disasters, 1999). National Committees were formed, but less than half performed effectively owing to lack of funding and appropriate resources. The key tasks were to assess risks from natural hazards, complete mitigation plans and establish warning and preparedness systems. Developed countries like Australia or the U.K. carried out projects to assist developing nations, where disasters are relatively more expensive, and the insurance system is less established. (China suffered losses equivalent to 3.9 per cent of GNP between 1989 and 1996, with minimal insurance.)

Increasingly, public authorities are coming to the view that insurance has a role to play, by providing economic incentives for risk reduction and spreading risk. This is driven by the fact that there are severe constraints on public resources, particularly in market economies, and that therefore government needs to focus on human safety and wellbeing, the protection of the public infrastructure and the rebuilding of international confidence in the economy. For other damage, the appropriate involvement would be limited to establishing the framework for the private sector to operate within fairly. At the international level, the World Bank has realized that large amounts of its development funding have been diverted to fund recovery from natural disasters, and is now investigating how a more proactive mitigation policy can prevent this (Lester, 1999).

The critical feature of a sound disaster management system is to recognize that it is dealing with the upper end of a continuous range of misfortune. Therefore, rather than setting up a separate institutional policy to deal with ill-defined “disasters”, the answer lies in a mechanism which is able to deal with small-scale, even individual, losses, and can then move into top gear to handle widespread catastrophic damage.

11. A framework for co-operation action on natural hazards

Traditionally, insurers have had four strategies to manage their exposure to natural hazards: limit the risk; control the damage; transfer the risk; and adjust the product price. Limiting the risk by not writing it, or restricting the quantum through upper and lower limits of liability, or narrowing the circumstances of loss which are covered, are common tactics, but they often give rise to disputes over coverage, and are not welcomed by regulatory bodies, intermediaries or the public. In some cases, they may be essential to safeguard insurers’ own interests, but it is helpful to link them with other strategies, e.g. pricing incentives. Insurers do often assist their business customers with advice on how to manage specific risks, but it is not generally possible to provide on-site advice for the personal market.

Controlling the damage *after* it has happened has always been a valuable strategy, and as disasters have become more frequent, and insurance companies have grown in size, so it has become possible to apply a more professional approach. Thus 24-hour telephone helplines are common features of service, linked to the nomination of approved repairers/suppliers with a guarantee of quality delivery. This is immensely helpful in reducing the claim costs and improving customer satisfaction.

It used to be easy to transfer risk through reinsurance. The London market “spiral” of the 1980s showed how little attention reinsurers paid to catastrophic risk, and ultimately proved catastrophic for the reinsurers themselves. Now, reinsurers are the heaviest users of exposure management techniques, although this does not always flow through to their pricing (see Figure 5). The other way in which risk might be transferred would be to demonstrate that human agency had materially caused or worsened a particular catastrophe, and so seek

compensation. There have been a few instances of this, most notably the “Ash Wednesday” Australian bushfire in 1983, but in general it is public policy to dismiss such actions.

The final instrument is price. Here the underwriter faces major problems, because of public and sometimes regulatory resistance. This is particularly so with extreme weather, since incidents are relatively localized and infrequent, yet a small shift in return periods can produce a huge increase in the risk premium, as Figure 6 shows. If competitors do not share the same view, the insurer stands to lose a significant proportion of his market share, but the underlying uncertainty and the ease of entry for new competitors makes it difficult to reach a consensus.

A shift to a more co-operative stance would be more effective, and it would be in the public interest to avoid a poor response to disasters when they do come. Insurers can contribute greatly to a societal approach, because they have acquired skill and knowledge of use in preparing for, coping with, and recovering from, disasters through their normal activities. Before the event, they have to assess and possibly improve risks, and price them to reflect the degree of hazard, as well as marketing a “grudge” intangible service, which is notoriously difficult. During the incident, they provide emergency advice, and then afterwards they are accustomed to controlling the recovery process because they provide the funds from their reserves. This involves appointing a whole range of specialists, suppliers and contractors, as well as looking after the financial and physical well-being of customers. Their ability to mobilize resources internationally, and their possession of an efficient administration release public resources for more vital tasks, and they are instrumental in resisting dishonesty which often abounds after disasters.

