

Central Europe Floods August 2002

by Carla J. Maggs



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The meteorological conditions that triggered the flooding throughout central Europe during August 2002 were not exceptional. However, it would seem that the damage and destruction that was caused to the historic city of Prague in the Czech Republic amongst other locations, was on an unprecedented scale.

The total economic losses that arose from the floods have been estimated to be in the region of 55 billion euros. In light of the flooding the European Union agreed to set up a permanent fund, which will be made available in the event of future 'natural' disasters. Estimates of total insured losses are between 1.5 billion and 3 billion euros, however, there were many uninsured losses resulting in an over-reliance on financial assistance from relevant government bodies. It is suggested that in light of these recent flood events, governments should reassess the role of the insurance industry in providing flood cover and likewise review the nature of the partnership with the industry in order to maximise the benefit for society as a whole.

The meteorological conditions that triggered the flooding throughout central Europe during August 2002 were not exceptional. A first low pressure system crossed Europe bringing with it torrential rainfall near Salzburg, Austria on 6 - 8 August 2002. This was followed by intense rainfall over much of Romania and the eastern coastal regions of the Black Sea. The northern tributaries of the Danube river caused some flooding in the western parts of Austria. The water levels of the smaller rivers in Austria soon receded.

A second low pressure system followed in quick succession. This rain-bearing storm,

known as 'Ilse', brought with it heavy rain to northern and central Italy and parts of Germany on 10 - 11 August. On 12 August, the rain returned to Austria continuing relentlessly until 14 August. The Austrian Meteorological Service announced that precipitation levels in several locations were the highest recorded since 1900.

Many of the medium-sized rivers in Austria, Germany and the Czech Republic flooded immediately. The water levels of larger rivers, such as the Vltava, Elbe and Danube also

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Figure 1: Rainfall values (mm) taken from 14 measuring stations throughout Germany on the 12th August at 07:00 GMT. Rainfall figures provided by WetterOnline (Values range from 1mm to 31mm).

began to rise rapidly. Initial modelling forecast that the Vltava would reach a 1 in 20 year return height. This was subsequently raised to 1 in 50 years and then finally to 1 in 150 years.

Water flow in the Vltava was 5,300m³ per second compared with an average flow rate of 147 m³ per second. Large areas were flooded at the confluence of the Elbe and Vltava causing water levels to rise in Prague. The Elbe exceeded the 1845 flood level (8.77 m) in Dresden, hitting a record 9.40 m on 17 August. The towns of Meissen, Wittenberg and Dessau were also partially flooded.

During the flooding, some 60,000 residents were evacuated in Austria, 200,000 in the

Czech Republic and 100,000 in Germany. Some 4 million residents in Germany were affected in some way, and just over 100 fatalities were reported across the entire affected region.

Flooding in the Catchments

The fall of precipitation associated with the passage of the first depression caused some limited flooding to occur in some of the smaller catchments and tributaries of the Danube river. However, the first event was sufficiently able to raise both the water levels in the rivers as well as the saturation levels in the soil

of the catchment area of both the Elbe and the Danube. Thus by implication with the onset of the second low pressure system, the antecedent conditions were set to ensure that any further rainfall would fail to be absorbed and that flooding would thereby occur within the catchments. The rain continued to fall with the result that the major rivers, notably, the Danube, Vltava and Elbe began to flood.

In the Czech Republic the Vltava and Elbe rivers reached a 1 in 150 year return height. The capital city, Prague, which lies at the confluence of the Vltava and Berounka rivers was flooded particularly badly as the resultant water levels exceeded all previous measurements over the past 175 years. Indeed, this event surpassed the previous major Vltava flood event that occurred in 1845 which had a discharge of just over 4500m³ (see figure 2).

