Weather Disasters – the Perspective of the (Re-)Insurance Industry

Gerhard Berz*

Over the last few decades, the international insurance industry has been confronted with a drastic increase in the scope and frequency of major natural disasters. This trend is attributable primarily to the continuing steady growth of the world population and the increasing concentration of people and economic values in urban areas. Another factor is the global migration of populations and industries into areas such as coastal regions that are particularly exposed to natural hazards. The natural hazards themselves, on the other hand, are assuming ever more threatening dimensions as global warming continues to intensify many atmospheric extremes. In addition to its prior problems involving pricing, capacity and loss reserves, the insurance industry must now focus more attention on the assessment of insured liabilities, preventive planning and climate protection strategies.

If the greenhouse predictions come true, the present problems will be magnified drastically. Changes in many atmospheric processes will significantly increase the frequency and severity of heat waves, droughts, bush fires, tropical and extra tropical cyclones, tornadoes, hailstorms, floods and storm surges in many parts of the world. These events will inevitably have a profound impact, quite apart from their consequences for all types of property insurance, and apart from the consequences of stratospheric ozone destruction for health and life insurance. Rates will have to be raised, and in the case of flood plains and certain other areas, it will be necessary to impose considerable restrictions such as significant deductibles and low liability or loss limits in order to provide insurance cover at all. In areas of high insurance density, the loss potential of individual catastrophes will confront even the international reinsurance industry with serious capacity problems. Recent disasters have highlighted the disproportionately heavy burden shouldered by reinsurers in compensating extreme disaster losses and underscored the need to be better prepared for the risks of the future if the insurance industry is to continue to fulfil its obligations in an increasingly hostile environment.

*Dr. Gerhard Berz, email: gberz@munichre.com, Head Geo Risks Research Dept., Munich Reinsurance Company, D-80791 Munich, Germany

The last twenty years or so have prompted growing concern among insurers in regard to the rapidly increasing burden of claims resulting from natural catastrophes. Because most of these losses had been caused by extremely powerful atmospheric phenomena such as windstorms, floods, droughts and hailstorms, insurers soon began to suspect that the environmental and climatic changes observed throughout the world were playing an important role in this trend toward more frequent and more extensive disasters. Even though this correlation has yet to be confirmed scientifically, there can be no doubt as to its plausibility and staggering significance. In planning and providing for the future, the political and financial world must take into account the likelihood that the expected climatic changes will further intensify this trend in catastrophic events, and weigh their consequences against the costs of implementing effective avoidance strategies.

Trends in the frequency and severity of catastrophic events

Particularly in the last few decades, the burden of claims resulting from natural catastrophes has taken on dramatic dimensions, especially for the insurance industry. Table 1 lists all the natural catastrophes that have cost the insurance industry more than US$ 1bn. Prior to 1987, this threshold had been reached by only a single event, Hurricane Alicia of 1983. Since 1987, however, this figure has been surpassed by a total of 41 events, 39 of which have occurred since 1990 and already 12 between 2000 and 2003! The record holder, Hurricane Andrew, cost insured losses of approximately US$ 17bn, but losses would have been several times greater if Andrew had scored two direct hits on Miami and New Orleans, rather than a “double miss”. In this respect, Andrew could be likened to California’s 1994 earthquake, which affected the greater Los Angeles area only marginally and, even though causing more than US$ 15bn in insured damage, could still be considered merely a “warning shot” or at worse a “grazing shot”, just as could the 1995 earthquake in Kobe, Japan. These two earthquakes are the only catastrophes in the list that were not of atmospheric origin.

Analysis of claims experience from great weather-related natural catastrophes since 1950 (Fig. 1) reveals very clearly that there has been a dramatic increase in losses resulting from such catastrophes in recent years (Munich Re 2004). Economic losses in the last decade (1994-2003) have increased by a factor of five over the 1960’s level, and insured losses by a factor of nearly ten, (Table 2). These figures reflect only the claims that are attributable to great weather disasters; all the other claims resulting from smaller events, of which Munich Re registers approximately 700 around the world each year, increase the volume of total losses at least two-fold.

Table 1: The list of natural catastrophes that caused aggregate insured losses of at least US$ 1bn shows only a single event prior to 1987 (Hurricane Alicia of 1983). Since 1987, however, 36 such events have occurred, 34 of them since 1990.

Natural Disasters: Billion-$ Insurance Losses

Table 2: Compared with the great natural catastrophes of the 1960's, those occurring in the 1980's caused approximately three times greater economic losses and nearly five times greater insured losses, while the figures for the past 10 years are approximately seven and fourteen times greater, respectively. All these loss figures have been converted to 2002 dollars, i.e. have been corrected for inflation (from Munich Re, 2003).

