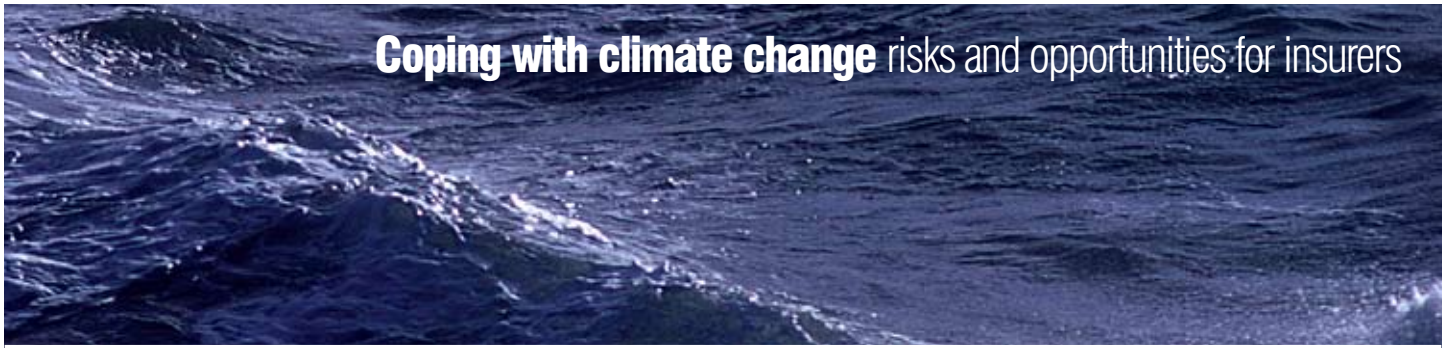

Chapter 9

Major commercial risks

9.1 Introduction
9.2 Commercial clients and climate change
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9.1 Introduction

This chapter focuses on the particular issues that climate change creates for insuring major commercial clients. 9.2 describes the special characteristics of commercial clients, and briefly reviews how climate change could affect them, 9.3 deals with property damage, 9.4 considers business interruption, and 9.5 looks at claims handling. Finally, 9.6 briefly discusses other implications of climate change for large commercial clients. Recommendations relating to each function are contained in the relevant sections of the chapter. While the analysis focuses on the insurer's point of view, they are equally relevant to international commercial enterprises, since the optimal approach is a co-operative one between insurer and client.

9.2 Commercial clients and climate change

This chapter demonstrates the need as well as the possibility to incorporate the implications of climate change into underwriting commercial property risks. Firstly, the relevant characteristics and exposures of commercial clients are introduced, to show their specific needs. This is followed by a brief description of directly related climate change features. These two sections form the basis for identifying pertinent underwriting aspects in 9.3, 9.4 and 9.5, including a discussion of possible impacts and also offer some alternative ideas. All aspects have to be considered, from accumulation and risk assessment, to terms and conditions to pricing. Finally, the need for both insurer and insured to develop future insurance solutions jointly will be shown, as well as the importance of contingency planning for claims-handling. As major businesses are often major direct and indirect sources of greenhouse gas emissions, they are more likely to be affected directly by emissions targets, and this is considered briefly in 9.6.

Briefly, climate change has the potential to jeopardise two basic insurance principles: first, the Law of Large Numbers, second, that risks are uncorrelated. Therefore, accumulation control needs to be complemented by distinctive risk selection and underwriting. This is even more important for volatile commercial portfolios and should clearly lead to action points such as training of engineers and underwriters as well as scrutinising insurance contracts and pricing at the corporate level.

Specifics of major commercial clients

Vulnerability and individuality

Generally, major commercial clients are unique regarding their business processes, their products as well as their inherent exposures. In recent decades, fundamental technological progress in various fields of production, administration and service has taken place in most industries. Thus, all customers have been investing in highly sensitive and expensive machines, devices and processes. Those are often tailor-made, capital intensive and prone to damage by natural perils, for example, moisture or temperature changes. Considering this increased vulnerability in conjunction with environmental changes, a client's property, business continuity and success is nowadays threatened to a much larger extent than previously. Consequently, commercial clients expect specialised loss prevention and risk management schemes as well as tailor-made insurance solutions and individual pricing.

Exposure and internationality

Another specific of commercial risks is their global spread, including production sites, warehouses and sales offices all over the world. For example, about 1,650 German companies are located in China with BMW, Daimler-Chrysler, Bosch and VW among them. Furthermore, with global added-value supply chains, our clients are now dependent not only on their own production sites and distribution centres, but also on their key suppliers and customers outside of Europe. In the past, European companies were not generally perceived to be prone to natural perils, as regional winter-storms and floods did not result in large claims and business interruptions. Now, because of these changes in economic and industrial structures worldwide, insureds are additionally exposed to natural perils such as tornadoes, typhoons, storm-surge and drought, either directly by choice of manufacturing location, or indirectly via the supply chain.

Of course, it could be argued that risks are nowadays also more widely spread geographically. However, this has been offset by a trend towards larger-scale production units at individual sites. Also, most industries have concentrated their business in major economic or industrial centres. Unfortunately, several of those are particularly exposed to weather risks, like the US east coast or the south-east coast of China. This results in a concentration of vulnerable assets of the commercial clients. Suppliers and customers may well be situated in the vicinity and can be simultaneously affected by the same single natural event. The combination of alterations in economic and weather factors directly increases the clients' physical damage potential and accumulation-interdependencies as well as their business interruption risk (for more detail on China see chapters 2 and 3).

Risk management

Taking into account this range of internal and external factors, the complexity and importance of risk management becomes clear. However, Europe-based global clients, having not experienced natural perils losses threatening their business continuity so far, therefore will likely pay less attention to them. With escalating predictions about climate change, the necessity of strategic natural perils risk management rapidly increases. The complexity of the anticipated transformation requires expensive and high-quality risk management. Options range from scenario modelling tools for accumulation management to expert engineering know-how[1]. A variety of approaches has to be evaluated; hence the buy-in of relevant expertise could be an efficient alternative. As risk assessment is the core interest of an insurer before providing capacity, both sides of an insurance contract could benefit from a new kind of partnership and exchange of information.

Features of climate change

By now it is common knowledge that sea-level and temperatures have been rising, but how exactly does climate change impact on underwriting? The US hurricane season 2005 was a reminder of the awesome loss potential of large single events. Katrina's damage by far exceeded the estimated maximum loss of most insurers. This initiated a discussion on the credibility of current assessment tools. But it also raised the awareness of climate change and its critical impact on insurers' financial stability. For underwriters to be prepared, it is crucial to identify any insurance-related aspects of climate change. Basically, all weather related perils of a property policy need distinct evaluation against an altered climatic environment. Such analysis should include flood, storm, storm-surge, hail, landslide, heatwave and drought.

In general, the frequency and severity of individual events will increase[2]. But unfortunately it is not that simple! Climate change takes place at various levels. Global warming affects the globe as a whole system whereas the local implications vary significantly. Those relate to the hazard itself, the affected area and/or time, either in isolation or in any combination.

One possible scenario is that a local flood zone may expand whereas another totally dries out. Alternatively, snow can become a constant weather pattern in a previously unexposed area. Another prominent example is Hurricane Vince which in 2005 found its way to Madeira – the farthest east ever.

Timewise, changes could affect the duration of single events or entire seasons. A typical example again was the US hurricane season 2005 which lasted much longer than usual: Hurricanes Epsilon and Zeta were active in December and January, while the official end of the season was 30th November.

A further phenomenon is that severe events occur with shorter return periods. Historically, the return period for a hurricane of the same category as Andrew (1992) was 30 years, but Katrina occurred only 13 years later. Furthermore, more intense "Cat following Cat" events are possible, e.g. heavy rainfall and flash-floods following storm. The problem in these latter cases is that only small areas are affected and forecasting longer than an hour in advance is difficult.