On reaching Germany, the flood water on

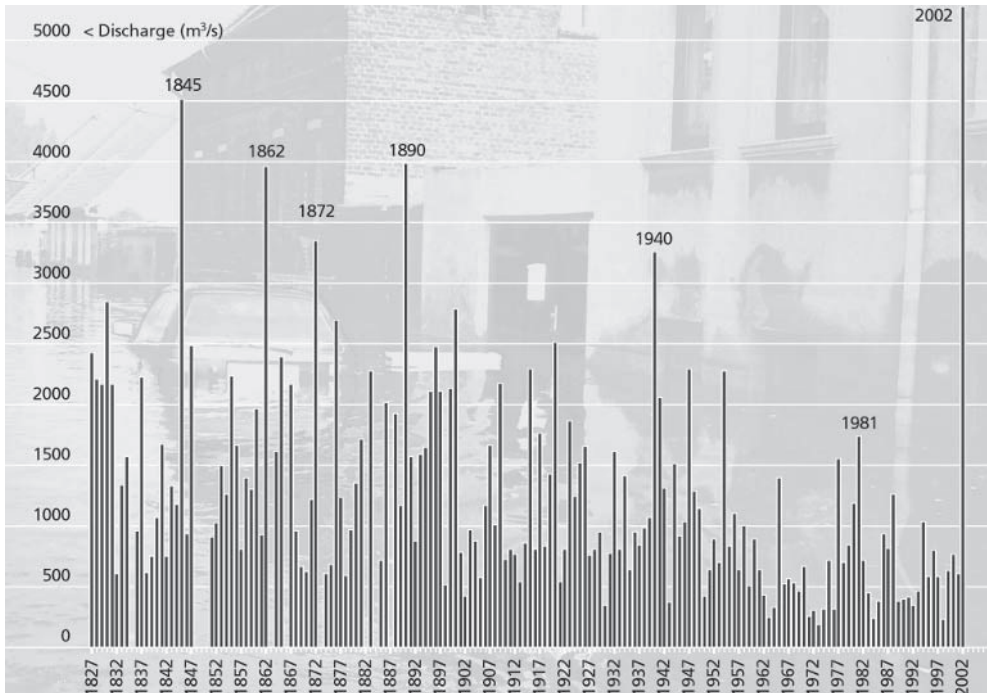
the Elbe inundated the city of Dresden causing the flooding of many properties both residential and commercial as well as damaging many historical buildings in the city centre.

Flooding also occurred on the Danube river in areas of Germany and small parts of Austria. In the upper reaches of the Danube, the towns of Regensburg, which is located at the confluence with the Regen, and Passau, which is located at the confluence with the Inn river, both experienced some flooding. Further downstream, flooding was relatively minor in comparison with only slight inundation occurring in Vienna and Hungary.

Economic Losses

The European Union (EU) has estimated that the flooding caused 15 billion euros in economic damages in Germany; 2 billion euros in

Figure 2: Discharge on the Vltava river in Prague from 1827 to 2002. Source: Cesky Hydrometeorologicky Ustav (CHMU), Czech Republic.



Austria; 3 billion euros in the Czech Republic and about 35 million euros in Slovakia.

The European Commission set up a permanent fund of up to \$1 billion to help victims of disasters in light of the flooding. The European Union executive also promised to unblock billions of dollars of regional aid and farm subsidies to assist the flood-struck regions of Austria, Germany, Slovakia and the Czech Republic.

“Today, when some of our citizens are enduring such difficult conditions, it is more important than ever that the European message of solidarity is clearly heard,” EC President Romano Prodi said.

Prodi said that if the European Parliament and EU governments backed the measure, \$500 million could be made available to help flood victims in 2002. A further \$1 billion in loans was also pledged by the European Investment Bank to help rebuild damaged infrastructure such as bridges, sewers, tunnels and factories.

After much debate, at the end of September the European Union agreed that this permanent fund would only be triggered when damage due to future ‘natural’ disasters in Europe reaches 3 billion euros or 0.6% of a country’s gross domestic product (GDP). The council raised the initial threshold up from 1 billion to 3 billion at the insistence of some of the Member States who expressed concern and wanted to ensure that strict criteria were adhered to when funds were being called for. The EU have not ruled out the possibility that the fund could also be used in the aftermath of a technological or human made disaster should it occur in Europe.