Great Weather Related Natural Disasters 1950 - 2003

Decade comparison

	Decade 1950-1959	Decade 1960-1969	Decade 1970-1979	Decade 1980-1989	Decade 1990-1999	last 10 1994-2003	Factor 80s : 60s	Factor last 10: 60s
Number	13	16	29	44	74	47	2.8	2.9
Economic losses	41.8	54.8	82.8	130.5	439.1	288.8	2.4	5.3
Insured losses	0/unknown	6.1	12.1	23.9	101.2	58.8	3.9	9.6

Losses in bn. US$ - 2003 values **MRNatCat*SERVICE***

Table 3: Main reasons for the increase in natural catastrophes

The frequency and size of losses due to natural disasters are increasing dramatically all over the world

The reasons:

- **Rise in population**
- **Better standard of living**
- **Concentration of people and values in large conurbations**
- **Settlement in and industrialisation of extremely exposed regions**
- **Susceptibility of modern societies and technologies to natural hazards**
- **Increasing insurance density**
- **Changes in environmental conditions**

Certainly, these increases in losses are attributable in large part, or even for the most part, to increasing values and insured liabilities, particularly in conurbations in regions of high exposure (Tab. 3). Moreover, natural catastrophes have demonstrated repeatedly that buildings and infrastructures have become not less, but even more susceptible to damage, despite all building regulations and technological advances. This was shown very clearly by many recent earthquakes, storms and floods.

At the same time, however, there is an increasing body of evidence that the emerging climatic changes are influencing the frequency and intensity of natural catastrophes. On the one hand, there are the major windstorm catastrophes of recent years, which have set new loss records and, on the other hand, there are the innumerable flood, tempest, drought and forest-fire catastrophes that seem to occur more frequently now than ever before.

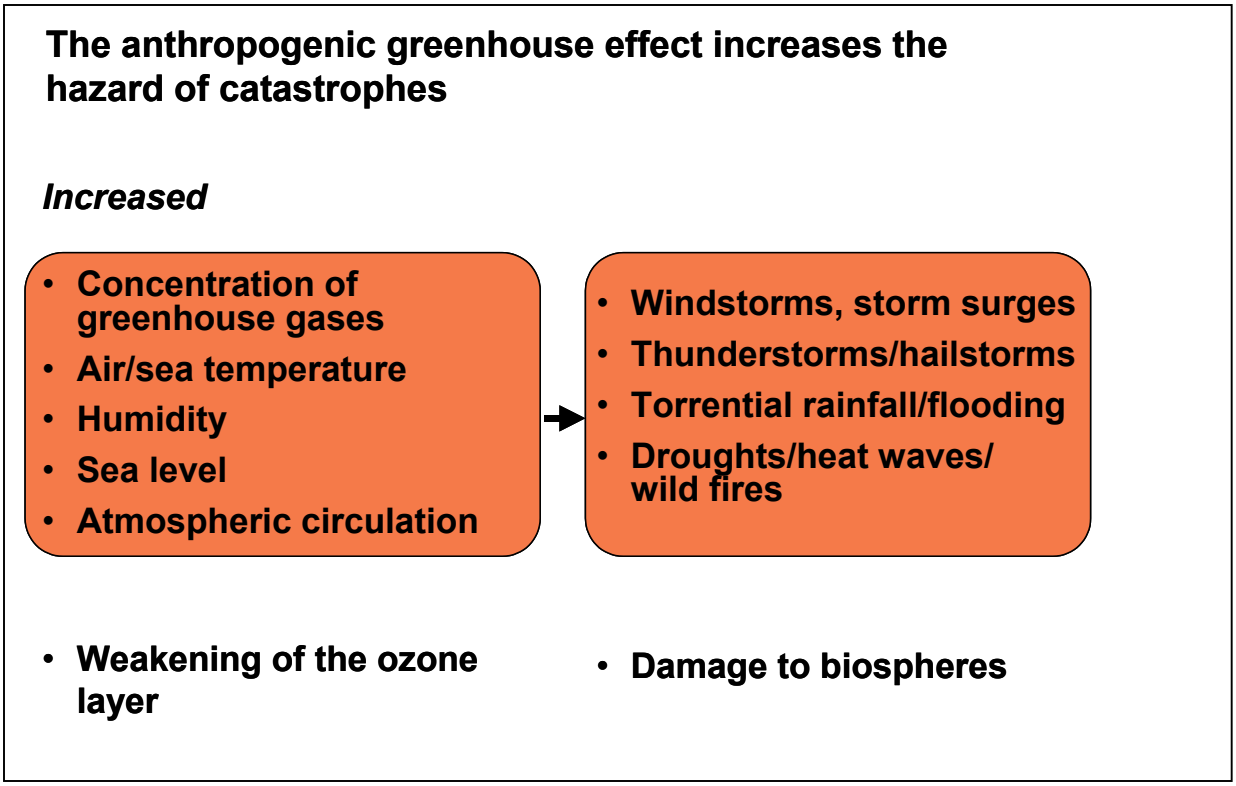
In spite of these phenomena, the third IPCC report (2001) still saw no clear proof of the correlation between global warming and the increased frequency and intensity of extreme atmospheric events. Many studies and simulations, however, have provided a good deal of evidence that the probabilities of various meteorological parameters reaching extreme values have already changed or will change significantly. Some examples are provided below:

