Increasing Weather Losses in Europe: What They Cost the Insurance Industry?

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Losses caused by natural events have increased dramatically all over the world in recent decades. In western and central Europe, weather-related events above all are placing ever growing demands on national economies and insurance companies, not least due to the costs of protective measures. The insurance industry has long been warning about the trend towards an increase in such events, in particular, about the increase in weather-related catastrophes (storms, hailstorms, torrential rains, floods, landslides, extreme heat and frost periods, snow loads, droughts, etc.). The main reason behind these phenomena can be found in the increased settlement of particularly vulnerable areas, the concentration of increasingly sensitive values within these areas and the significant changes in climate and environment that have already taken place. There are significant differences in the market penetration of insurance products in many countries, not only in regard to the type of natural hazard insured but also to objects for which insurance is purchased. Whereas coverage of storm and hail damage to private property is high almost everywhere in the world, insurance density for other elementary perils ranges from below 10 percent to almost 100 percent, depending on the country. Not only is property damage insured, but often also the interruption of business operations, the loss of harvests, production downtime and event cancellation. Weather catastrophes have an immense accumulated loss potential for which insurance companies must prepare themselves. To do this they make use of, among other things, new solutions for risk diversification, such as cat bonds. Successful, efficient risk management for society as a whole can only be achieved by the government, individuals and companies affected, and the insurance industry cooperating with each other in a risk partnership.

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Weather catastrophes – the current situation

The international headlines in the first half of the last decade were dominated by the extreme hurricane events along the coastlines of the northwest Atlantic. Hurricane Katrina (1,322 fatalities; total losses (TL) of 102 billion euros) along the US Gulf Coast in August 2005 was the most costly loss on record, with dramatic consequences in human terms. In more recent times, however, flooding has come to the fore, such as the storm surge during Cyclone Nargis in Myanmar (2008; 140,000 fatalities; TL of 2.5 billion euros), the Indus deluge in Pakistan (2010; 1,760 fatalities; TL of 7.3 billion euros), in several regions of China (2010; 2,550 fatalities; TL of 15 billion euros) and in Australia (2010–11; 38 fatalities; TL of 7.5 billion euros). On the other hand, 56,000 people perished in the record heatwave and fire summer of 2010 in Russia, while snow, ice and frost caused losses of over 15 billion euros in China during the winter of 2008.

West and central Europe have also already been beset by an unusually high number of weather-related catastrophes and disturbing new developments in the new millennium:

- the Elbe flood in 2002, to date Germany's most expensive natural disaster;
- the heatwave summer of 2003, a 450-year event, in which more than 70,000 died in Europe due to the heat;
- the August 2005 flooding in the Alps, Switzerland's most expensive natural catastrophe on record;
- the catastrophe caused by extreme snowfalls in Bavaria and Austria in the winter of 2006;
- winter storm Kyrill in January 2007, for Germany the most expensive winter storm ever, for Europe the second most expensive;
- continued flooding in Britain in the summer of 2007 – the most expensive natural disaster of all time for the country; and

- severe summer storm Hilal that tore through Germany leaving a path of destruction in the wake of its hailstones, gale-force winds and flash floods.

These and other extreme weather-related events since 1997 in west and central Europe are listed in Table 1.

Analyses of the data in Munich Re's NatCatSERVICE database confirm that the incidence of weather-related natural disasters since 1980 in Europe has more than doubled. In absolute terms, the nature extremes in western and central Europe are not as intensive as in other parts of the world: the speeds of winter storm winds are approximately only about two thirds of those reached by hurricanes and typhoons – but they affect a much greater area;

- the 345-mm daily precipitation record (Nova Louka, CZ) is just 18 percent of the world record (1,870 mm in Réunion);
- the discharge in major rivers such as the Yangtze and Mississippi is an order of magnitude higher than in the Rhine or the Danube;
- the surface area of flooded regions is given in hectares and not, as elsewhere, in square kilometres;
- regions with a significant earthquake hazard are comparably rare, quakes do not often occur and, if they do, are only of moderate magnitude;
- there are no active volcanoes; and
- geo-morphologically unstable regions cause problems on a local scale only.

Nevertheless, one thing above all is certain: we are better protected against the forces of nature than people in poorer countries.