These points briefly show the complexity and resulting uncertainties of assessing and underwriting climate change effects. The following sections discuss the insurance implications to identify topics of concern. However, the above limitations need to be kept in mind.

[1] A discussion of modelling tools can be found in Chapter 4 of this report.

[2] See Chapter 3 for a fuller discussion

9.3 Underwriting property risks

General

Climate change has the potential to violate two basic insurance principles: On the one hand, the Law of Large Numbers; and on the other hand, selective underwriting. These principles have intuitive as well as mathematical support, and are the basis for a customary two-pronged strategy.

The first strategy is to write uncorrelated risks at a price equal to the expected loss for the class plus a margin for expenses (including the cost of capital) and profit. As the number of risks increases, the claims experience will approach the expected value and the company will realise a contribution equal to the margin – that is the benefit of the Law of Large Numbers. The second strategy is to identify and select risks that have lower than average loss propensities within a rating class, thereby further increasing profit.

The characteristics of natural perils, in combination with increasing severity and frequency due to climate change jeopardise this strategy: Common drivers such as global warming violate independence may lower the advantage of individual risk selection, since future event patterns may differ significantly from historical experience. So far, current risk quality assessment methods are not capable of enabling underwriters to distinguish good from poor natural peril quality risks, as well as differentiating exposure by geographical zoning. Thus, new approaches on accumulation control and risk selection of natural perils need to be developed. In respect of pricing, new loss patterns could occur that might reverse historical relativities and result in inadequate premium level for individual risk as well as a portfolio.

Accumulation

Understanding a portfolio's sensitivity to macro-environmental variables such as large-scale patterns like El Nino, extreme events such as hurricane Katrina, and sectoral effects like vulnerability of global industries is a perennial challenge for insurers. Therefore, the discussion about effective accumulation control following Katrina is not new. Accumulation control of natural perils exposure is a well-implemented process at property insurance companies. Frequently scenario modelling software is used to handle the degree of its complexity. But why did the actual Katrina loss far exceed the modelled loss? Among other reasons, modelling scenarios did not take climate change into account.

How to reflect climate change in accumulation control? As with any other trend risk, predictions of future loss amounts are difficult. However, due to the inherent loss potential at both individual and portfolio exposure, just adding a margin to maximum loss estimations is not good enough. Comprehensive adjustments are required on, e.g. return periods, zoning and maximum loss exposure calculations. (For more detail see Chapter 4 Catastrophe Modelling.)

Irrespective of scenario parameter settings, current coverage limitations must equally be addressed. It is appreciated that coverage issues as well as risk profile of commercial clients make accumulation control particularly difficult. One major concern is business interruption, as BI claims can greatly exceed property losses and might become more relevant as exposure increases with climate change (see 9.4 for a detailed discussion).

Another shortage is underlying data. The availability of data is particularly difficult with global clients operating at many locations and with property not captured in sufficient detail. For example, changes of external storage or distribution centres are not regularly reported. In addition, the data quality especially regarding street addresses is insufficient, varying from typing mistakes to misinterpretation of, e.g. local addresses. This can result in absent or incorrect accumulations.

Last but not least, new approaches to accumulation control need serious consideration. Until now, accumulation control predominantly reflects single events. Clearly, increased severity needs to be quantified and monitored. But experts also predict more frequent medium sized events. Hence, not only the catastrophe single event jeopardises the insurer's profitability but also the aggregation of medium events. Therefore, an additional annual assessment is recommended. An adequate basis might be the use of contractual annual aggregate limits – if agreed. Some rating agencies such as Fitch already claim adjustments in that direction. This approach could strongly impact, among other aspects, reinsurance, capitalisation requirements and finally even pricing and capacity. If the industry were to follow such a cautious assessment based on aggregate limits, market discussion on how to assess Annual Maximum Losses expanding current MFL/PML calculations would be necessary.

To maintain and increase the effectiveness of accumulation control, current limitations of modelling scenarios need to be overcome. But irrespective of improvements to come and those that have already been made, underwriting of individual risks must simultaneously be enhanced to incorporate environmental aspects, with risk selection being the starting point.

Risk selection

If risk selection is so crucial for insurers' success, are we honestly in a position to distinguish 'good' from 'bad' natural peril risks?

A thorough and detailed risk assessment is essential. Although site surveys by engineers are market practice for the individual risks of a commercial client, there is usually not enough attention to a site-specific natural perils analysis. Predominantly, a location's natural-hazard exposure is classified on geographical coordinates using hazard maps and their electronic successor, the GIS – geographical information system.

The advantage of hazard maps is that they are available from various sources such as reinsurers or local authorities. Thus, they are easily accessible and available for nearly any region. Unfortunately, various scales are used, which is an obstacle to benchmarking. Another disadvantage is that localised and complex weather-patterns such as flash-flood, hail or drought are rarely considered. Furthermore, the majority of those maps are based on historical data – without anticipating future changes. So far only Munich Re provides a specific world-map taking climate effects into consideration.

Alternatively, GIS combines a relational database with digital maps. However, that does not overcome the majority of the limitations of hazard maps. A clear advantage of GIS is that it provides a direct link to location specific underwriting information, ranging from site values to deductibles and limits, to scope of cover. Several application levels are available. The most valuable add-on is provided by the internet version. It enables all users to access the same data and consequently increases data quality and integrity. Furthermore, it could be a great advantage for Underwriters to have access to portfolio impacts and asset concentrations, enabling them to judge the risk from a combination of geographic and portfolio exposure assessment at location level. Of course, the downside to giving generalists the opportunity to use specialists' data is possible misinterpretation or misunderstanding of results. Undoubtedly, the overall underwriting judgment is greatly impacted by the expertise and experience of the user as well as the quality of the data.

But still, neither paper nor digital maps take client-specific vulnerability or exposure aspects into account. Given these drawbacks, a change from solely geographic classification to a full site-specific risk assessment is necessary. One alternative is to use natural peril models that overcome many limitations of one- or two-dimensional maps, but they are rarely utilised at site-level as opposed to portfolio-level. Furthermore, modelling experts are needed to interpret the results. The potential benefits of this risk information for underwriting should trigger enhancement of the software as well as respective training of underwriters.

Clearly, the highest level of individual exposure and vulnerability assessment comes from the engineer survey, which is standard practice for fire risk. An extension to natural perils is the logical step. The scope ranges from risk management through technical protection, to business interruption and interdependency. At first sight, there seems to be no difference! However, natural perils' loss-scenarios differ significantly from those of fire: Fire-damage is restricted to a small area such as a production site and its vicinity, whereas natural perils such as flood and storm affect large areas, both on the site and outside it.

On the one side, risk management for fire is well-implemented worldwide on both the insurer's and the client's side. Technical industry and fire prevention standards exist, allowing benchmarking of a site's protection against its peer group. Assessment of the human element is more difficult, but market procedures and guidelines exist there also. On the other side, the equivalent assessment of natural perils is new, with very few broadly accepted standards, if any only locally restricted guidelines are in existence. Effective risk management must reflect all the relevant factors.

As opposed to fire loss, loss prevention is usually undertaken for an entire vulnerable area by, e.g. flood walls or levees that are not situated on the client's property; hence clients have little influence. Consequently, the insurer's engineers need to assess third party protection systems. As with fire protection systems, maintenance is of highest importance, but difficult to influence. In addition to upkeep, adequacy needs to be assessed. For example, is a 100 year flood wall – given previous claims experience and climate trends – still sufficient or not? If found inadequate; engineers should provide recommendations on site-specific protection. However, insurers collectively need to liaise with government on state and local level to achieve physical improvements and improve cooperation.