Insured Losses

According to a report issued by Merrill Lynch, reinsurers would ultimately bear two-thirds of the insured loss. Swiss Re have issued a total insured loss estimate of between 1.5 billion

euros to 3 billion euros. Figures for some classes such as automobile and hull have not yet been made available at time of writing, and they will undoubtedly lead to increases in the total insured losses. Company announcements so far and the Merrill Lynch estimates based on the companies’ respective market shares produce the following pre-tax losses:

<i>Company</i>	<i>Million euros</i>	<i>Estimate source</i>
Munich Re	500	Munich Re
Swiss Re	170	Swiss Re
PartnerRe	110 - 120	PartnerRe
Hannover Re	50	Hannover Re
General & Cologne Re	50	General & Cologne Re
Converium	50	Converium
Scor	40 - 50	Scor
XL Capital	50	XL Capital

A report from analysts at Morgan Stanley said that PartnerRe’s loss reflects its large share of the European market, which in turn results from its strategy of providing large excess capacity; its close ties to European customers via Swiss Re, its original sponsor, and its 1997 acquisition of French reinsurer SAFR.

On the primary side of the business, Germany’s Allianz was seen as carrying the highest exposure under the Merrill Lynch scenario. Allianz have estimated their gross loss to be in the region of 580 million euros for Germany, 120 million euros for Austria and 115 million euros for the Czech Republic. They have estimated the net loss to the group to be in the region of 550 million euros. Next would be Italy’s Assicurazioni Generali SpA, with losses of 90 million euros. Around 50 million euros stem from the company’s exposure in Germany. Finally, AMB, a German unit of Generali, estimate a total net loss of 30 million euros.

Significant flood events in Germany have previously resulted in insured losses of approximately 10% of the total economic loss. In 2001, a total of 500 million euros was claimed for flood or storm damage in the German market.

For the German market the current estimate is that the total insured loss will be in excess of 1 billion euros. According to some estimates there will be some individual industrial losses that are in excess of 1 million euros (for example, the damage done to Deutsche Bahn, the railway network.) Gerling, HDI and Allianz are expected to bear the brunt of the industrial losses.

Allianz estimates for each of the different lines of business are as follows: 335 million euros for residential property, 100 million euros for commercial property, 50 million euros for engineering, 30 million euros for motor and 80 million euros for industrial (this figure includes Austrian and Czech business if the policy holder is domiciled in Germany).

The Austrian Insurance Association estimated the insured losses at 200-300 million euros, significantly less than 10% of expected economic damage. One out of two homeowners in Austria carries flood insurance, but cover is often limited to the first 5,000 - 10,000 euros.

The floods that affected the Czech Republic in July 1997 led to an insured share of the economic loss of approximately 20%. This estimate is in line with initial estimates of insured damage resulting from the recent event. Dominic Stros of Marsh in the Czech Republic stated that "Economic losses could be in the region of 100 billion Czech crowns (about 3.3 billion euros) with an insurance loss of 30 - 33 billion Czech crowns (977 million -1.1 billion euros)." The Czech insurance association reported that about 120,000 claims had been notified by 27 August valued at around 20 billion crowns.

Dr Vlastimil Uzel an advisor to Ceska Pojistovna, the main insurer in the Czech Republic, stated that; " Ceska Pojistovna has issued a preliminary estimate of 8 billion Czech Crowns (260 million euros), which is much larger than the losses they experienced in the aftermath of the 1997 flood events." Dr Uzel

also stated that approximately 40% of householders have flood insurance in the Czech Republic, "a figure which has not changed significantly since the 1997 losses."

Most of the Czech insurers completed their inspections of damaged property by the end of September 2002 and had paid out approximately one quarter of the claims that had resulted from the floods. At this stage, Kooperativa, which recorded the largest loss, stated that they had paid out 3 billion Czech Crowns (97 million euros). Ceska Pojistovna had already paid out 1.8 billion Czech Crowns (60 million euros). Another smaller Czech insurer, IPB Pojistovna had paid out 500 million Czech Crowns (16.2 million euros).

