Natural Disasters and Climate Change: Predictions and scenarios – will precautionary actions profit?

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Summary

Over the last few decades, mankind 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. 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. Authorities and industries must focus more attention on the assessment of exposures, preventive planning and climate protection strategies.

1. Introduction

The last thirty years or so have prompted growing concern 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, heat waves and hailstorms, environmentalists and 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 precautionary strategies.

2. 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. Statistics of great weather-related natural catastrophes since 1950 reveal very clearly that there has been a dramatic increase in losses resulting from such catastrophes in recent decades (Munich Re 2007). Economic losses in the last decade (1996-2005) have, after being adjusted for inflation, increased by

a factor of 7 over the 1960s level, and insured losses by even a factor of 26. These figures reflect only the claims that are attributable to great weather disasters; all the other claims resulting from smaller events, of which approximately 700-900 are recorded around the world each year, increase the volume of total losses substantially.

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. 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 (Munich Re 2005). 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 fourth IPCC report (2007) still sees no general 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 (Dept. Environment 1996). Similarly, a heat wave like the one in summer 2003, which caused more than 70,000 deaths in Central and Western Europe, will probably become a rather normal summer situation in the last third of this century. Since we are currently in no way prepared for such heat waves, 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 other major rivers. 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.

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. 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, 1999 and 2007 can no longer be considered rare and exceptional phenomena (Dronia 1991).

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. In regard to the connection between global warming and tropical cyclone activity, which could well become a question of survival for thickly populated coastal regions, particularly in view of the expected rise in sea level, recent analyses reveal a significant upward trend at least of the number of the most powerful Atlantic hurricanes (Munich Re, 2006).

3. Economic consequences and strategies

Against the bleak backdrop of these dreaded changes the crucial question is not whether or 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.

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 trillions of US dollars per year or up to 20% of the global GDP, if nothing is done to curb

the greenhouse gas emissions. In contrast, the costs of taking action now are lower by a factor of 10-20 and would mean for most countries, that they can expect their losses to range from a few per mille to a few per cent of their respective GDP each year, but even then certain countries – especially small island states - could face losses far exceeding ten per cent of their GSP (Stern 2006). These studies might now 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.

4. 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.

5. References

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