The scale of a natural disaster is not defined alone by the magnitude of the damage caused but primarily in terms of how an inflicted region can cope with or resist it. Not only do the existing values, related to population density, and their physical vulnerability play a role but also the various protective mechanisms of structural (flood protection, building codes, etc.) and organisational nature (early warning systems, disaster aid, insurance). Taken together they can even prevent a catastrophe from happening in the first

Table 1

The most expensive and deadly weather catastrophes since 1997 in west and central Europe
(in original values, not adjusted for inflation)

Month	Year	Type of event[1)]	Countries affected[2)]	Fatalities	Losses in million euros Total	Insured
7–8	1997	F Oder	CZ,SK,PL,D,A	118	5400	730
11–12	1998	Cold snap	F,D,PL,H,I	220	0	0
1–3	1999	Avalanches	F,CH,A,D,I	108	800	185
5	1999	F Northern Alps	CH,D,A	13	760	290
12	1999	WS Anatol	DK,D,PL,S	20	3000	2350
12	1999	WS Lothar	F,B,D,A,CH,I	114	11500	5900
12	1999	WS Martin	F	30	4000	2450
10	2000	F Southern Alps	CH,I,F	38	10000	560
10–11	2000	F	GB	10	1700	1270
7	2001	F Vistula	PL,SK	26	800	35
8	2002	F Elbe, Danube	CZ,D,A,I,CH,SK,H	51	22000	3470
10	2002	WS Jeanett	UK,F,B,NL,D,A,CZ,PL	37	2600	1720
6–8	2003	heat, drought	All countries	35000	10750	20
12	2004	WS Dagmar	F,D,CH	17	900	440
1	2005	WS Erwin	UK,DK,D,N.S	18	4150	1900
8	2005	F Northern Alps	F,CH,A,D,SLO,H	11	2700	1430
2	2006	Snow, cold snap	D,A,CZ,PL	80	840	440
7	2006	heatwave, drought	NL,B,F,D,PL	2070	630	0
1	2007	WS Kyrill	UK,F,B,NL,DK,D,A,CH,CZ,SLO,H	49	7700	4470
6–7	2007	F	UK	6	5850	4390
3	2008	WS Emma	UK,D,A,CH,CZ,PL,SK	14	1260	950
5–6	2008	SSS Hilal	D	3	1100	800
7	2009	SSS	D,A,CH,CZ,PL	11	1300	850
12–1	2009–10	Snow, cold snap	UK,F,D	51	2300	1400
2	2010	WS Xynthia	F,B,LUX,NL,D,UK,CH	65	4500	2300
6	2010	F	CZ,SK,PL,H	7	3000	220
8–9	2010	F	D,CZ,PL	16	1000	350
11–12	2010	Snow, cold snap	UK	–	1900	1700

1) F = Flooding, WS = Winter storm, SSS = Severe summer storm. – 2) The following (parts of) countries have been included: Britain (UK), northern part of France (F), Belgium (B), Netherlands (NL), Luxembourg (LUX), Germany (D), Denmark (DK), Southern Norway (N), Southern Sweden (S), Switzerland (CH), Austria (A), Northern Italy (I), Slovenia (SLO), Czech Republic (CZ), Slovakia (SK), Hungary (H), Poland (PL)

Source: Munich Re.

Table 2

The most expensive flood catastrophes in Germany since 1990
(original values and 2010 values adjusted for inflation)

Month	Year	Regions affected	Losses (in million euros) Total Original	Total (2010 value)	Insured Original	Insured (2010 value)
12	1993	Rhine	530	(800)	160	(240)
4	1994	Saale, Unstrut	300	(440)	150	(220)
1–2	1995	Rhine	270	(390)	100	(145)
8	1997	Oder	330	(450)	30	(41)
10–11	1998	Whole of Germany	220	(300)	45	(60)*
5	1999	Rhine, Danube	410	(540)	72	(94)
6	2002	West Bavaria	100	(120)	50	(60)
8	2002	Elbe, Danube	11600	(14100)	1800	(2200)
8	2005	Bavaria	175	(196)	40	(45)
3	2006	Elbe	80	(87)	16	(18)
7	2007	Central Bavaria	90	(95)	–	–
5–6	2008	Southwest, West Germany (‘Hilal’)	400	(405)	100	(101)*
8–9	2010	Saxony	1000	(1000)	400	(400)

* Estimated share of flood losses.