The anticipated further increase in average temperatures causes an extraordinarily sharp rise in the probability of extremely high temperatures. For example, an increase of 1.6°C in central England's average summer temperature, which is expected to occur by approximately 2050, will mean that a hot summer such as that of 1995 – which according to the 1961-1990 temperature distribution was a 75-year event – would then occur once every three years on average (Fig. 2, Dept. Environment 1996). Similarly, the temperature statistics for Berlin indicates that the highest temperature observed there in the last century (39°C) will have a nine times greater probability of being exceeded by the end of this century. Since we are currently in no way prepared for the heat waves that this will entail, considerable adjustment costs and losses are to be expected.

In central Europe, recent decades have brought significantly wetter winters and drier summers. A greater proportion of winter precipitation falls as rain, rather than snow, with the consequence that most of it runs off before being absorbed. Evidence of increasing runoff quantities is provided by measurements from the Rhine basin and the increased frequency of flooding catastrophes such as occurred in December 1993 and January 1995. A Dutch study (Reuve-Kamp & Klein Tank 1996) predicts a considerable increase in the probability of critical precipitation volumes being exceeded (Fig. 3). Global warming also increases the capacity of the air to absorb water vapour and thus the precipitation potential, as well. In conjunction with intensified convection processes, this will lead to ever more frequent and ever heavier downpours, which are already responsible for a large part of flood damage (Gordon 1992).

The milder winters that have meanwhile become typical of central Europe have reduced the extent of the snow-covered areas above, which stable, high-pressure zones of cold air used to form a barrier against low-pressure storm fronts approaching from the Atlantic.

Table 4: Changes in the atmosphere and oceans caused by mankind thus far and in the future will presumably increase substantially the frequency and severity of catastrophic weather events



The barrier is therefore often weak or shifted far to the east, with the consequence that series of devastating gales such as occurred in 1990 and 1999 can no longer be considered rare and exceptional phenomena (Fig. 4, Dronia 1991). Wind records kept by representative German weather stations indicate a marked increase in the number of windstorm days in recent decades (Fig. 5). There is also a not yet fully confirmed North Atlantic trend toward more frequent and more extreme cyclones, that is to say toward increased windstorm activity itself. Equally controversial and inherently contradictory are the findings obtained thus far in regard to the connection between global warming and tropical cyclone activity (Henderson-Sellers 1998, Saunders 1997), which could well become a question of survival for thickly populated coastal regions, particularly in view of the expected rise in sea level.

Against the bleak backdrop of these dreaded changes, which are summarised in Table 4, the crucial question is not whether or even when there will be conclusive proof of anthropogenic climatic changes, but whether the climatic data and models used thus far offer an adequate basis for sensibly assessing future changes and developing appropriate adaptation and avoidance strategies in a timely fashion. Given the fact that the risk of error will remain great for the foreseeable future, it is all the more important that the strategies themselves be adaptable, and their results be measurable in terms of the losses that are to be avoided. Success is guaranteed from the start in the case of “no-regret” strategies such as measures to reduce the fuel consumption of motor vehicles or energy consumption in general because, even if the strategies prove to be less relevant to the climate than is currently supposed, they will in any case yield desirable savings and demonstrate the industrial nations’ awareness of their responsibility toward the Third World.

