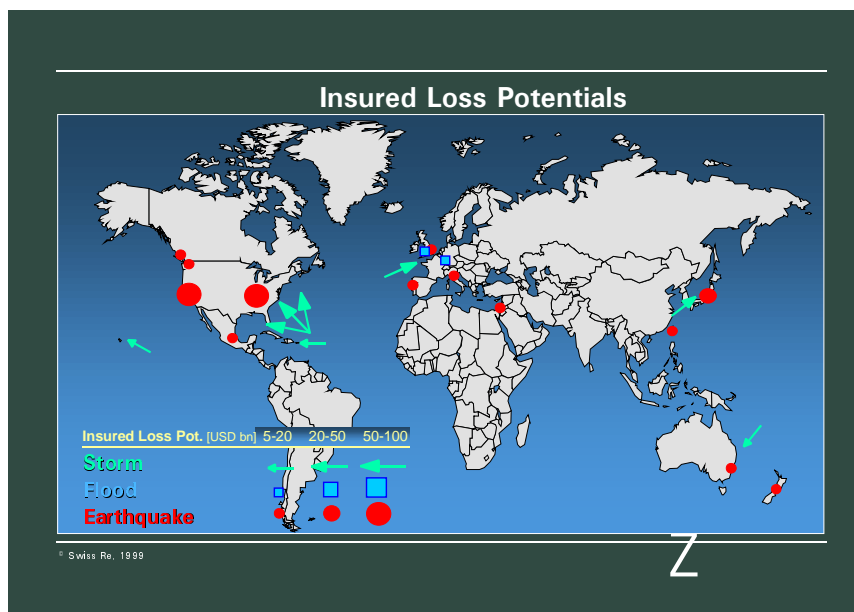


# A Reinsurance View of Flood Risk

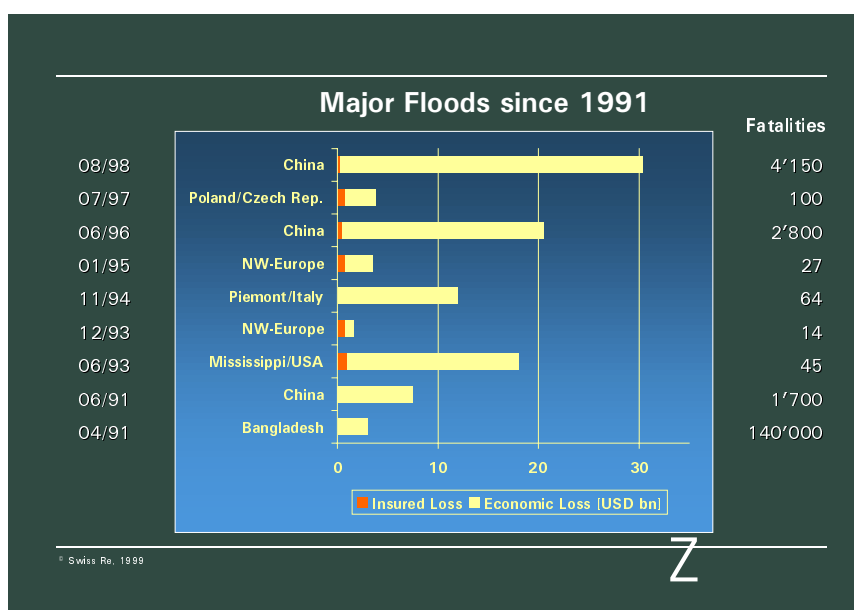
Ivo Menzinger, Swiss Re

**Reinsurance** is the insurance of insurance companies. It is the reinsurer’s business to assume risks that the primary insurer cannot or does not want to carry entirely on its own. The key driving factor for buying reinsurance is to protect oneself from extraordinary losses, caused, for example, by natural catastrophes.

From a global reinsurance perspective, **flood risk** has played a minor role compared to earthquake and storm risk. The reason is quite simple: insured loss potentials due to flood are fewer and significantly lower than those due to earthquake or storm.



However, the comparably low insured flood loss potentials do not reflect low economic loss potentials, but **low flood insurance penetration** in many countries of the world.



In light of the economic losses suffered during recent years, we can assume that the low flood insurance penetration is not the result of a lack of demand for flood insurance. In many European countries the pressure on insurance companies to offer flood cover is

growing. What are the reasons that prevent flood insurance from being more widely in effect? Among the most important factors are:

- adverse selection
- difficult risk assessment and
- huge loss potentials in selected countries.

**Adverse selection** describes the phenomenon that only those people who think they are seriously at risk buy insurance. This is especially true for flood risk, since it is more easily perceived by the individual than earthquake or storm risk: "Why should I buy flood insurance, living as I do on the top of a hill or ten meters above the mean water level of a river?"

Strong adverse selection means high premium rates (reflecting the expected mean loss per year), which in turn minimize the number of those affording flood insurance even further. The negative consequences of adverse selection illustrate that insurance is based on the principle of solidarity and needs the balancing effect inherent to large numbers of participants: many pay little – the insurance premium – and few gain more than they have ever paid and will ever pay – when the insurer finances rebuilding the flooded home.