Ceska Pojistovna announced shortly after the floods that the newly concluded insurance contracts will be more costly, starting in 2003. They stated that insurance premiums will go up by 15%-20% in contracts that include flood risks. Insurers Kooperativa and Allianz that together with Ceska Pojistovna control over two-thirds of the Czech market, also stated that they are to adopt a similar policy.

The Hungarian general insurance company AB-Aegon Altalanos Biztosito Rt received over 10,000 claims for compensation for damages caused by the August storms and floods. At time of writing the company had also paid out 1 million euros in compensation so far and had set aside reserves of 2 million euros to cover further claims. The company stated that they will compensate all paid-up policy holders and will not base its decision on the nature of the construction permit for the insured home. AB-Aegon is the largest retail insurance company in the country, handling more than 1.1 million home insurance policies, approximately one half of the market. Furthermore, the firm announced that they will cover about half of all flood-related compensation as well.

AB-Aegon signalled its preparedness to participate in the set-up of a flood emergency

fund, but noted that such a move would require firm clarification to define the contributors to the fund as well as victims to receive compensation.

It is likely that discussions will begin shortly between the Hungarian Insurers Association (Mabisz) and the Ministry of Finance to concentrate on the role that insurance companies will play in adequately compensating future flood victims.

The floods highlighted the relative lack of insurance coverage by smaller local businesses in comparison to the larger foreign-owned companies. Whereas many of these larger companies have full flood and business interruption insurance cover, in contrast their relatively smaller business counterparts are either struggling to make their claims with locally based insurance companies or, as is the case with many, they have only limited amounts of flood and business interruption cover.

According to some analysts many of these small businesses, for example; restaurants, hotels, small manufacturers have no flood or BI cover at all, with the result that many are unlikely to reopen after the floods unless there is substantial government assistance. It has been suggested that there will be further problems where hotels and their associated suppliers are concerned. A downturn in the tourism industry in the subsequent months could have negative implications even if such businesses are insured. For example, one area which may cause problems is in the exact wording of the BI cover.

Some have commented that businesses in Eastern Europe are not treated equally over insurance provision. In many cases where BI is concerned, insurers will often expect a business to get itself up and running again within a stated time period following a flood event.

The floods also highlighted the fact that event limits are not standard in a number of proportional treaties, a problem that many

reinsurers will have to at least address come renewal. Furthermore increased emphasis is likely to be made in obtaining more detailed information about underlying portfolios to enable reinsurers to understand and appreciate the full extent of exposures and be able to effectively use exposure pricing models. No doubt the floods have acted as a prompt in order to obtain greater transparency of data at all levels.

Return Periods

Fundamental to any understanding of damaging events within the insurance industry is the concept of the return period. No single return period can be attached to the floods that occurred in much of central Europe throughout August 2002. Indeed, each occurrence of flooding along the same river will have a unique return period. The same flood event, for example, could potentially cause a 1 in 100 year occurrence in one location and a 1 in 400 year in another.

The recent severe weather experienced across Europe is not necessarily exceptional when viewed over a long time period. Historical evidence shows that many of the countries in central Europe do, indeed, experience severe flood events occasionally, for example, the 1997 event that caused severe flooding in the Czech Republic.

Figure 2 provides discharge figures on the river Vltava in Prague since 1827 and indicates previous extreme events, for example, 1845, 1862, 1872, 1890, 1940 and 1981.

It would be of great concern if these events were occurring on an annual basis, but currently there is no scientific evidence to suggest that this is the case. However, the losses associated with such flood events are likely to increase annually primarily as a result of continued expansion and development in flood risk areas.

Penetration of Flood Insurance in Countries Affected

AUSTRIA

Insurance carriers: There are no state insurance companies in Austria; each province has its own local company.

Available cover: In Austria, about half of all insured households are covered for floods but the cover provided is very limited and is not provided as standard.

Insurance penetration: In 1999 total non-life insurance penetration (premiums as a percentage of GDP) was 5.8%. Of this, 2.7% was non-life business.

CZECH REPUBLIC

Insurance carriers: Only private insurance companies.