Source: Munich Re.

place. Protective measures of all kinds have succeeded in keeping the numbers of fatalities from natural disasters in Europe low, with the exception of the victims of heatwaves and cold snaps. The scale of natural disasters in our latitudes is therefore usually defined in terms of euros, less frequently in terms of the number of fatalities or victims. Paradoxically, protective measures also play a role in the ever-increasing costs of natural disasters. For one thing, they are expensive to provide. Not only that, they also make people feel safer (and frequently even safe) thus encouraging them to accumulate immense values which they then expose to risk.

To add to all of this, the climate is changing. This was confirmed without reservation by the fourth report of the Intergovernmental Panel on Climate Change 2007 (IPCC 2007). The average temperature has increased over the past 100 years, in Europe by approximately 0.95°C. This is leading to more and stronger weather extremes. Although single events such as the major floods in August 2002, the heatwave in the summer of 2003 and winter storms Kyrill and Xynthia cannot be attributed directly to climate change, the increasing frequency and intensity of such events do point to such an influence.

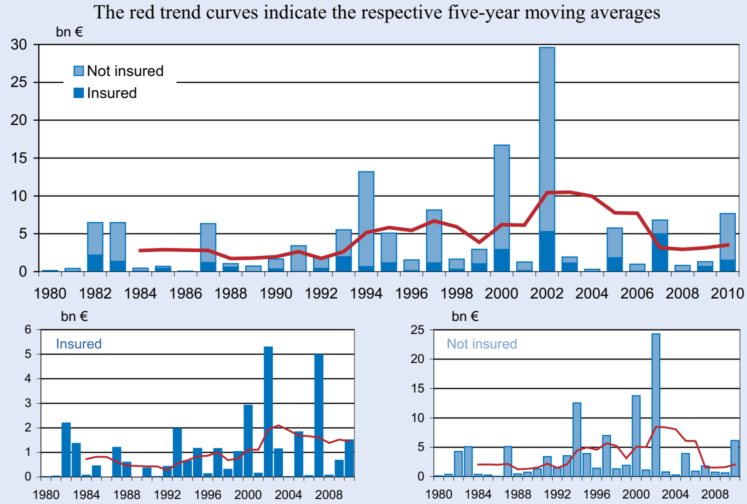
Not only has the number of weather-related disasters risen distinctly over the last decades, but also the resulting losses for the national economies of Europe and the insurance industry, almost 100 percent of all the natural disasters in the region being triggered by weather extremes. Since the early nineties, Germany has been hit almost every year by floods that have led to losses in the three-digit-million figures (see Table 2).

Figure 1 presents the inflation-adjusted annual losses caused by inland flooding in Europe since 1980. While there is considerable volatility from year to year, the figure does not reveal a distinct upward trend in aver-

Figure 1

INSURED AND NON-INSURED INLAND FLOOD LOSSES IN EUROPE FROM 1980 TO 2010

The red trend curves indicate the respective five-year moving averages



Source: Munich Re.

age overall annual losses (upper part of the figure). If large single events such as the flood catastrophes in the Southern Alps and Northern Italy in 1994 and 2000 and the great central European flood of 2002 had not occurred to the extent they did, the red moving average line would barely have exceeded the 5 billion euro level. The average overall losses during the past five years were only slightly higher than those in the eighties and early nineties. This statement is valid for the non-insured losses (lower right) also. Insured losses (lower left) show a somewhat different pattern as they seem to have climbed to a higher level. However, the current high 5-year average is governed by the high level of insurance coverage in the case of the 2007 UK floods (75 percent).

Flood control efforts very probably explain why flood losses do not show distinct upward trends. They have certainly have reduced flooding incidents at many sites. However, during very rare events such measures are much less effective and the resulting losses may be larger than ever before – which also is one explanation for the increasing volatility.

Figure 1 and Tables 1 and 2 make one thing clear: floods primarily impact the society of an affected country as a whole whereas the losses caused by storms are largely covered by the insurance industry. This is because, on the one hand, flood insurance is not widely established in most countries, while on the other, much of the damage is caused to public property such as roads, dykes, bridges, public buildings, etc., in other words to objects that usually are not insured.

