

The Risk Triangle

David Crichton, CGU Insurance, UK

THE DRAMATIC increase in average annual economic cost of natural disasters can, to a great extent, be explained by population growth, movement into more hazardous areas and also increased wealth, at least in the developed world.

There is strong evidence, however, that we may now also be seeing more frequent and severe weather conditions. Certainly there are indications that the climate is changing (Figures 1, 2).

Whatever the causes, insurers are 'in the front line' when it comes to the effects. In the past, historic claims experience was a good measure for predicting future risk. This only really works if the risk is changing at a predictable rate. If the climate is changing this adds more uncertainty to any predictions, and climate change presents the biggest potential challenge faced by insurers in the next century, perhaps even the next millennium. Insurers will need to be able not only to anticipate future risk levels, but also to explore new ways to reduce them.

One way to explain how insurers, or indeed anyone involved in disaster reduction, can do this is to use the concept of the 'Risk Triangle' (Figure 3). 'Risk' is the probability of a loss, and this depends on three elements, hazard, vulnerability and exposure. For example with property insurance, we have to consider the frequency and severity of the hazard, such as a flood or storm; the vulnerability of the insured property to that hazard, that is the extent to which it will suffer damage or loss, and the exposure of the property to the hazard, for example its value and location.

If we think of the size of the risk as being the size of the area of the triangle, then by simple geometry, we know that this in turn depends on the size of each of the three 'sides' of the risk triangle. If any one component or 'side' of the triangle is zero, then there is no risk. So for example, if we can reduce exposure by reducing the number of properties we insure, we reduce the area of the triangle, so reducing our risk. Of course in doing this, we also reduce our income and society (or other insurers) still have to bear the rest of the risk.

Disaster management practitioners will find much of this very familiar except perhaps for the way insurers use the term 'exposure'. When an insurer accepts a 'book' or portfolio of risks, it knows that its maximum exposure to losses is the value of that book of risks. When a disaster happens, the insurer writes a cheque and walks away, its duty done.

For a country, the 'exposure' would mean the population, the infrastructure and the built environment. After a disaster, its problems have just begun. Recovery will depend on the strength of its economy and its institutions and their resilience and preparedness for the disaster.

Having said that, the insurance risk triangle is of value in helping those involved with disaster management understand how risk can be measured and also managed. One solution for a country where there is a high level of natural hazard, for example, is to look at ways to discourage the development of housing and industry in areas where the hazard is particularly high, such as floodplains. In this way, the country's assets will be less exposed to flood.

Another solution is to reduce vulnerability, by having appropriately resilient building standards and designs, and sound disaster preparedness measures. Even if the built environment remains vulnerable, the vulnerability of the country's economy can be reduced by having contingency plans to help with rapid recovery using local institutions, government resources such as the army, and stockpiles of emergency food and shelters.

Even the hazard can be reduced in some cases, for example by the construction of flood defenses. At the very least, the authorities should make sure that they do not increase the hazard, for example by re-routing rivers or constructing inadequate culverts.

The concepts used in the risk triangle could apply to any type of risk in any country, but for the purposes of illustration an outline follows recent UK property insurance work.

Managing risk

There has been a major change in the approach by some insurers in response to increasing risk. They have been adopting a strategy which has been described as an 'Integrated Property Damage System' (Dlugolecki, 1998). As risk increases, insurers find that they need to move from a 'passive system' of simply paying for the damage. First, they progress to a 'reactive' system and then evolve into a 'planning' system.

In a reactive system, insurers will provide risk management advice to their customers, and will apply policy conditions or exclusions to the risks they accept, in order to encourage customers to take precautions. They will also start to reduce exposures. As the risk continues to increase, insurers move into the 'planning' system mode, to prepare for the future, by sponsoring research, and liaising with Government to implement measures to reduce the risk for society as a whole. Insurers will start to act collectively to feed back information to the other components of the economic system, and if the risk becomes severe enough, or if Government and the public are not responding positively, they will collectively start to withdraw from the market.

In the UK and the USA, some insurers have now very much moved to a 'planning mode', and are working closely with Government on disaster preparedness. Government have generally welcomed closer involvement by the insurance industry, after all, insurers have a great deal of expertise in dealing with risks. They also have a considerable incentive to get it right.

Hazard

Scientists are predicting that climate change will produce increases in the frequency and severity of floods in the UK. There is an increasing consensus that the South East will have more summer droughts, which could lead to building subsidence, while the North and West will be much wetter, with more extreme rainfall events. The UK has a maritime climate and research has indicated that warmer winter months in the UK are associated with more frequent and severe storms.