Available cover: Natural perils cover is offered as a voluntary endorsement to fire policies ("extended cover").

Insurance penetration: Simple risk – around 40%
Commercial risks – around 10%
Industrial Risks – 20-30%

Remarks: If flood continues to be offered on a voluntary basis, counter selection will further increase, since other hazards in the natural hazards package cause relatively small losses. Flooding is the only natural peril to which the country is exposed, and losses occur annually. Risk assessment is still at a low level of development, but experience from the 1997 event is being used to improve this. Compulsory insurance is under discussion and would counter increases in premiums in the areas at risk. A rising standard of living will increase the demand for insurance.

GERMANY

Insurance carriers: Only private insurance companies

Available cover: Simple risks – Coverage for other natural perils other than storm is available as an extended natural perils annex to buildings and contents policies, which amongst others comprises flood but excludes storm surge. Premiums and deductibles vary by zone. Coverage is usually not provided for zones with frequent flood events like certain areas on the river Rhine.

Industrial Risks – Traditional fire and fire business interruption policies foresee an optional annex for extended coverage on flood and other natural perils. In recent years all risk policies have been a popular alternative. Storm surge is usually excluded under both coverage types.

Insurance penetration: Personal lines – Only about 3% of policies in Germany include extended natural perils coverage. Nevertheless a major proportion of eastern German policies do include flood as former East Germany insurance had no exclusions.

Industrial risks – Premiums allocated to natural perils from extended coverage and all risk policies equate to approximately 50% of premiums from traditional fire and fire business interruption policies.

(Sources: Marsh, Swiss Re, 1998; Axco 1998-2001)

Statistical return periods relate to the long term average time interval between events of a particular magnitude. Thus, the 1 in 100 year return period flood has a 1% chance of occurring in any one year.

However, return periods are averages, so it cannot be assumed that there will be exactly 100 years, for example, between 100 year events. It is statistically possible for such events to occur in successive years or even more than once in one year. Equally, they may be several hundred years apart.

One of the problems in assigning a return period to an event is lack of good historical data. In many cases records are only available for a limited number of years.

Flood Catastrophe Modelling

Although flood insurance cover is not widespread in continental Europe, increased exposures and growing demand are establishing a need for a more sophisticated breakdown of exposures for premium rating and accumulation analysis. Imminent changes in legislation expected in several countries where the private sector will handle natural catastrophe insurance once covered by government schemes, will increase market opportunities and, thus, create a need for better understanding and assessment of exposure to the peril of flood.

River flood modelling is possible, although undoubtedly complex, because the numerous variables can cause a high degree of uncertainty.

The assessment of riverine flood risk can be approached at different levels of complexity and sophistication from basic risk mapping techniques to more sophisticated probabilistic models which attempt to simulate the effect of all possible flood scenarios on a single portfolio.

Fundamentally, a riverine flood model attempts to evaluate some, if not all, of the

following factors that will affect damage to property:

- How deep – possible inundation depths
- How often – frequency of inundation at varying depths.
- How long – duration of the inundation
- Extent – the geographic extent of flooding at varying depths

However, to determine all these factors requires considerable collation of historical environmental data, the availability and quality of which are currently very inconsistent across territories.

The flood hazard represents one component in the assessment of risk. To understand and model expected losses on any portfolio, the vulnerability of the property exposed to flooding needs to be assessed, according to such factors as the class and date of construction and type of occupancy.

Using the hazard and vulnerability data of past events, relationships between different structure types and damage are established in the form of *vulnerability curves*. These curves are then used to calculate losses to different building types.

Finally, to estimate the likely cost of possible flood events on an individual portfolio, the model will incorporate details of the insured properties and insurance conditions such as insured value and deductibles. Ultimately, the model will produce exceedance probability loss (EP) curves to illustrate the probability of varying levels of losses.

To calibrate these curves requires historic claims data which may include date of loss, event, geographical locator (for example; post-code, CRESTA, town), insured value, claim amount, deductible, risk type (for example; residential, commercial, industrial) and structure type (for example; apartment, detached house).