Weather hazards and their significance for the insurance industry

Storms

For the insurance industry, storms are by far the most significant natural loss events, as the market penetration of storm insurance in almost all countries is high compared to the other hazards. Storm insurance became widely established in Germany in the wake of the heavy winter storms at the beginning of the nineties (Daria, Herta, Vivian, Wiebke among others), not only on the private but also on the commercial sector. Two types of storm in central Europe have a high accumulation loss potential, in particular for the insurance industry: winter storms and convective events (thunderstorms, tornadoes).

Winter storms – meteorologically defined as extratropical storms – occur between October and April. One single winter storm event can affect an area in Europe extending from the north of Britain to south of the Alps and from the Atlantic into the heart of eastern Europe. Due to the geographical scale of this type of storm, the number of individual losses can run into the millions while the insurance industry can face potential losses ranging from the low to the medium two-digit billion euro range.

Local severe weather events (convective storms) occur throughout the year but most frequently in the summer. Although limited in area, their complexity (gusts, torrential rains, hail, lightning, etc.) can result in accumulated insurance losses to the order of several billion euros. Single-cell storms (summer thunderstorms) rarely lead to a severe storm, as a rule they last less than an hour. Multi-cell storms have a distinctly longer life-cycle and either occur in groups (clusters) or in a line along a cold front. As their wind speed increases they can develop into super-cells, which are substantially larger, more organised and longer lasting than the multi-cells and, in approximately 30 percent of all cases, accompanied by extreme rainfall, hail, storm gusts and tornadoes.

Tornadoes are not infrequent, even in Europe: the average number of annual observations recorded is 170, of which approximately 20 are observed in Germany alone (whereby it may be assumed that more than half of tornadoes go unnoticed). Their ground-level diameter can range from some tens to hundreds of metres, and even to as much as over one kilometre. The vortex lasts normally from just a few minutes up to a maximum of one hour. Tornadoes travel at translational speeds of 50 to 100 km/h, but the highest wind speed inside the tornado can even exceed 500 km/h. However, tornadoes usually occur on a small scale and rarely have a track longer than ten kilometres. Most of them are of low to medium intensity, but in Germany there have already been eight F4 tornadoes (the second-highest category with winds speeds of 330 to 420 km/h) since 1891. One of them was the tornado that hit Pforzheim in 1968. Other F4 und F5 tornadoes are known to have occurred in northern France, the Benelux States and northern Italy. Tornado effects can range from minor property damage to complete destruction caused by wind pressure and air-borne debris.

One of the by-products of severe thunderstorms that is extremely important for the insurance industry is hail. The terminal velocity of hailstones increases in proportion to the square root of their diameter: a 1-cm hailstone therefore impacts at a speed of some 50 km/h; in comparison, a 14-cm pellet (the largest found in Europe to date) impacts with a velocity of 170 km/h. Hailstones of this size can have fatal consequences for humans and animals and can cause immense damage on a small scale. The hailstorm in Munich on 12 July 1984 was for a long time the most expensive event experienced in Europe. At the time it cost the insurance companies the equivalent of 750 million euros in total, which today would be equal to twice the amount adjusted for inflation. Another major hail insurance claim (230 million euros) occurred at the end of June in 2006 in the Black Forest (near to Villingen-Schwenningen).

Floods

Almost anywhere in central Europe can be hit by floods. Floods are a recurring threat for buildings and facilities built close to bodies of water, but even areas that are far away from watercourses and lakes are not immune to flooding. The causes and effects can vary greatly – from gradual inundation due to the rising waters of a lake or groundwater table to streams that have become raging torrents.