The last twelve years have seen the three most damaging UK storms this century, and two of these, in 1990, cost insurers some

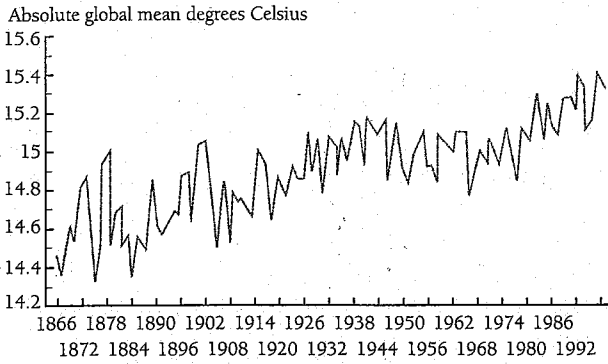


Figure 1: Compiled by Worldwatch Institute from James Hansen and Reto Ruedy, Goddard Institute for Space Studies, 14 January 1997

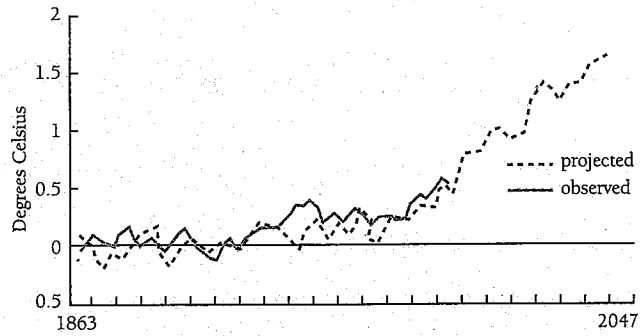


Figure 2: Compiled by the Worldwatch Institute¹

£2,500 million. The UK has the highest winds and the highest tides in Europe, and it seems clear that it is likely to suffer more than other European countries from the effects of sea level rise and increased storminess.

Increasing rainfall will add river flooding to the problem: already, since the 1970s, average rainfall in the West of the UK has risen from 1,700 mm a year to 2,400 mm a year, and predictions from the UK Climate Impacts Programme could mean that flood protection designed for a 'once in a 100 years' flood will not be adequate for the same floods once every 60 or even 30 years.

In the UK, insurers still remember the devastation of the coastal floods of 1953. Many of its flood defenses were built just after that storm, and are in need of repair. Governments are concerned too, and there is now a close relationship between the insurance industry and the Environment Agency which is the relevant Government agency in England and Wales on these issues. The UK insurance industry trade association, the Association of British Insurers has funded research into the condition of sea defenses and has been working with Government and engineers on future strategies to reduce the flood hazard.

Vulnerability

Insurers are well placed to know how much damage a flood or storm can cause and how much it costs. By providing claims data to researchers looking at the vulnerability of buildings to wind-storm and flood, valuable progress has been made in identifying the types of properties which are most vulnerable.

By measuring the likely costs of flood and storm events with more certainty, UK insurers will be better able to assess the extent to which they need to spread the risk onto the global insurance market by buying reinsurance. In this way, the UK economy as a whole benefits. The research will also help with future reviews of building regulations.

Exposure

Unless they can obtain adequate premium levels for the risk, insurers will want to reduce their exposures in high hazard areas. This is a particular issue for UK flood risks. Many houses have been built in floodplains in the last forty years, when flooding was less common than it is now, and according to the EA, planners in England and Wales are still allowing developments in areas at a high risk of flooding. In Scotland, insurers were closely involved with drawing up new planning guidelines issued in 1996. Under these guidelines, planners are advised to consult insurers to see if insurance cover will be available before giving consent for new developments in flood hazard areas. This gives

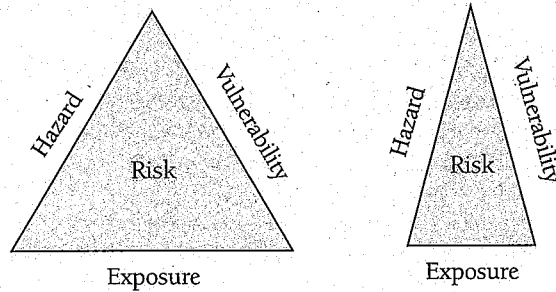


Figure 3: The Risk Triangle

insurers the opportunity to indicate that the risk is unacceptable before the buildings go up, rather than afterwards. The system is working well, developers realise that without insurance, they will not be able to sell the buildings they want to erect, so they are happy to co-operate.

Insurers would eventually like to see a similar system applied in England and Wales.

Exposure accumulation

The UK is the only country in the world where flood cover is automatically provided under all home insurance policies. Insurers are becoming increasingly concerned that this means that those in safe areas are subsidising those living in hazardous areas. In 1997 they advised UK Government that if they continued to allow new developments on flood plains, insurance cover might not necessarily be available (Crichton and Mounsey, 1997).

Managing accumulations of exposure is an important element of an insurer's strategy. Geographic information systems are used extensively for identifying and measuring exposure accumulations, and hazard data from various sources, including satellites, are being used.

Great advances have been made in the insurance industry in the last few years in developing disaster preparedness and management techniques using the risk triangle concepts.

The probability and severity of natural hazards is now being modelled in very sophisticated ways, and large databases have been established of exposure and vulnerability information. This expertise may become beneficial in helping governments and disaster relief agencies in the future. Insurers are now more receptive than ever before to dialogue with such agencies, recognising that such dialogue can not only be mutually beneficial but will be essential if climate change predictions become reality.