A further advantage of on-site assessment could be exposure analysis to extreme but locally restricted weather events such as flash-flood or heavy rainfall. Neither hazard maps nor modelling software can provide this. Due to their geographic limitation such incidents pose no threat to a commercial insurer's portfolio, but have the potential of a total loss at a single site. Hence, the PML amount (probable maximum loss) is comparable to that of fire. A related aspect is the general shift from partial to total losses due to a general increase in severity that accompanies global warming and creates secondary damage.

The most prominent example, Hurricane Katrina, destroyed whole industrial sites by storm and ensuing flooding; not just roofs or building facades, as would have typically been expected in a storm. This clearly demonstrates that total loss needs to be in our mindset, especially considering secondary perils such as storm surge, levee breakage and heavy rainfall.

Although highly beneficial, engineering assessment is time-consuming and costly. As specialised engineering know-how on weather perils is rare, resource and expertise limitations need also to be overcome. Therefore appropriate training and development of engineers is essential. For highly vulnerable or expensive sites, an alternative would be to use business-trained meteorologists for site visits. In any case, the client's cooperation is paramount as only a trustful partnership enables engineers to adequately assess the risk. Since, it will not generally be feasible to individually inspect each location for a large multinational, then key, i.e. potentially high-risk, sites should be identified by desk research beforehand.

To summarise, various methods of natural perils assessment are available; all with their respective advantages and disadvantages. Evidently, further development of the basic tools themselves is necessary, as well as in respect to climate change. But not only enhancement of risk assessment methods and engineering know-how is needed. Even more important will be the underwriters' ability to interpret assessments; enabling them to select high-quality risks and set adequate terms and premiums.

Terms and Conditions

Following risk selection, a combination of various measures is chosen to restrict risk; the insurance contract being at the heart of it. Peril and event definitions in combination with limits and deductibles are the most important parameters regarding natural perils cover. But do current definitions still hold against changed loss scenarios?

With global warming changed loss patterns need to be reflected. Since peril definitions steer the limit and deductible amounts for loss settlements, wording discrepancies have the potential to unexpectedly multiply loss payments. Obviously, this jeopardises the insurer's results at the account and portfolio level. To avoid surprises a precise distinction between single perils and their complex "proximate peril" consequences is needed. More than ever, given recent loss experiences "CAT-following-CAT" events have become more frequent and intense. So far, most markets tackle the issue by excluding potential following events. For instance a flood endorsement may exclude consequential landslide. This is a valid approach but clauses should be scrutinised for completeness and accuracy given changed environmental conditions; be it named perils or all-risk. At the same time, adopting a tighter definition may generate a more contentious claims process. Adding new definitions for currently neglected weather events such as flash-flood and storm-surge should be considered. For example, storm surge can be covered under flood or storm in a German market-wording and can thus give rise to dispute with the client and also lead to incorrect accumulation.

Another trigger – originally imposed by reinsurers – is the 72 hour clause contained in most wordings. This time dimension further defines a single event and directly influences limit and deductible application. Basically, the excess for two storm losses occurring within 72 hours, would only be deduced once. But with the anticipated extended duration of single events like storms, the 72 hours period should be reassessed. Although important, the clause does not eliminate uncertainty over the interpretation of cover relating to case-by-case assessment of proximate cause chains. As opposed to fire only, there is little case law on proximate cause decisions for natural hazards, e.g. storm and flood events. Although more frequent and expensive CAT-events may lead to legal actions that in turn clarify such causation chains, clearly contractual agreements are preferable, as lengthy claims settlement is to the detriment of all parties.

Since events such as flood and storm may occur more than once a year, annual aggregates further restrict liability per policy year. The anticipated increase in frequency of medium sized events reinforces this. At this point, shortfalls in wordings on succeeding events, claims reserves, non- or late-reported claims as well as priorities in aggregation erosion need to be examined. Theoretically, these questions equally arise on aggregate deductibles, but they are rarely used for natural perils.

International insurance programmes exceptionally challenge peril, event and aggregate definitions. An area of great concern is cross-country events. How would flooding of the Danube affecting locations in the Czech Republic, Germany and Hungary be handled? Would the event-limit be paid one, two or three times? This is even more complex, if different sublimits are agreed, e.g. flood Germany is covered up to 10mEUR whereas flood Europe is limited at 20mEUR. From the annual perspective, do a European storm, a hurricane in USA and a typhoon in Japan occurring within a policy year all erode the aggregate? If yes, how do the claims rank?

These illustrations outline present contractual uncertainties. Climate change will definitely speed up market dialogue to overcome unsatisfactory terminology. The current general debate over contract certainty could be a good opportunity to review terms and conditions from this angle also. The insurer's ultimate aim is to ensure all underwriting measures are legally enforceable; especially limits and deductibles with their great impact on capacity and pricing.

But then, how to set adequate limits and deductibles?

No general formula can cope with the complexity of setting limits and deductibles; basically a balance between risk, maximum and normal loss expectancy should be achieved. Although climate change does not overturn basic underwriting principles it demands underwriting precision.

Thus, markets like the USA that traditionally limited critical storm only, now also sublimit general windstorm. Developing markets like China might follow suit. With restricted worldwide capacity for natural perils, commercial clients especially experience severe capacity shortage; leading to buying behaviour that is driven by availability and market price as opposed to exposure-related demand. This economic shortfall can only be overcome in the short term by accurate assessment tools allowing both insurers and insured to link risk and capacity efficiently. This challenge provides the insurance industry – if taken seriously – with a great scope of opportunities for the coming years. It could generate a competitive advantage for the most efficient risk solution provider

In order to exploit capacity without running the risk of exceeding reinsurance treaty limits, a combination of location loss estimates and portfolio evaluation should be achieved. Traditionally, underwriters take only an individual site's maximum loss into account, omitting area loss aspects. Those have been controlled in the reinsurance department without direct connection to underwriting. Some global insurers are already overcoming this barrier by incorporating 250 year and/or 500 year portfolio impact results in the underwriting decision, in view of the uncertainties over scenario and return period mentioned earlier. This clearly is a key factor, especially in areas with high accumulation.

However, underwriters need equally to evaluate exposure to cross-country events and secondary perils, not to mention the time dimension, be it single events or multiple losses within a policy year. Only all three dimensions together provide a complete risk estimation and thus build the basis for setting the technically adequate level of limits and deductibles.

A side-issue is that financial institutions lending on property might soon require insurance certificates not only for fire but also for natural perils. Since their interest is full recovery of the loan, they might not accept high deductibles and low limits.

Pricing

In general a combination of risk parameters and contractual terms and conditions allow customised premium calculation. This is especially important to reflect commercial clients' risk profiles and distinct insurance demands. However, natural perils may be subject to state insurance schemes or market tariffs with mandatory coverage requirements as in Switzerland and France.

Despite some state pooling of natural perils, in many markets the private sector plays an important role in covering natural perils, with adequate and individual pricing being their greatest challenge. Basically, it is approximating the ultimate loss value. Therefore, adverse selection and inhomogeneity of commercial portfolios are of concern. But most importantly, any time-trend in risk needs to be incorporated by extrapolating past claims experience. Both medium-term and long-term developments should be adequately evaluated, as incorrect loss extrapolation would have a major impact on the individual policy as well as on the portfolio. Projections are always difficult, but the impact of climatic changes is especially complicated to quantify.

So far, global insurers have predominantly used the annual average loss calculations of modelling software in their pricing methodology. Flaws within the scenarios became obvious as first Hurricane Andrew and then Katrina clearly showed loss estimates greater than expected, and thus premiums that were too low. Among other causes, one reason was that medium-term trends and cycle effects have not been fully considered. For example, US hurricane models did not allow for high ocean-temperature and enhanced activity; many believe that there are activity cycles varying from 25 to 50 years.

As these "minor" cyclic aspects – compared to experts' future predictions on global warming of 2-6 degree Celsius – already stretch insurers' pricing adequacy, is the industry prepared for dramatic climatic changes?