Table 5: The anthropogenic greenhouse effect could confront the insurance industry with a number of fundamental changes

The climate changes have significant impacts on the insurance industry:

- **Increase in weather variability**
- **New extreme values in certain regions**
- **New exposures**
- **More frequent and larger natural disasters**
- **Greater claims potential**
- **Poorer claims experience**
- **Lagging premium adjustment**
- **Rising demand for cover of natural hazards**

However, not all the effects of climatic change will necessarily be negative. In many countries in the temperate and subpolar latitudes, for example, there would be reason to expect increased agricultural yields and substantially reduced heating costs during the winter. On the other hand, regions closer to the equator will need more energy for cooling during the summer, and more frequent heat waves and droughts may be expected to cause additional losses.

Recently, several attempts have been made to estimate the worldwide costs of anthropogenic climatic changes and to compare them to the costs of measures for bringing about lasting climatic stabilisation. The results are disturbing, as they indicate that climatic changes will trigger worldwide losses that could total many hundreds of billions of US dollars per year. Most countries can expect their losses to range from a few per mille to a few per cent of their respective gross social product each year, but certain countries – especially small island states - could face losses far exceeding ten per cent of their GSP (Tol 1995). These studies still require substantial improvement before they can be considered conclusive and reliable, but when that point is reached, they might be able to convince even those governments and business enterprises that are still undecided or even oppose the framework agreement for a world climate convention reached in Rio de Janeiro in 1992 as well as the climate protection strategies provided by the Kyoto Protocol 1997.

Table 6: The insurance industry has a number of instruments at its disposal for actively promoting climate protection measures.

Insurance and the protection of climate

Some areas of possible action:

- **Information and (financial) motivation of clients and authorities (also through limitation of cover)**
- **Developing climate-"friendly" insurance products (i.e. in motor liability insurance)**
- **Eco-audits in environmental liability insurance**
- **Including environmental aspects (e.g. sustainability) in investment decisions**
- **Sponsoring of climate protection projects**
- **Eco-balance of insurance business and real estate**

Effects on the insurance industry and countermeasures

With the confidence born of its extraordinary ability to adapt to changing risk conditions, the insurance industry could take the stance that climatic change is relatively unimportant for insurers. The industry should be earnestly warned against adopting such an attitude, however, for several reasons: on the one hand, because there is reason to fear that climatic change in nearly all the regions of the earth will affect numerous parameters of relevance to insurance and give rise to new, more extreme maxima or minima. This will lead to natural catastrophes of hitherto unknown force and frequency and trigger considerably greater capacity problems on the national and international insurance markets than those that occurred recently. Incorrect assessment of these developments could jeopardise the future of the entire industry in some regions. In this case, moreover, premium adjustments would continually lag behind loss trends. Some of the effects to be expected are listed in Table 5.

On the other hand, the insurance industry has the ability to effectively protect itself against the consequences of climatic change, while helping substantially to promote and gain acceptance for measures to protect the climate (Table 6). No other sector of the economy has such effective instruments for encouraging risk reduction as the insurance industry does, but only if it can win over its customers and the public authorities as partners. If the insurance industry can, for example, convince its customers that natural hazards policies with a substantial deductible are advantageous for both sides because this type of cover relieves the insurer from having to pay large numbers of minor losses that can be regulated far more effectively by the customers themselves and thus makes possible substantially more cost-effective insurance protection, then customers will be far more inclined to adopt loss-prevention and -minimisation measures. If, on the other hand, the insurance industry were to respond to threatening loss potentials by excluding from cover certain hazards or risk zones or by narrowly limiting the scope of cover, there would inevitably be growing pressure placed on public authorities to take regulatory measures to improve the risk situation or to combat the causes.

It would be wrong, however, to transfer tasks, which are properly those of government to the insurance industry by making it responsible for penalising environmentally deleterious behaviour and rewarding environmentally friendly behaviour on the part of its customers, as has occasionally been demanded by environmental protectionists. This cannot be the task of the insurance industry, even if it were in its own interest in view of the connection between environmental impairment and natural catastrophes.

Nonetheless, the insurance industry should take action autonomously in regard to climate-protection issues and take full advantage of its options for promoting protection. Here, the industry could have a big impact and, as the industry specialising in the management of future risks, it would be only fitting that it do so.

Concluding remarks

The frequency and scope of loss of major natural catastrophes will continue to increase dramatically throughout the world. Unless drastic measures are taken soon to prevent it, this trend will be intensified considerably by the ever more evident warming of the atmosphere, the resultant increase in sea level, and the intensification of storm and precipitation processes.

In its own interest, the insurance industry must assume a major role in implementing preventive measures in order to ensure that it can provide cover for natural hazards over the long term. By designing insurance products appropriately, the insurance industry can motivate not only policyholders, but even government agencies to adopt loss-prevention and -minimisation measures and thus also reduce its own loss potentials.

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