Figure 3: Resident cleaning exterior wall to remove dirt left by flood water in Waldersee near Dessau, Germany. Source: Judith Johnston, Guy Carpenter UK.

The Events/Hours Clause

Floods are notoriously difficult in the context of excess of loss reinsurance. The reason being that such a contract is designed to deal with aggregations of individual insurance losses resulting from sudden, extreme occurrences usually in relatively limited areas: *an event*. To control the reinsurer's exposure, the contract will use an hours clause to restrict the definition of an event by duration and possibly geography.

Floods, however, are often widespread geographically and comparatively slow to develop and disperse. The question, therefore, is whether flooding affecting such a large area can be interpreted as one event or more. In

Germany, the occurrence in this case may be seen as;

1. one atmospheric disturbance which, therefore, can be treated as one event, or
2. two separate events; one in the River Danube basin and the second in the River Elbe basin. The basins are completely separate and, therefore, there are two independent events.

Czech Republic market sources advised that the occurrence should be classed as one event.

The answer is important because it will determine the extent to which primary insurers can recover from their excess of loss reinsurers.

**Guy Carpenter put some questions to Dr. Lucas Menzel
of the Potsdam Institute for Climate Impact Research (PIK), Germany:**

Do these floods have any relation to climate change?

It is, of course, not possible to attribute to climate change the occurrence of this particular flood. However, if we analyse existing trends, such as an increase in the total number of floods (both in Germany and in other countries) and an increase in annual precipitation totals in several regions in Germany, accompanied by an increase in rainfall intensity, we can trace this back to an ongoing change in the climate.

Have engineering schemes, such as river channeling and increasing urbanisation had any negative implication for flooding in the Elbe region?

The river course of the Elbe as well as those of other rivers in Central Europe has been seriously shortened. For example, the course of the Elbe has been reduced by 120 km between the headwaters in the Czech Republic to Magdeburg in the middle part within the last few centuries. The building of dikes has taken most of their natural inundation areas (e.g., only 13% of the natural inundation area of the Elbe is left).

These measures have seriously affected flood risk, by increasing the total water volume in the stream, increasing the flood wave and increasing flood wave propaga-

tion. Channelling of rivers such as the Rhine has had similar effects. This is also often accompanied by an increased probability that due to these technical measures the flood waves in the main stream and in a tributary do coincide and thus increase flood risk by several magnitudes.

Urbanisation has exacerbated the flood risk in smaller scale areas (small rivers) and on low to moderate floods. As a rule of thumb, one can say that the larger the catchment area the lower is the impact of urbanisation on flood aggravation.

Do you feel that governments are doing enough to provide strategies to alleviate the risk of flood?

There are already several good concepts for flood risk mitigation, especially along the Rhine. These flood action plans combine technical and non-technical measures (restoration of former inundation areas) and have several positive side effects. However, flood risk mitigation often suffers from economic interests, especially on a communal level. The federal system of Germany also often prevents efficient flood protection measures. On a final note – it is very important to increase risk consciousness within the population.

(Dr Menzel is a Hydrologist of the Potsdam Institute for Climate Impact Research (PIK).

Climate Change and El Niño

During a typical average summer an area of high pressure spreads out from the Azores to dominate the weather over much of central and southern Europe and areas of low pressure tend to drift northwards in the Atlantic. This year the area of high pressure has been weaker than normal allowing low pressure to develop more often in the rain soaked areas.

There have been claims that this event has been linked to El Niño, but generally the relationship between El Niño and European weather is weak. According to several analysts, climate change cannot be blamed either. Scientists predict more extremes of weather over Europe because of climate change, but current models suggest extreme rainfall events are most likely in winter. Indeed, summers are predicted to become drier over many parts of Europe.

In any case, the effect of growing exposure through development of flood plains and increased personal wealth in eastern European countries will exert a far more predictable inflationary effect on flood losses than climate change. Whether the insurance industry in continental Europe is prepared to accept more of this exposure, even without evidence of greater flood hazard, will depend on whether or not there is an effective partnership between the national government and the insurance industry.