The good news is: the market has woken up. However, the solution is not just adjusting the mathematical foundation, although enhancement of the modelling software is an important step. It is in the common interest to ensure affordable coverage, but to do that all market participants need to work together.

A starting point is information. At present, commercial clients especially in Europe do not provide sufficient data on individual risk parameters such as building type, age and roof construction. Before that, risk managers and insurers need to establish global risk prevention standards, similar to those for fire risk. Regional regulations, for instance building codes, cannot substitute for this exercise, though they are a vital component. Contrary to underwriting fire risks, in underwriting natural hazards maximum probable loss estimations quantified by an engineer are not yet considered in pricing. These few examples show that customised pricing for natural perils is also possible and further efforts in that direction are needed. Until then insurers will make collective, conservative assumptions to the disadvantage of good-quality-risks.

Despite these needed data enhancements, the world capacity continues to be a major price-driver. One way to resist this cyclical behaviour is to allocate capacity to each individual risk on the basis of a thorough risk and exposure assessment. This should help to ensure satisfactory premium levels on a global scale also, thus being in the interest of both insured and insurer.

Although pricing is a significant success factor for an insurer, and reliable capacity is key for the insured, both depend critically on market cycles. Consequently, underwriting discipline remains paramount, irrespective of all scientific and technical enhancements. This is even more valid when climate change results in a market environment with increased prices, reduced limits or even exclusions.

Conclusion

The aspects discussed in this section give a brief and incomplete catalogue of effects which might result from the potential of climate change to threaten an insurer's financial performance, as well as the business continuity of our clients. Highly regulated pooling systems might be a solution for mass market customers, but clearly not for complex international enterprises with their individualistic and geographically diverse insurance needs. Solutions for them are better provided by the private sector – the insurance industry. However, there is a lot to do!

To start with scientific findings, climate change must be taken seriously and its effects scrutinised for their impact on all aspects of insurance. A thorough and detailed analysis is needed to reflect the complexity and range of the issue. Then, the findings need to be put into practice at all levels and functions of a company; with accumulation control and risk assessment as well as terms and conditions and pricing being part. This can be achieved by corporate liaisons with the relevant governmental and private organisations.

After that, methods to identify risk differentiators need to be established, allowing a wide variety of insurance solutions particular to individual commercial clients. Here, risk assessment remains the most precise tool to establish degrees of risk quality. Therefore, the key technical parameters and risk management points need to be shared between the insurance and the risk management community. Only the right know-how, awareness and appreciation of all kinds of climate change impacts can allow adequate and stable natural peril coverage in the future, in relation to both terms and price.

Clearly, it is in insurers' own interest to manage the effects of climate change. Yet, third parties such as Rating Agencies are closely monitoring developments also. For example, Fitch and Standard & Poors have already announced amendments to their natural perils assessment procedures. The revised modelling tools from providers such as EQcat or RMS with anticipated premium increases of 30-50% were the basis for those. Also they will factor in additional impacts on stock markets or credit risks of reinsurers. A change from event to annual aggregate assessment is also under discussion. Besides the direct climatic changes, the Rating Agencies are also considering data quality and internal processes. So, they request further improvement of catastrophe risk management systems. Whatever the changes will be in detail, they will lead to an external requirement of stronger capitalisation to support the risks inherent in natural perils, with obvious impacts on terms and price for the insured.

On top of that, insurance regulatory authorities in Europe such as BaFin and FSA have already required their registrants to adopt tighter control on handling and pricing of natural perils. Nevertheless, Solvency II has not specifically catered for requirements regarding correlations on natural perils. It even allows aggregations in property insurance to be considered as non-correlated risks, an important oversight which may need to be reconsidered.

To sum up, climate change must be understood as a problem that seriously affects both the insurer and the insured; adequate solutions will only be found, if insured and insurer start working together.

Topic	Recommendation	Responsible
Accumulation	Enhance modelling scenarios and software to cater for climate change	Modelling Company
	Develop software to allow individual site assessment	
	Incorporate Business Interruption and allow for coverage extensions in modelling scenarios	
	Increase Location Data Quality	Insured/Broker
	Train underwriters on modelling results	Insurer/CII in training
Risk Selection	Implement on-site assessment of natural perils exposure	Insurer
	Allow maximum loss estimates on natural perils by engineers (event and annual basis)	Insurer
	Train engineers on climate topics and weather peril assessment	Insurer/CII in training
	Insureds/brokers must cooperate	Insured/Broker
Terms and Conditions	Underwriting discipline on limits and annual aggregates for all weather perils in any exposed area worldwide, not just for those already in UWs focus	
	Train underwriters of natural peril loss patterns, cross-country events	Insurer/CII in training
	Wording: reassess peril definitions and 72 hour clause, discuss systematic on aggregate erosion and include in wording	Insurer/Broker/ CII in training
	Limits/Deductibles: Move from setting limits on availability to exposure related criteria	Insurer/Broker
Pricing	Move from capacity pricing to exposure pricing by considering MPL estimates per event and per year and site specific risk quality parameters (modelling results can supply the basis but must be combined with on-site risk assessment results)	Insurer/Broker/ CII in training

9.4 Business interruption impacts of climate change

BI implications of natural disasters

As has been shown during large scale accumulation disasters, BI losses are adversely affected by such events. In the three events of 9/11, the 2004 Hurricane season and Hurricane Katrina, the proportion of BI losses represented more than half the total Commercial/Industrial insured loss. The scale of such events and the indirect effects such as damage to infrastructure and restricted access greatly magnify the BI interruption period.

Due to the geographical scope of climatic catastrophes, the potential loss of profit exceeds that of fire by far, because multiple locations of an insured can be affected either directly by property damage or via the supply chain. Also, key suppliers and customers are often located close to the manufacturing sites, and so are likely to be hit by the same event. Essential infrastructure such as power, telecommunication and transportation roads may not be available, further increasing the interruption time. Because of the scale of disruption, employees' domestic circumstances can cause absence and construction material may be hard to obtain, or very expensive – all this can also delay reconstruction and repair. In particular, existing contingency plans may fail, as they rely on inappropriate assumptions about material, personal capacities and the business environment. Another obstacle is that post-loss actions need to be coordinated with local or governmental authorities, as well as other internal or external risk managers. All these together increase consequential loss and interruption time.

The use of past loss experience whilst a guide is only of limited use when we consider climate change. Losses are increasing in an exponential way. To assess interruption times and their financial impact on enterprises is difficult enough, but to evaluate area effects seems nearly impossible. Improved scenarios need to recognise that essential infrastructure such as

power, telecommunication and transportation roads may not be available; extending interruption time. Depending on the scale of the catastrophe, shortages of material and professional staff could further delay reconstruction and repair. A true business interruption scenario is especially important for commercial property portfolios, as these claims can greatly exceed property losses and become more frequent as environmental exposure increases with climate change.

Another factor is that common coverage for customers'/suppliers' extensions or denial of access is not considered. Furthermore, high limits granted for coverages such as unnamed locations or newly acquired property contravene portfolio accumulation controls.

Insurance penetration to natural perils is growing which means greater accumulations. The biggest threat in this area is flood coverage in the developing countries. In developed countries insurance penetration for flood is around 20% of economic loss. If we use the following table of large flood losses we can see clearly the potential exposure before building in a climate change multiplier.

Table 1: Insurance and major flood losses: global comparisons

Date	Country/ Region	Economic Losses US$m	Insured Losses	20% Insurance penetration
20 – 28 Sept 93	USA	$1.8bn	$470m	No change
19 Jan – 3 feb 95	Europe	$3.5bn	$750m	No change
5 Jul – 10 Aug 97	Europe	$5.9bn	$785m	$1.18bn
20 – 31 Dec 93	Europe	$2bn	$800m	400m
May – Sept 98	China	$30bn	$1bn	$6bn
27 Jun – 13 Aug 96	China	$24bn	$445m	$480m
27 Jun – 15 Aug 93	USA	$16bn	$1bn	No change??
May – Sept 91	China	$15bn	$410m	$3bn
Totals		**$98.2bn**	**$5.66bn**	**$20bn approx**

Business trends in the 20th Century

Insurers have perhaps not yet woken up to the enormous changes in the manufacturing supply chain that have occurred. Historically the manufacturing base has been concentrated in the industrialised countries of the world. Much of this manufacturing and associated infrastructure was built during the post-war boom of the 1950s and 1960s. The trend since this time has been to build lightweight structures that offer flexibility efficiency and can be reconstructed quickly and cost effectively. Main suppliers are often located close to a main manufacturer.