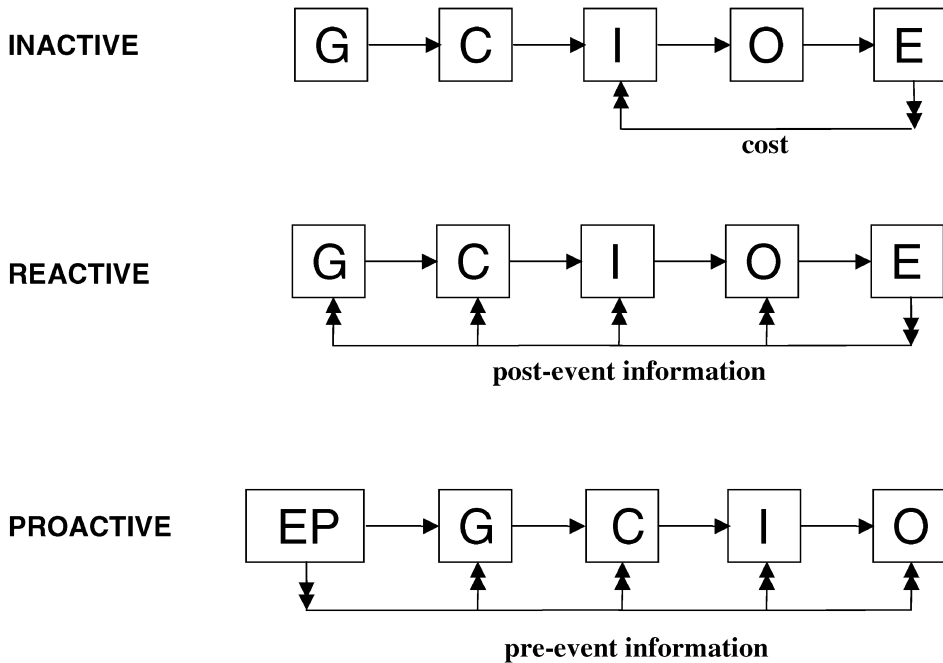
Figure 8 summarizes the way in which the insurance industry could assist a programme for climate change mitigation. Most of the activities would take place at a national level,

- Assist research on weather patterns
- Identify key hazards
- Educate property stake-holders
- Co-operate with government, professionals etc. to:
 1. *improve physical risks*
 2. *provide “essential” cover/recovery*
 3. *build up reserves*
 4. *control exposure*
- Create an international voice (UNEP initiative) to influence policymakers
- Lobby on emission controls

Figure 8: A programme for climate change mitigation

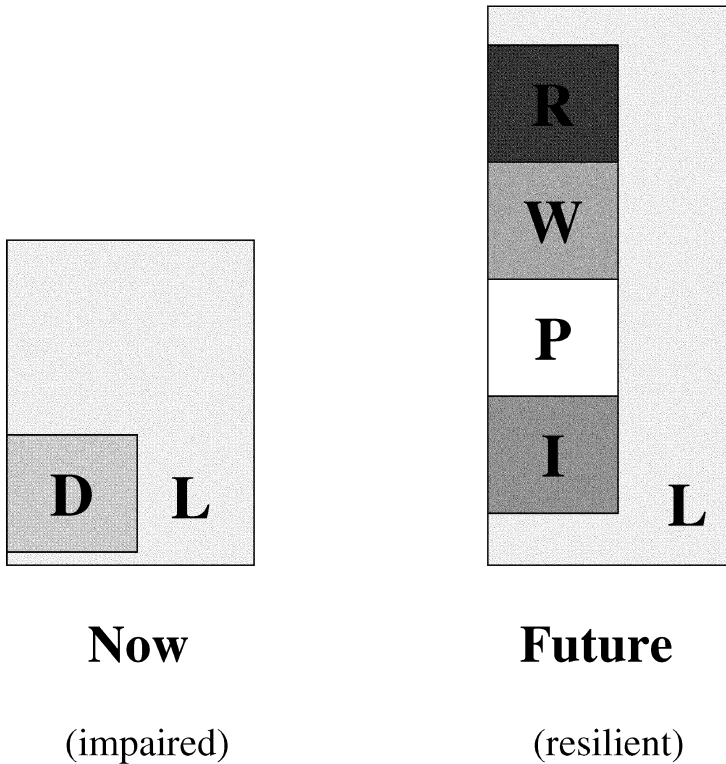
because different countries will have their own preferences for the blend of private and public resources, and will face a different range of natural hazard problems. Through its experience with the monetary aspects of disasters, insurers can help to identify key hazards and provide information on how costs arise, and through the economic discipline of pricing they can help to educate the various stakeholders in the property market. As Figure 9 illustrates, currently the insurance industry is in reactive mode as far as the construction industry is concerned, but a shift to a proactive mode would be more effective, because of the longevity of most building stock and infrastructure.

Where the economy is underdeveloped, and natural hazards are severe, most of the burden falls locally, as Figure 10 shows in the left-hand column. By mobilizing international



- Key: **G** - General regulation and design, not site specific
C - Construction, finance etc. at specific site
I - Insurance of property
O - Occupation of property
E - Extreme event, damage to property
EP - Extreme event potential
- Sequence of processes
 → Information

Figure 9: An integrated property damage system



L = Local resources

D = Disaster relief

I = Local insurance market

P = International hazards pool

W = World financial bodies

R = Reinsurance market

Figure 10: Substitution for disaster relief

financial resources, and integrating them with the local insurance and global reinsurance markets, it might prove possible to organize a system which spreads the burden of disasters more equitably, without actually increasing the cost to the international community, because the local economy would be more resilient.