River floods occur following heavy rainfall over a widespread area or when snow masses melt. The soil becomes saturated and cannot absorb any more water, precipitation flows directly into the rivers. As a rule, river floods last for a period of several days to several weeks. The flooded area can be very large if the river valley is flat and wide and enough water is present. This type of flooding is problematic from the insurance point of view: only a relatively small proportion of the total building stock is threatened by riverine flooding, and it is for this proportion that insurance protection is requested. According to the ZÜRS zoning system, developed by the German insurance industry to classify the hazard of (river) flooding, less than 14 percent of the populated area of Germany (less than 12 percent of all addresses) is located within the 200-year flooding zone, of this area 66 percent (77 percent) is located outside the 50-year zone. The highest hazard category applies to only 3.1 percent (1.7 percent) of the area, as it is frequently, at times even regularly, affected (flood probability greater than 10 percent annually). Consequently, it cannot be readily insured. Delineation of the threatened areas is often difficult, and defining the probability and the extent of damage at a specific point even more so. This is particularly difficult whenever flood prevention measures are in place that could either be more efficient than anticipated or fail under loads much smaller than projected.

Flash floods can occur everywhere, so that everyone is potentially exposed to this risk. Flash floods are caused by what are usually short periods of heavy rain often occurring over a very small area and typically in conjunction with thunderstorms. The water rapidly converges in the receiving streams thus leading to rapidly rising water levels and flood waves. Streams in particular can be transformed in a matter of minutes from gently flowing brooks to raging torrents eroding embankments and river beds. The moving waters carry off rocks, gravel, sand and earth. If the proportion of solid materials exceeds 30 percent, the flow is referred to as a debris flow. The term ‘flash flood’ also includes a cloud burst over a flat area leading to floods because the water cannot run off quickly enough. Insurance against flash floods that are not associated with bodies of water is not problematic, as the risk is adequately balanced, both in geographical and temporal terms. However, the prerequisite for a strong market penetration is an adequate risk awareness of this type of hazard among large sections of the population – and that is exactly what is lacking at present.

One relatively frequent source of problems with water is a high groundwater table at a specific locality. This can be caused, among other things, by a high water level in a nearby body of water. A flood of this type is particularly problematic for those afflicted, as it can extend over a considerable period of time and, although it usually causes less damage to property, it often incurs high costs, for instance if water must be pumped off all day long over a period of several months to keep the basement dry. Insurance contracts usually do not cover losses arising from groundwater damage, as it is assumed that damage is the result of construction defects.

Storm surges occur along the coast and the shores of large lakes. They are caused by gale-force wind that drives water towards the coast. Precipitation does not play a role. Rising sea levels will continue to increase the risk of storm surges and erosion along coastlines throughout the world – one of the most serious consequences of global warming.

It is important to differentiate between the types of flood from the insurance point of view due to the phenomenon of adverse selection. Insurance works on the principle of a large number of policyholders paying relatively small premiums to an insurance company so that a small number of claimants can receive relatively high compensation payments for the cases of loss that occur. The total sum of the premiums must, therefore, cover the total sum of the losses over a longer time period, plus the costs for administration. In the case of flood insurance, only those people who are very frequently affected by flooding are typically interested in taking out insurance against this type of risk. And it is exactly this circumstance that makes such persons very difficult to insure. The underlying reason is also one of the principles of insurance; namely that protection can only be afforded for unpredictable, sudden events, as this is the only way of balancing out the risk over time. The same does not apply to many river floods. Often, it is merely a question of time as to when the next flood will happen. On the other hand, people who do not live close to a body of water believe themselves not to be at threat, and reject offers made by the insurance companies. The result is that the insured community not only remains relatively small but moreover consists of people who are exposed to a high level of risk. This effect is known as adverse selection.

Mountain hazards

Most mountain hazards are mass movements. These come in the form of mudflows, landslides, rockfalls, slope creeps, glacier ice avalanches, glacial lake outbursts and, last but not least, avalanches. Although they often are geological occurrences, usually they are triggered by weather events. Debris flows have an enormous destruction potential but are local events and, therefore, only cause damage within a limited area. For this reason they generally tend not to be of major significance for the insurance industry. Losses can furthermore largely be avoided by observing the hazard zones defined, or at least known of, in most countries. If they are ignored, insurance protection is likely to be refused. A number of spectacular events in the summer of 2006 in Switzerland (rockfall at the Gotthard pass, landslide on the Eiger, glacial outburst flood in Samedan) have drawn increased attention to the effects of climate change in the mountains: glaciers will shrink even more quickly and the permafrost will begin to thaw in a warmer climate. This will lead to destabilisation of the slopes and produce more loose material which will be carried downhill into the valleys by landslides and mudflows triggered by severe rainfalls.