Globalisation has opened up new markets and allowed the movement of people and communications at levels previously not dreamt of. Globalisation and ongoing competition within the marketplace has driven companies to look very closely at cost structures. The emergence of Japan as an economic superpower (the world's second largest economy) showed how very high levels of efficiency, quality and a cheap workforce could be mobilised to become a major competitor in global markets within a relatively short timeframe, but the relatively small domestic population limited manufacturing production. China has adapted this model, by transferring manufacturing output to China and driving down manufacturing costs. Off-shoring has major cost benefits, which are to a very limited degree offset by increased transport costs. The supply chain is much more exposed to the transport risk, shipping times (typically 6 weeks) and any shipping shortages. Increasing energy costs including the likelihood of surcharges for environmental impacts may redress this imbalance between labour costs and transport costs.

Whilst sourcing from distant locations makes financial sense on a balance sheet, what are the possible impacts of this business model to insurance, specifically BI? Along with the long economic development of the West came the development of the insurance industry. Commercial insurance has a long history with high levels of market penetration. This has led to an insurance industry with a very good understanding of the risks in this region based on a long historical claims data from a large pool of risks with the long developed insurance infrastructure to react to claims based on this model.

When discussing natural catastrophes things begin to get a little more complicated. Coverage of all perils does not have the same long data track as fire coverage; as already outlined, many parts of Europe still exclude flood from their standard coverage. However, coverage has been available, the risk has been studied and again claims information is available to assist underwriters and claims adjustors. A good example would be the USA which has significant exposure to all natural catastrophe exposures, and where the insurance industry has grown to understand and underwrite these risks as it developed.

The supply chain was historically located in developed countries with perhaps the exception of raw materials. Insurers have therefore applied the same model to suppliers and customers with little adjustment in their underwriting philosophy.

The move towards the developing world has been accelerating in the last 20 years as they have industrialised. So what difference does this make? All forms of perils are characterised by their claims' experience and historical data is therefore a key guide. Whilst you can in part apply the same model for the peril of Fire to developing countries, there are vast differences in construction standards, protection of risk, infrastructure and management. Many of the new economic powerhouses of the developing countries are investing huge sums in training to develop a generation of managers and workforce but can this match the demand at current growth rates? Experience is perhaps the missing ingredient with any weakness in this area significantly enhancing the BI potential. Management experience in contingency and business continuity and recovery are key following any loss. Whilst in theory governments can send in physical resource and equipment, what levels of local and national planning exist to allow a speedy recovery of infrastructure and enable the flow of business to resume following a significant event? The Kobe Earthquake of 1995 is an example. The corporate culture of Japanese companies at the time was to downplay contingency plans, which made a significant contribution to the period of interruption and final insured loss.

This change in the supply chain is a matter of concern with China encouraging the development of hi-tech industry. We only need to remember the lessons of the Chi Chi earthquake in Taiwan 1999, when the lack of a resilient electricity infrastructure resulted in a worldwide shortage of semiconductors to realise the global effects that large scale natural catastrophe events can have on the world economy. It is worth noting that Taiwan and Japan, both countries very exposed to Earthquake and Windstorm and both developed and hi-tech economies, are big investors in, and markets of, China, which is itself exposed to natural catastrophes, so that their risks are compounded.

Let us look at the contrast between the developed and developing countries in respect of Nat Cat losses. Asia represents the most hazardous area on the globe for all forms of natural perils. Flooding in China alone represent approx 10% of the flood occurrences worldwide each year[3]. Regarding tropical cyclones, in a typical year twice as many are formed in the NW Pacific as in the North Atlantic. However, do we have the same data that exists in the developed countries? Do we have the loss data, given that insurance penetration is low, and that economic development has lagged? To date the international insurance industry has not had any major impact from this high hazard profile, but why? The hazards are there, but the insurance penetration has been very limited. Hurricanes and floods have historically hit the poorest levels of society which are uninsured in many instances, or cover has not been available, or cost prohibitive to those at risk. We have not had the long term insurance penetration or exposures to have a proper understanding of the inherent risks there.

Before globalisation and due to protectionist markets, these were not issues that the international insurance market concerned itself with. However, the speed of development in this region is staggering. China within 20 years has become the fourth largest economy, recently overtaking the UK, and she is on track to become second to the USA in the next two decades. The insurance industry of course mirrors industrial development and since the opening of the Chinese market to insurance, the number of foreign insurers and reinsurers has multiplied. China is an extremely competitive insurance market where for industrial risks all Nat Cat covers are available and mostly without sublimits (for more detail on China see chapters 2 and 3).

[3] Dartmouth Flood observatory

Accumulation – new trends

Whilst large individual losses can have an effect on the balance sheet the biggest threat is due to large accumulations of risk. Cat losses (together with Terrorism) represent the biggest threat to profitability and sustainability of the commercial property insurance industry.

Whilst accumulation control for property damage is fairly well understood and practised, BI is a different issue. Businesses are not self-sustaining and need interaction within the organisation as well as outside from customers, suppliers and utilities. Insurers must have a better understanding of how a business operates and where the major dependencies lie, so these contingent exposures can be factored into accumulation control. The World Trade Center loss showed the industry's weakness in controlling these exposures, with large scale unnamed supplier/customer extensions and non-damage BI losses greatly inflating the initial estimates. Lessons have been learnt but has this issue re-emerged following Katrina? Is the industry currently modelling, controlling and pricing them? The fact that so much economic activity is now located in flood plains and low-lying coastal zones, of itself creates a potential accumulation, since flooding is expected to be more frequent in future.

A move away from unspecified covers and a greater understanding of these dependencies would be advantageous. Insurers could still give the clients what they need, but the industry would receive fewer surprises when the big events occur. The economic environment is changing and we must adapt to ensure capacity is intelligently apportioned.

Contingency planning

Every business is different; each has its own level of seasonality and dependencies whether they be utilities, suppliers or customers internal or external. Pure property damage is far more straightforward.

Much has been written about contingency planning. It is usually undertaken at corporate level but of course there are always some site specifics. Whilst a company producing a similar product throughout its units can standardise procedures and take a homogeneous view to interruption from say a fire at one of their facilities, this model is less reliable for natural hazards and even less reliable for a major catastrophe. Catastrophes are external events driven by atmospheric conditions, and damage can extend beyond national boundaries. Planning for such issues therefore becomes at the same time, a much bigger project and far more localised, due to inter-site differences in exposure and hazard. Coastal locations or those on a floodplain will need much more attention. This is even more so if suppliers are located in the same area.

In today's highly competitive environment few companies can afford the advantage of spare production capacity, and the same applies to alternative sources/competitors. Inevitably therefore organisations will focus on their core business and clients at least in the immediate aftermath of a nat cat event. Increased costs will be significant. Communications and other utilities are very susceptible to damage, with elevated cables exposed to wind damage and cables and substations open to flooding. Disaster recovery sites may be located in the same nat cat area or may be overwhelmed if on the usual "first come, first served" basis. These arrangements need to be in place beforehand, not ad hoc.

Large scale devastation from an insurance event has been seen in the recent past with the 2004 Hurricane season over Florida and Katrina and Rita in 2005. How do these events which will become more frequent with climate change impact on BI?