Beyond technical issues, the insurance industry should take an active part in climate change politics to ensure that the threat of natural disasters is attended to urgently. This can be done partly by communicating with national politicians, but since they have to reconcile a wide range of opinions in arriving at a negotiating stance, it is still imperative for insurers to be involved in international lobbying through associations like the UNEP initiative.

12. Other opportunities for insurers

As well as their involvement in managing catastrophic risk, climate change will present the insurance industry with a number of other business opportunities, and “early movers” may be able to gain an advantage.

Superior risk knowledge

Earlier, this paper highlighted potential developments in the field of forecasting. It is possible that within five years these may have progressed to the point where they become the basis for commercial decisions, e.g. on reinsurance programme design (attachment levels, rating etc.). Such forecasts could be used as input to more detailed simulation models, already commercially available but limited by the absence of information specific to the period of risk. Because of the cost of developing such complex techniques, most insurance companies will need to buy this information, but they could still gain an advantage over others through (i) better information on exposure, (ii) use of in-house wisdom to supplement the models, (iii) will-power – there will often be strong commercial or political reasons to ignore the advice.

New insurance markets

Section 3 identified a wide range of implications for the insurance industry arising from climate change, apart from the most obvious one of changes in property damage risk. For instance, political initiatives to deal with global warming will result in a variety of major infrastructure projects, under the heading of “adaptation”, i.e. accepting and managing the transition to a warmer world, or “mitigation”, i.e. resisting the trend. Adaptation could involve flood defence, as well as water supply, agriculture and construction. Examples of mitigation projects could be afforestation, or solar energy. Like any enterprise, these new developments will require financial services, including insurance, and they will present new technical risks to be underwritten. One area of risk which UNEP III considered and rejected, was the insurance of liability for default on Kyoto emission targets (UNEP III, 1998b). This was because of the long exposure period, and the fact that the risk was fundamentally a political one.

On a more positive note, section 7 noted that the environment is becoming an important business issue, and this is filtering into the asset management world. Already there is a variety of “green funds” for consumers to invest in, and this can only grow as public awareness of global warming improves.

Diversification

Besides providing new markets for supplying traditional services, climate change is likely to bring about an increase in activity in other industries closely related to insurance activities, and this might open the door to diversification. Firstly, as exposures escalate, traditional sources of capacity will be exhausted, and thus accelerate the move towards Alternative Risk Transfer. Also, the increasing severity and frequency of natural disasters will create a growth in emergency management/recovery services, which could become a significant separate business, not simply dependent on insured damage. The tendency for governments to divest public services could reinforce this. Another interesting avenue might be resource management. As insurers grow in size, the sheer scale of their internal costs will

elevate them into an object worthy of serious management attention. When allied to the political and public pressure for environmental efficiency, some insurers may see an opportunity to create an independent profit centre to provide third-party services in the field of office and transport management.

13. Conclusions

This paper has demonstrated that climate change will progressively impact society, through gradual increases in sea level, and shifts in weather patterns. During this lengthy period there will of course be many other changes, some of which will compound those effects. The insurance industry will inevitably be involved, and will be susceptible on two main fronts. More obviously, shifts in weather patterns will adversely and significantly alter the potential for property damage from extreme events. However because of the direct effects of climate change and the indirect efforts of governments to deal with them, there will also be fundamental movements in the economies of entire industries and countries or regions, with consequences for any organization or activities linked to them, including investment.

At present, very few insurance companies are treating climate change as a strategic issue. There are a number of reasons for this: mainly it is due to a lack of information about future weather patterns, a lack of direction by politicians internationally on the issue, and the fact that most businesses are faced with a wide range of more immediate priorities which stretch their limited resources to the full.

Though it might appear otherwise, climate change does present definite opportunities as well as threats for those who can identify the key trends. For example, there will be further emphasis on renewable energy technologies and public transport systems, and increasing reliance on telecommunications rather than physical movement. This will open up new avenues for underwriting and of course investment. Similar developments will affect property risk management, with rising demand for emergency services and mitigation projects such as forestry.

But the most important message is that some issues will need strong collective action to avoid the risk of serious losses. With the rapidly rising loss potential from natural hazards in many areas, it is vital that insurers become proactive and start cross-sectoral initiatives lest they encounter reactive/emotive policymaking in the aftermath of disasters. The industry has many of the skills necessary, but will have to be prepared for a lengthy and sometimes frustrating process of evaluation and persuasion. At one level, this needs to be aimed at domestic issues in order to adapt conventional insurance processes to manage natural disasters more effectively, but the greatest challenge will be to develop an international voice to have constructive dialogue with policymakers at that level in order to develop the appropriate protocols (e.g. "contraction and convergence") to slow climate change down to a manageable pace. The UNEP Insurance Industry Initiative has begun to show the way, but it is still poorly represented in key regions, particularly in the U.S. and the less developed countries.

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