Soil subsidence, in contrast, has a very high significance for the insurance industry. It occurs after a relatively long dry period in areas where the subsoil consists of certain types of clay materials that shrink when dehydration sets in. Such events bear the risk of immense damage potential. In Great Britain alone over 11 billion euros have been paid out by insurance companies since 1976 for subsidence damage, of which some 760 million euros were paid out in the peak year of 1991. Fortunately, the types of clay that are prone to this reaction only occur in significant quantities in southern England and parts of France, so that the problem in the rest of west and central Europe is not as dramatic.

Winter hazards: frost, ice, snow and avalanches

Snow storms, frost and freezing rain are hazards with potentially disastrous consequences that have been largely underestimated in the past. During the LÜKEX 2004 crisis management exercise of the German Federal Office of Civil Protection and Disaster Assistance, the authorities and utility providers simulated the following scenario in the south of Germany: a snow storm with freezing rain followed by a frost period leads to a ten-day power failure in 75 percent of the municipalities and rural communities of Bavaria and Baden-Württemberg. As a result, lighting, heating, cooling, ventilation, public transport systems, work equipment (machinery, computers) come to a standstill almost everywhere. Public life comes to a halt. It is not even possible to maintain nationwide operation of the army's communication systems. During the simulation exercise, hundreds of thousands of animals die due to the failure of ventilation and heating in their buildings. There are deaths in hospitals and homes for the elderly because life-support machinery such as dialysis units and the heating no longer work. Weather events of this kind can cause huge losses for the insurance industry, since policies may not explicitly exclude many of the costly knock-on effects (in the production and service sectors). These might be covered under business interruption or liability policies.

Following a series of years with relatively low snowfall, the winters in 2004/2005 and 2005/2006 proved that the hazard posed by snow pressure was by no means a thing of the past. In the middle of November 2005, it began to snow heavily in Austria – and then later in Bavaria too. Major snowfalls continued well into January 2006. The huge weight of the snow not only caused damage to the forest areas but also to the buildings. Roofs collapsed in almost all the states in Austria. Schools, shopping centres, business premises, sports halls and hotels were evacuated and churches closed. A state of emergency was declared in some towns in Lower Austria and Upper Styria. The country paid a heavy price for the snow. The economic loss was in the region of 500 million euros, the insured market loss was approximately half as much. Snow load damage to residential buildings is covered under storm policies in Austria and market penetration for snow load coverage is consequently over 90 percent. In Germany, where similarly spectacular losses occurred in eastern Bavaria, this hazard is covered under extended coverage for natural perils, which fewer than 10 percent of home owners have taken out. Large masses of snow could have had further consequences: when it began to rain at the end of March 2006, the snow load was immediately followed by a rapidly increasing flood hazard. Fortunately the floods did not take on critical dimensions and the regions concerned were spared an additional disaster.

Avalanche hazards and their consequences for the insurance industry are comparable with those of fast-moving mass movements. The extreme 'avalanche winter' of 1998/1999 claimed a total of 79 lives in the Alps. Although at the time it was considered to be a catastrophe of exceptional dimensions (which was largely due to the comprehensive media coverage of some of the more spectacular cases, such as Galtür), the economic losses incurred actually 'only' amounted to a little over 800 million euros. Most of the insured losses occurred in Switzerland, where private avalanche damage is largely covered by insurance. The loss borne by the insurance industry for these events was nearly 200 million euros.

Protective measures for all the mountain hazards described are even more expensive than those for floods – at least in central Europe. This is primarily due to the fact that avalanches and other hazards common to mountainous areas arise suddenly and unexpectedly, and consequently pose an extreme threat to humans. Measures to protect human life are justifiably more complex and costly than those required to protect property and goods. Switzerland alone has invested over 1 billion euros in avalanche defence structures since the severe avalanches of winter 1951.