The first main element is the scale. Katrina for example affected an area the size of the UK. To mobilise mitigation and claims teams on this scale is a complex issue when hundreds of thousands of properties are damaged simultaneously (Katrina created 1,634,700 claims (ISO,2005)).

After Katrina the Federal response was slow and, specifically for New Orleans, Martial Law was imposed along with an exclusion zone. This resulted in the workforce being displaced/evacuated, the communications network being down, and loss adjusters unable to get in. In those circumstances, the whole claims process is delayed and costs start to escalate. Some companies were faced with real workforce issues even when ready to re-open as many residents did not return to the area causing some businesses to be closed for months or even permanently.

How does a company deal with this? The imposition of Martial Law is not unusual for a large scale disaster. The claims process cannot begin until the relief operation of the population is carried out, with critical weeks being lost in trying to mitigate the damage and interruption. The first line of defence is of course the emergency services. To what extent can they cope on a regional scale bearing in mind their life-saving focus. They will be of limited help on a per site basis. A large scale disaster brings the prospect of secondary damage from looting, malicious damage and military control, the release of pollutants will go unchecked widening their effects and future clean up costs. Immediate effects will often be the loss of power, gas, and water (see utilities), as well as access issues with the primary infrastructure down.

Focusing on Katrina, even the USA needed overseas assistance to resource the humanitarian aid. The US has arguably the best emergency response system FEMA but still there were failures, delayed response and resultant increased periods of restoration and aggravated PD/BI losses. Once Martial Law is lifted, out-of-state contractors need licences to operate, extending the remediation period and increasing the demand surge effect. Once the area is reopened the process can start. However, as was seen, the shortage of labour and materials (demand surge) not only pushes up the rectification costs but will further delay a commercial operation's attempts to minimise operational affects. Key personnel may be unable or unwilling to return to the area, and both communications and transportation may continue to be difficult, as was shown in both the 2004 and 2005 hurricane seasons.

Once loss adjusters can gain access the main problem is going to be numbers. Whilst the PD loss is relatively straightforward the settlement of the BI is always a protracted affair and with the limitation of resources available to the loss adjuster due to high demand, early mitigation actions become more difficult and lengthier. Local suppliers of materials are likely to be affected by the same incident so the scale effect could greatly affect an insured event even if direct PD damage is limited.

Denial of access, ingress and egress

Globalisation relies on the transport system. The move to off-shoring has significantly extended the supply chain geographically. Ports are very exposed to windstorm damage and storm surge. Closure or severe damage to a port can therefore have a big effect on the BI of a business both from stocks stored and continuation of import/export flows. A worldwide shortage in shipping of course adds to this problem. In China, Shanghai is the biggest port in the world measured by tonnage, Shenzhen port has the largest number of exporting companies in its area and both are heavily exposed to climate change from flood and typhoon. The loss of one of these key ports for any period of time would be devastating to the Chinese economy with consequential direct and indirect BI impacts. These impacts have of course been seen in Hurricane Katrina with damage to the Port of New Orleans estimated at $1.6bn.

General denial of access is also an important factor to consider as damage to the local infrastructure that prevents access to the disaster zone is again critical to remediation. Businesses little affected by direct damage will be affected by the general lack of access in two ways: absence of customers who may even have evacuated the area, and also non-arrival of goods and supplies to allow continued production.

Utilities

This is probably the most exposed general extension to BI coverages from Nat Cat and therefore climate change. There is great potential for knock on effects, e.g. loss of gas supply affects electricity generation which affects pumps at a water pumping station. There could be a two-fold climate change impact, firstly from shortages in supply due to greater demand and secondly, in changing peak demand from winter heating to summer cooling. This impacts on generators' maintenance downtime as summer is generally the time maintenance is carried out. This was the case in the UK in the hot summer of 2006 when power shortages were experienced. For business customers, greater demand has been reflected in higher energy prices, whereas prices for mass market customers are less flexible.

This vulnerability is reinforced by the lack of robustness of the current supply infrastructure as well as the low levels of investment as many utilities have moved into the private sector. These problems surfaced on the US East coast on August 14th 2003. The initial cause was a lightning strike at a power station on the US side of Niagara. This triggered a widespread shutdown of power as reserve capacity could not be tapped quickly enough. The blackout affected 9,300 square miles and hit New York and other major cities, such as Cleveland, Ohio, and Detroit, the home of the US car industry, where thousands of workers headed home early, contributing to a city-wide gridlock. In New York, thousands of people were rescued from underground trains and lifts, and millions made heir way home on foot. The three airports serving the city closed down. Ten nuclear power plants went off line along the American eastern seaboard, for safety reasons. A local problem can soon escalate into a regional one. Concerns have been expressed about the robustness of the energy grids in many other countries, including the UK.

Due to the high demand for cooling water, many power stations are positioned close to major rivers or on the coast. Climate change could make a number of these facilities untenable in the longer term adding to further pressure on the supply of energy. The UK nuclear energy industry is typical with all current facilities on the coast. Dungeness and Sizewell are the most exposed to extreme events. Dungeness plant is protected by a massive wall of shingle; 600 tons are brought in daily to maintain this protection. Sea level effects of climate change will be felt most on the East Coast with these two locations most affected.

Those Countries currently whose Energy industry is under stress are UK, France, Belgium, Greece, Japan, USA. In terms of industries exposed, the following are noteworthy:

Steelworks	Gas supply a potential problem
Ceramics	
Glass works	
Car factories	
Semi Conductors	Water supply a potential problem
Paper Mills	
Dye works	
Laundries	
Breweries and other Drinks manufacture	

9.5 Claims handling

This section will outline some of the major losses for large commercial risks resulting from global weather-related events, then move on to consider the preparatory steps insurers and policyholders can take to cope with these, and finally discuss the measures appropriate for a proactive and customer-facing claims service, bearing in mind the heavy calls likely on time and resources in the midst of a disaster. These features are crucial to the delivery of an insurer response to extreme events arising from climate change.

Principal sources of loss for large risks

Whilst natural catastrophes associated with climate change can include avalanches, heatwaves, drought and landslides, the majority of losses will result from windstorm and flood. These therefore form the focus of this study. In 2004 Hurricanes Charlie, Frances, Ivan and Jeanne all affected the state of Florida. It was the first time since records began in 1850 that so many extreme events had occurred in so short a space of time. The fact that flood comprises a smaller share is partly due to the reluctance of insurers to offer that cover in many countries; 2002 for example saw major flooding in Eastern Europe causing severe damage in Eastern Germany and the Czech Republic.

As shown in Chapter 2, the statistics collected by Munich Re show major increases in catastrophic weather events in the 1980s and 1990s, continuing into the current decade. In particular, 2005 saw Hurricane Katrina which raised numerous issues with BI, damage to peripherals such as computer terminals and back-up facilities. Not least it highlighted major problems caused by the destruction of local infrastructure and a severe shortage of local claims handling and loss adjuster capacity.

Classic problems for insurers caused by natural catastrophes

- All classes of insurance are likely to be affected, including Motor, PA and Liability.
- After a major loss has occurred the local infrastructure is likely to be severely compromised, which will make it difficult to reach risks, or to carry out basic claims administration.
- Accessing policy cover details is likely to be less problematic for major risks, as there will generally be multiple copies at the offices of insurer, intermediary, and policyholder.
- If claims are not notified promptly it makes it very difficult to estimate overall losses which in turn can impact on notifications to reinsurers.

- In these circumstances it makes sense for insurers to "guesstimate" provisional loss figures. For corporate risks an appropriate basis might be sums insured in the affected area, with adjustments for "floating" stock and other clearly relevant factors.
- Geocoded information, apart from its use as an underwriting tool, can be valuable in pinpointing the critical locations that may have been affected.
- Another difficulty that confronts insurers is the need to deal with claims promptly and equitably against a background of sheer organisational and logistic challenges posed by the receipt of thousands of claim notifications within a very short space of time. In practice this means a process of "triage", i.e. identifying the hard core of cases that are very costly and handling them in special teams, while the bulk of cases are fast-tracked.
- Disputes over issues like event definitions will always arise. This may be a particular problem with corporate clients, where policy wordings are customised, and even reinsurance arrangements may be bespoke.