A sound **risk assessment** is the prerequisite for granting insurance cover. In the case of flood, risk assessment proves to be especially challenging, adding to the inclination of many insurance companies to refrain from offering flood insurance. More than for most other hazards, it is the very local setting in terms of space and time that determines the risk of being flooded. Keywords are precipitation patterns, infiltration rates, time of concentration, discharge capacity and, more than anything else, topography. To make matters worse, flood is one of the few natural hazards that is heavily influenced by human activity (watershed management; protection measures, such as levees, ...) and thus changes its face constantly.

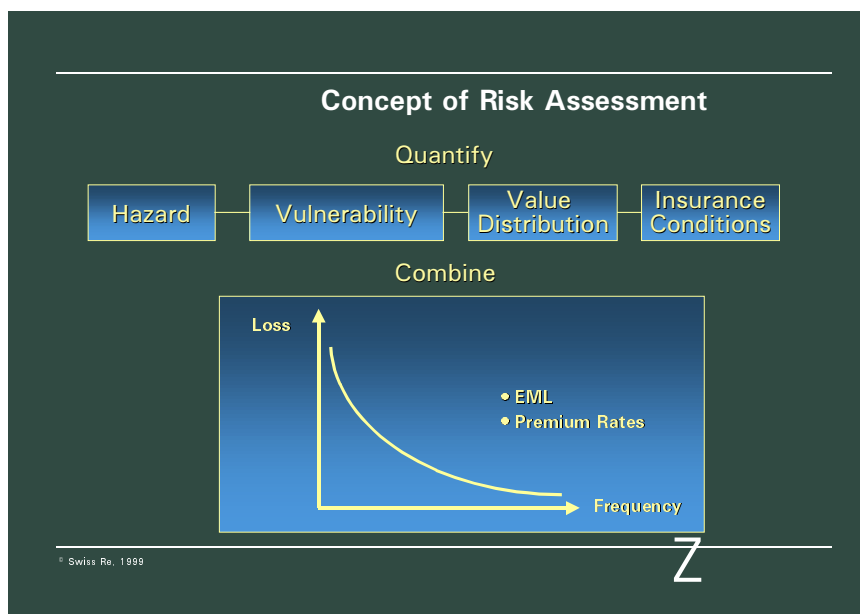
In some countries, insurance companies do not cover flood due to the **huge event loss potential** which goes beyond the capacity of traditional insurance and reinsurance products. An example are the Netherlands: two thirds of the values lie below or slightly above sea level or are prone to flooding by the Rhine and Maas rivers. Alternative risk transfer instruments might step in and offer economical solutions.

Swiss Re's publication 'Floods – an insurable risk?' goes more into the details of insurability and explains the ingredients needed for successful solutions. In the companion publication 'Floods – an insurable risk? A market survey' the flood insurance systems of 24 countries are described and commented on, serving as guidelines in a changing market environment. Both publications can be downloaded from Swiss Re's web site <http://www.swissre.com> or ordered by e-mail at [publications@swissre.com](mailto:publications@swissre.com).

An **insurance view of flood risk** will – in a first step – focus on the risk selection process. An insurance company's primary interest is to know which areas are at risk in order to avoid adverse selection and to be able to graduate premium rates according to risk. Flood hazard maps including frequency aspects would serve this purpose. Governmental institutions should be the primary sources for this kind of information. However, to date, European countries are a long way from having a continuous coverage of flood hazard mapping at the required spatial resolution from these sources. Reinsurers with specialized research departments and risk consultants are prepared to assist, but due to the difficulties described above there is still a long way to go.

As mentioned above, reinsurers specialize in the coverage of extraordinary, low frequency losses their customers, the insurance companies, might incur. Therefore a **reinsurance view of flood risk** will focus on the event loss aspect. The question that has to be answered is

how often event losses reach or exceed given thresholds. The relationship between loss amount and frequency can be mathematically represented by a loss excess-frequency distribution. Premium calculations are based on this distribution. An approach to assessing flood risk should comprise the four elements **hazard** (where, how often, and with which intensity?), **vulnerability** (how does the insured object react to event intensity?), **value distribution** (where are the insured interests located?), and **insurance conditions** (deductible, event limit, ...).



### **Hazard**

Ordinary hazard maps are not very helpful in respect to the event aspect. Records about historical events are rare, do not include low frequency losses and very often do not reflect the current situation. Therefore, flood hazard has to be modeled. Since insurance companies usually cover flood on a national or international level rather than on a local one, the models have to work on national or international scale. The major challenge is the level of detail required, including topography and protection measures.

### **Vulnerability**

The analysis of historical events allows to establish a relationship between event intensity and degree of damage suffered by insured objects. Many parameters, such as water depth, flow velocity, flood duration, pollution, and last but not least, type of risk are involved and should be taken into account.

### **Value Distribution**

Since the local setting plays a more important role for flood risk than for earthquake or storm risk, the distribution of the insured values has to be mapped at a high spatial resolution. This requires that the primary insurance companies report their exposure at zip code or street address level in digital format.

Professional reinsurers develop their own flood hazard models using Geographic Information Systems (GIS) or rely on the help of risk consultants and research institutes. They are prepared to assist their customers in designing adequate flood insurance products and suitable reinsurance programs.