Summer hazards: heatwaves, dry periods and droughts

Average air temperatures in central Europe have risen during the last century by approximately 1.0°C – well above the global average. However, not only has the average value increased but variance too. Extreme heatwave and drought periods during the summer months have been the result. In central Europe, the term heatwave is usually used to refer to daytime air temperatures exceeding 30°C for several days in a row. Heatwaves affect people directly – the elderly in particular: they place the cardiovascular system under excessive strain thereby increasing morbidity and mortality. They can also be a food-hygiene hazard, creating ideal conditions for the spread of salmonella, for instance.

The meteorological summer of 2003 was an extreme event over much of Europe: between June and August, average temperatures throughout Germany exceeded climatological averages for the 1961–1990 period by 3.4°C. Based on previous climate statistics, this roughly corresponds to a 450-year event probability, even though May and September, which were also exceptionally hot, were not taken into account. The heatwave affected not only Germany but also widespread regions of central, western and southern Europe. It claimed more than 70,000 lives (above the normal death rate) and was, consequently, one of Europe's worst natural catastrophes of recent centuries in human terms.

Only three years later, the summer of 2006 once again broke records in many parts of Europe: July was the hottest month ever recorded in Germany. In the Netherlands and in Belgium, where new peak levels were also reached, the death toll was 1,000 respectively. The negative impacts of the heatwave received little media attention due to the World Cup football tournament in Germany. The probability of a heatwave summer as hot as 2003 has risen by a factor of twenty in the last two decades alone, and climate models indicate that this trend is to become even stronger. According to statistical analyses by Swiss climatologists, this is to be expected every other year in the last third of this century, that is to say it will become the norm.

Dry periods and drought are usually directly connected to a heatwave. Both these terms are relative concepts denoting a reduction in water availability in a particular region over a given time period in comparison to the long-term average, or referring to the effects of reduced water availability. The problem with drought as opposed to permanent aridity is that nature (flora and fauna) and human beings have not adapted to these conditions, thus giving rise to a high degree of vulnerability. Drought can be caused by increased evaporation or reduced precipitation, but is generally due to a combination of both. Since both tend to be caused by large-scale, persistent atmospheric conditions, they usually affect widespread areas. Increased water consumption in agriculture, industry and the population can also cause, or at least exacerbate, droughts.

Heatwaves and dry periods leave their mark on the economy: the accident rate increases, workforce productivity drops. In addition, heat and drought reduce agriculture and forestry yields, the danger of forest fires increases and with it the risk of values being destroyed on a large scale. Falling river levels can significantly affect revenues in inland shipping, the energy sector and many industrial operations. If the water level is too low and the navigation channel therefore too narrow, or if ecological risks arise because sediments are stirred up by propellers and the fish population is affected, not only must shipping be brought to a halt – or at least restricted – but the strongly growing tourist business in river cruises will also literally dry up. Numerous cruises were cancelled in 2003, or longer bus journeys were required for some stretches of the cruise, which did not exactly please the guests and caused many of them to cancel their trip. Widespread interruption of shipping operations quickly leads to interruptions in the supply of raw materials, energy resources and commodities, and consequently to business interruptions in industry and commerce. Such was almost the case at Frankfurt Airport in August 2003, which was on the verge of drastic restrictions as the jet fuel supplies – largely transported by ship – had not been delivered. Power plants also had to reduce their output due to a lack of cooling water and some even had to shut down operations. In the case of hydropower plants, low flow has a direct effect on the output. In some cases even the lack of water that is used for purposes other than cooling (processing water) may play a role.

The insurance industry is therefore not only affected by heatwaves and dry periods in the life and health insurance lines of business but also in various property and business interruption lines. River shipping companies can insure themselves against the risk of low water levels, but the contracts usually provide for a deductable of at least 14 days business interruption. Only after this period compensation will be paid on a daily-rate basis. The daily compensation payments claimed in the summer of 2003 ran into the millions, especially for river cruise lines due to the enforced long periods of laytime. Although not yet widely established, liability insurance policies for utility providers (e.g. water, power) who cannot meet obligations to their clients due to drought and heatwaves are undoubtedly gaining in demand.