Preparation

Insurers need to plan so that they are prepared to cope with emergencies when they arise. They need strategies that respond quickly to clients' real needs and robust systems to handle the claims once they actually arise. To a great extent these will mirror the preparations for handling personal lines claims in a disaster situation (see Chapter 7).

However, there are some important differences with corporate clients. They and/or their insurance intermediary will have carried out a corporate risk assessment of the business, and will have access to specialist resources of various types, e.g. engineering skills, software. However, owing to the wide range of external (and internal) risks that face enterprises, very often natural hazards will not have been sufficiently well addressed (cf various references, e.g. Carbon Disclosure Project, McKinsey). Insurers can therefore add value to the client here, in that they do have the additional technical knowledge and expertise to identify and plan for climatic hazards. As always, a judgement needs to be made about what are adequate preparations based on the likely problems to be encountered, as opposed to, at one extreme excessive expenditure to counter a remote possibility, and at the other a policy of "business-as-usual", the consequences of which can be a lack of preparedness.

The standard contingency plan procedures for facing a corporate disaster like fire or explosion can serve as the base for the natural hazard plan. Experience has shown that the majority of these incidents result from windstorm and flood claims In these circumstances the use of external resources should focus on those best able to deal with these particular emergencies. For example, flood claims will demand the use of cleaning and restoration concerns and windstorm claims will entail the use of insurers' panels of approved builders both to carry out emergency repairs and also permanent restoration works. Damage to historic or scheduled structures may well entail the instruction of specialists. Furthermore any work entailing the stripping out and removal of asbestos is likely to require the use of licensed specialist contractors.

As noted earlier, however, the effects of a natural disaster may be much greater. More insidiously, a far-off event may interrupt the supply chain even when the production base is unaffected, and this is particularly important in these days of "just-in-time" supply procedures. Fortunately, it is often possible to provide some advance warning of climatic incidents, and there are various services available to provide this. Again, insurers can add value by forwarding relevant alerts to their clients and claims units.

Handling the claims that arise

This is of course the key to meeting clients' expectations. Insurance is an intangible product and the customer only knows the value of the product he has purchased at the point of a claim.

Issues for major corporate customers may embrace total destruction of a corporate facility, which necessitate permanent or temporary relocation, with all the associated issues for workforce, suppliers, and customers. In that event local planning requirements are likely to be critical and the relevant climatic considerations will require careful attention to avoid further exposure. In extreme situations such as Katrina there may be a loss of backup sites, when IT experts are likely to be needed. There can also be the sometimes unquantifiable losses resulting from pollution where say structural damage causes the escape of chemicals or other substances into the water supply – even milk is a pollutant. An often overlooked exposure is the destruction or partial damage to the motor vehicle fleet.

A major crisis can arise with business interruption losses. Most business failures occur through diminished or lost cash flow rather than unprofitable trading and this is clearly going to be the case with major climate-related losses. In these circumstances innovative approaches are likely to be necessary such as sub-contracting work to competitors and perhaps the purchase of a facility with suitable equipment that can restart the productive process, or relocation of critical elements.

An important aspect which can run the risk of being overlooked is that damage claimed by the insured as resulting in a total loss may in fact be repairable. To investigate this possibility it will be necessary to ensure that loss adjusters instruct and liaise with damage restoration companies. This will be particularly important where property of a specialist nature is involved. Contrary to received opinion much can be done to restore computer hardware and software if action is taken swiftly. In another case, a valuable collection of maps was substantially restored after a museum major loss event.

As fast as possible, a dedicated major loss team should be formed, as it is important to maintain close focus on the claims notified and to allow the other parts of the client's business to function as normally as possible. The use of loss adjusters, disaster restoration companies and extra-territorial staff (with the appropriate language skills) may be necessary to achieve this. Early tasks will include estimation of the losses, including uninsured elements, so that listed companies can provide relevant bodies with a statement of the impact if it is material. Timely interim payments will help to keep businesses solvent. This may require international fund transfers, with all the attendant difficulties of complying with anti-money laundering legislation, currency control, etc.

Corporate claims are likely to be complex, involving difficult technical and financial issues that necessitate the instruction of outside experts. These could include independent structural engineers advising on modes of repair and restoration and chartered surveyors to assist on design and planning issues. Business recovery issues can entail the obtaining of advice from accountants. Many firms employ forensic experts who specialise in these areas. Problems attached to leases and possible subrogation against say public bodies for their neglect of flood defences, may warrant the instruction of solicitors and counsel to provide the appropriate legal advice.

There may be occasions where the interests of insurer and client diverge, e.g. where the client wishes to minimise disruption to customers in a way that is not strictly covered by the insurance policy, or to avoid bad publicity. It is important that such issues are identified quickly, and a clear decision is taken on what will be admitted as a loss, if necessary consulting reinsurers and coinsurers.

When the loss occurs in a territory where the insurer has limited technical expertise available in-house, the role of the loss adjuster is correspondingly magnified. It is essential that they work to a clear brief. Potential issues include:

- Close familiarity with the insurer's policies and relevant deductibles. This may well involve bespoke wordings, and DIC/DIL covers.
- Liaison with appropriate bodies on damage limitation. It may be necessary to make ex-gratia payments to limit losses, e.g. assistance for workers' families, so that key workers can give their undivided attention to the company's problems.
- Clear, adequate authority limits. Urgent action may be required when time zones or hardware problems make communication difficult.

Cases

The following cases of losses resulting from extreme weather-related events drawn from personal experience and a reinsurer's reports may be of interest:

a. Snow melting on a Scottish hillside coupled with heavy rain caused a burn to overflow and cause a huge amount of damage to sensitive cashmere items. A major reclamation exercise was called for and substantial business interruption losses ensued after the loss of critical markets. Working with loss adjusters enabled rescheduling and subcontracting to minimise a major loss.

b. In another case severe flooding occurred over one Christmas period in South Yorkshire. A large factory was inundated and it was claimed that expensive machinery was a write-off. A specialist loss adjuster visited the site on New Year's Day, and working with a disaster recovery firm, was able to have most of the machinery repaired and dried out thus effecting substantial savings for insurers. In such cases, the timing can be of great benefit, since production is normally halted anyway, but it is critical that the problem is spotted quickly, so that damage does not escalate. In some cases, non-essential workers may be required to bring forward their holidays to reduce the interruption costs.

c. A third case occurred in an African territory following severe and unseasonal flooding. Part of a railway line was washed away and a locomotive and its wagons toppled down an embankment. There was no suitable crane available to salvage the locomotive and one had to be brought in from Europe. Another specialist contractor was employed to repair the permanent way. The lesson here was that while interruption to the trackway might have been foreseen, and was not viewed as a disaster, the loss of the train had not been foreseen and was far more serious.

d. Until June 2001, all that insurers feared in the hurricane season was wind damage. Tropical Storm Allison changed that. Intense rainfall combined with extensive amounts of impervious surfaces created serious flooding. Some areas received around 1 metre depth of rain in four days. This weak tropical system ended up causing over US$6bn in economic losses primarily in the Houston metropolitan area.

   The flood losses surprised underwriters, because wind damage was very light. Some 105,000 vehicles were written off by the flood. Over 10,000 commercial property claims were received, averaging well over USD 150,000 each, due to underground flood damage, ten times the average in previous events. Skyscrapers had their ground floors and basements flooded, the water submerging cars, inventory, and electronic equipment. Floodwaters in the basements of the Texas Medical Center, one of the largest medical complexes in the world, destroyed sophisticated medical equipment, records, and laboratories. Two hospitals shut for several months. The loss of diagnostic equipment such as magnetic resonance imaging (MRI) machines delayed thousands of medical tests and scans. Underground air-conditioned shopping malls filled with water. Some roofs collapsed due to the weight of rainwater on top of them. Entertainment and transport facilities were seriously disrupted. The port of Houston needed to be re-dredged before returning to full operation and over 1,000 flights were cancelled because staff could not get to work.