Strategic options for the insurance industry and government

The Comité Européene des Assurances (CEA) voiced the concern of European insurers about the problem of flood risk management in general and called for a preventative approach at European level through public and private sector partnerships.

The CEA continued, "In view of the in-

crease in natural catastrophes over the past few years, CEA furthermore considers that systematic European action on climate change is needed, involving an in-depth analysis of its causes and consequences. An agreement on the measures to be taken at a global level (for example, concerning the Kyoto protocol) is also necessary in order to protect the environment effectively."

Globally, insurance against flooding is only available when there is an effective partnership between the government and the insurance industry. The nature of the partnership within flood defence work between government and insurance industry varies internationally.

In a country where few homes are insured against natural catastrophes, the handling of the flood emergency by Germany's coalition government was suggested to have possibly affected the outcome of the general election on 22 September. From his position in government, Chancellor Gerhard Schroeder was able to take the initiative in delaying scheduled tax cuts to pay for flood damages, and his conservative opponent Edmund Stoiber had little option but to support the decision.

According to the German Insurance Association, only about 3% of comprehensive household insurance have an extension for natural disasters. The figures for economic damage, now estimated around 15 billion euros, will, therefore, dwarf the insured losses. For reinsurers, therefore, the claims are likely to be well within their normal planning for natural catastrophes.

What was even less clear in the immediate aftermath of the floods was the extent to which commercial property had suffered and the likely level of insured damages. As Tim Dawson, an analyst with the Swiss bank Pictet & Co in Geneva explained, business interruption claims do have the potential to force recalculation of loss reserves some months after an event.

There is, nevertheless, widespread concern in the industry that pressure on government budgets is compromising flood protection planning, while demand for development is leading to much more building in flood plains. As Munich Re comments, the result is a concentration of values in flood prone regions.

Governments can also manage the rivers and floodplains within their borders in order to minimise the damage caused by heavy river flows. Yet there is growing evidence that policies over recent years may have made matters worse. Engineers have channelled many of the major rivers (such as the Elbe and the Danube) and straightened the meanders with the aim of protecting surrounding land from flood.

In particular, the buildings of reservoirs and the reduction of natural flooding areas are influencing the flood run-off in the Elbe catchment with the result that in its lower and middle reaches the Elbe frequently suffers from inundation. Such actions have tended to create relatively sudden surges of water down the river, where in the past the water would have been delayed as it meandered across the river's natural flood plain. However, whether there is a high level of insurance against flood or not, the result appears to be the same. In the UK, where virtually all homes have flood insurance cover, the Association of British insurers (ABI) says that lack of a co-ordinated, strategic flood management strategy is undermining initiatives to reduce the risk of flooding for Britain's 1.8 million flood vulnerable domestic properties.

A report by Middlesex University's Flood Hazard Research Centre in May 2002, stated that in the UK the insurance industry generally no longer believes that the existing informal relationship between insurance and gov-

ernment can be sustained. A case in point is the fact that some direct insurance companies have now effectively excluded coverage for homes in the UK that they perceive as at risk to frequent flooding. Indeed, the agreement that insurers in the UK have with the government not to refuse cover to householders expires at the end of 2002. The fear is that many of those who have been affected by flooding face massive premium increases, while others will not be able to get cover at all.

Jane Milne, ABI property and household insurance manager, said the UK government urgently needs to better manage the increasing flood risk now facing many homes and businesses:

"Property owners can take steps to reduce the risk of flooding, and be better prepared if flooding occurs. We fully support the Environment Agency's Flood Warning Scheme, want to see greater use of flood prevention or reduction products, and encourage property owners to press their local authority and MP for better flood defences.

"However, there is only so much individuals can do on their own. Key decisions on flood defences and flood management rest with the government. The current lack of an effective flood defence strategy in the UK means that much-needed improvements to many flood defences are hampered by complex bureaucracy, as well as under-funding. Speedy decisions and action to improve flood defences are urgently required."

The insurance industry has the potential to influence government policy. In turn, the government needs to review the role of the insurance industry in providing flood cover and the nature of the partnership with that industry that maximises the benefits for society as a whole.