   The torrential rain overwhelmed pumps and drains. Back-up equipment was slow to arrive. Delays in removing the water were a major factor in aggravating the damage. Given that existing buildings cannot be easily reconfigured, underwriters need to assess the vulnerability of below-ground assets, the quality of structural and temporary flood defence measures, and the reliability of back-up power and pumps. The potential for accumulation within a city is now obvious[4].

e. On 5 May 2002, lightning struck an oil tank at a refinery in southern Poland. The bolt was deflected on to the roof of the tank, damaging it. A number of metal fragments landed on the surface of the oil, resulting in combustible evaporation. When air entered the tank, the vapour exploded. The tank, which had a capacity of 10,000 m^3, was completely destroyed by fire. The loss came to €600,000. It could have been much worse, but the company fire brigade, supported by 200 external firefighters managed to prevent the flames from spreading. From that point of view, the incident was well-handled.

   The three-year-old tank conformed with lightning protection regulations, and had recently passed a technical inspection. Post-loss analysis revealed that the design was flawed. The problem was that the tank was not homogenous; it was made of steel and aluminium, which react differently to rusting agents, and to lightning, together with various sealing and connecting components. When lightning strikes currents are induced, and pieces break off. Also, the lightning protection was too simple to provide a defence against normal degradation of working plant. The problem is serious; it can affect similar large vessels, such as storage tanks for combustible fluids, fermentation towers, and distillation columns, not just refineries[5].

9.6 Other aspects of climate change

Apart from changes in weather patterns and sea level, large commercial clients may be affected by climate change in three other ways. Firstly, since they are often large-scale emitters of ghg's through their production process, or via their supply chain or products, they are obviously exposed to policies aimed at reducing emission levels. Secondly, commercial enterprises may change their processes or products in order to adapt to climate change impacts on themselves, their supply chain, or their customers. Thirdly, it has been suggested that they might also become targets for litigation related to climate change.

The implications of climate change policy

Major industrial consumers of energy in the EU are now subject to regulation of their ghg emissions through the issue of emissions permits or allowances (see over). This policy is expected to spread to other nations, and is also a growing feature of business in developing countries, through the CDM (Clean Development Mechanism) – see Chapter 2. This has implications for insurable assets and financial flows.

Carbon content of assets (including CCS)

[4] Source - Schadenspiegel 1/2003 pp24-27 Munich Re

[5] Source - Schadenspiegel 3/2003 pp13-15 Munich Re

The EU Emissions Trading System (ETS) started in 2005 with phase II commencing in 2008. The focus of the scheme is on those industries with significant CO_2 emissions. The industries affected are:

- Energy industry
- Mineral oil refineries
- Production and processing of ferrous metals
- Mineral industries
- Glass manufacturing
- Ceramics industry
- Pulp and paper industry

Also, any company with combustion installations with a thermal input exceeding 20 megawatts is included, and, it is expected that other industries will be added, particularly aviation and marine transport.

Emission allowances are given based on the current emissions, with an assumed built-in downward trend. These allowances must be surrendered as emissions are released through the year. Any surplus or deficit can be traded on the carbon market at the current carbon price at that time. Any audited deficit at the end of the financial year (30th April) will result in a fine of €40 in Phase I and €100 per tonne in Phase II.

While fines are not insurable, there are implications for insurers. The valuation of assets may alter considerably, due to the altered economics of their energy source. There may be implications for BI, e.g. an event may cause reduction in output, and result in reduced emissions, so that surplus emission permits can be sold. Alternatively, in order to mitigate interruption, production may be switched to a less efficient plant increasing emissions, with a requirement to purchase additional emission permits.

It is also possible that companies could engage in activities that are intended to sequester carbon, such as afforestation or geological storage. The stored carbon needs to be valued, and if it escaped, it could result in additional costs. In all these situations, it is important that sums insured and claims settlements reflect the underlying carbon-emissions implications.

Adaptation to climate change

As weather patterns alter and sea level rises, people and organisations will change their behaviour to avoid damage, or capitalise on beneficial aspects. This is not unique to major commercial businesses of course, but they have the resources to initiate large-scale changes themselves, and because there are relatively few of them, insurers may be exposed differentially to changes in this sector. Some individual sectors are covered in other chapters, e.g. Energy, but the important point for underwriters is to be alert to changes in their exposure as products and processes change. For example, it has been noted that wine producers in Australia are responding to the drought there by recycling water to clean machinery, and also providing their wastewater for irrigation. These changes could give rise to new risks.

Liability for climate change damage

See Chapter 10 liability for a full discussion of this issue. In brief, it is most unlikely that a corporate client could be found liable for climatic damage caused by their ghg emissions. At a more limited level, it is possible that a company could exacerbate damage in a specific weather event by its actions or omissions, and in such a case, “normal” considerations of liability would apply.

Biography

Nadin-Shirin Lambert

Chartered Insurance Practitioner and Senior Associate Solicitor

Based in Wiesbaden Nadin-Shirin began her professional career with R+V Insurance in 1998 holding the position of Domestic Property Underwriter. From there in 2000 she joined Allianz Global Risk located in Munich as an Underwriter within the International Property Programmes department. In 2002 Nadin-Shirin moved to Tokio Marine Insurance situated in London where she was employed as a Corporate Property Underwriter.

In 2003 Nadin-Shirin took up the position of Senior Property Underwriter for XL Insurance based in Munich where she spent the next 5 years within that role. Since 2008 Nadin-Shirin has been working within Property Product Management Europe and Asia also with XL Insurance.

A professional career has also been combined with an academic career. From 1999-2001 Nadin-Shirin held the position as a host lecturer (Berufsakademie, Mannheim) concentrating on Industrial Property Insurance Market. In 2004 a return as a host lecturer (DVA, Munich) saw Nadin-Shirin focusing on International Insurance Programmes, Natural Perils, where she remains to date. In 2006 Nadin-Shirin won 1st prize in the XL CEA Scholarship Competition.

Memberships include The Chartered Insurance Institute, London, and also the Junior Chamber International, Munich.

Alan Milroy

Working as an Property Underwriter for in excess of 20 years Alan has seen the growing importance of Weather based risk to the bottom line from both a domestic and international standpoint. In the last 5 years this has taken on even greater emphasis with the potential to drive the insurance cycle.

In 2005 he attained a post graduate at University College London in Natural Hazards for Insurers run by Benfield Hazard Research which looked closely at many of the issues associated with climate change taking the scientists view.

The Insurance Industry needs to understand the full implications and wider issues of climate change. How this will significantly affect its business model both in the long and short term considering new business trends, changing risk profiles and growing accumulations.

Biography

David Clark

David spent his entire working life in what was eventually the Aviva Group, predominately working in the Claims area. He held a variety of posts in the branch organisation finishing his career as the Head Office Property Claims Superintendent in London.

David travelled extensively both at home and abroad on business and also developed a number of training/induction courses for junior claims staff.

He was also conducting evening classes for CII subjects at London Metropolitan University where he remains involved on a part-time basis.

After David left full-time employment he worked as a forensic marketing consultant with a leading firm of chartered accountants focusing on the insurance market.

Currently he works as an insurance and training consultant on a freelance basis.

Additionally he works with CII as an examiner and postal study tutor.

David holds a Bachelor of Arts degree from the Open University and is currently halfway through an Honours Law degree. He is FCII qualified and a Chartered Insurance Practitioner.

David's other interests include Modern European History, Music (All kinds) and watching cricket.