Loss aspects

Direct losses from property, hull and agricultural insurance

Thanks to the generally solid construction techniques practised in central Europe, structural storm damage tends to be the exception, even under high wind speeds. This applies also to the effects of lightning and hailstorms. Damage is mainly external, i.e. roofs, windows and installations affixed to the building's exterior. Temporary installations on construction sites or at trade shows and similar major events (building shells, scaffolding, cranes, temporary halls, tents, open-air arena seating) are particularly susceptible to damage. Air-borne objects – including hailstones – can cause enormous damage to vulnerable buildings, such as greenhouses, as well as to vehicles. Some 240,000 cars and 170 aeroplanes including a Boeing 757 were badly damaged during the 1984 Munich hailstorm, and 30,000 brand new Volkswagen cars waiting to be shipped from Emden harbour were dented during a 15-minute hailstorm in June 2008. Insured loss: over 100 million euros. The most common damage, and for humans the greatest threat, is caused by falling electricity poles and trees and broken-off branches. Insured properties in the countries of central Europe for which detailed information on major loss events is available, have tended in recent years to be increasingly prone to windstorm and severe weather damage, in other words, the ratio of loss to sum insured has increased. This is in part due to structural changes (extensions, special features and condition of roofs and windows), new construction materials (metal, glass and plastic façades, insulation), species, age, height and condition of trees in the vicinity of buildings, and extended coverage (e.g. inclusion of damage to fences and garden installations, cost of removing debris).

The increase in flood losses is primarily due to the growing development of land close to rivers and lakes. People like to live near water. Many at first knowingly accept the risks associated with the river, and then gradually forget about them as time passes without incident. Furthermore, people sometimes derive an illusory feeling of safety from the protective measures installed (such as early warning systems, dykes and flood barriers, civil protection organisations) so that values in exposed areas soar. Moreover, properties have never before been as large, as valuable and as vulnerable as at present. Heating systems and the associated oil storage tanks are among the main problems. The basements of apartment or commercial buildings often house the central control systems of lifts and air-conditioning facilities, storage rooms and sometimes even computer centres. Mistakes have been and still are regularly made in construction and land-use planning. This situation could be rectified if responsibility for land use were transferred from a local to a higher level. It should be mandatory that anyone proposing to build be informed of current risk exposure, in other words that they are informed about the potential uninsurability of property on a specific plot of land for instance. Instruments to motivate the purchase of flood insurance are available: suitable precautionary measures or an adequate deductible can allow insurance coverage of property located on a site which would not normally be insurable. Such measures should not, however, be used as a general planning specification (which all too often is ultimately not implemented to its full extent) but rather as a means of rendering currently uninsurable buildings insurable or as an instrument for reducing insurance premiums. The insurance industry should consider the possibility of a partial premium refund if no claims are made within a specified period of time (for instance three to five years) as an incentive to implement loss prevention measures.

Insurance against agricultural losses is not widely established in the central European countries; insurance against hail damage is the exception. Farmers usually find themselves saddled with the costs of losses caused by windstorms, heavy rains, flooding, droughts, frost, heat and cold waves unless they receive state subsidies, which, more often than not, are only granted under extraordinary conditions. The development of multi-peril insurance coverage is however being discussed intensively in several Europe countries at present.

Indirect losses: business interruption and contingent business interruption

The 'just-in-time' philosophy currently prevailing in industrial production bears the inherent risk of even small disruptions in the supply chain of raw materials, components, energy and other manufacturing resources required for the actual manufacturing process of a product or of its delivery leading to the interruption of the entire production process. A business interruption (BI) is a disruption in that part of the chain controlled by the (insured) company, if, for example, an assembly line area has been flooded. Most companies are covered for such incidents by business interruption insurance, but this usually includes a substantial deductible (measured in days or weeks).

If, however, the flooding only prevents employees from reaching the otherwise fully functional plant, or if the power supply has failed, or if no-one can or wants to purchase the product any more, this is referred to as an indirect business interruption or a contingent business interruption (CBI). As a rule, CBI insurance is not included in the BI policy but must be taken out separately. CBI losses can be exorbitant for the insurance industry and are difficult to simulate in loss models. In the wake of hurricane Katrina (US Gulf Coast 2005), for instance, credit card and cable TV companies headquartered far away from the impacted area submitted – legitimate – claims to the sum of several hundred million US dollars on the basis of CBI policies: hundreds of thousands of their clients and tourists in the catastrophe area had not been able to go shopping or watch television.

Insured loss percentages and large-loss scenarios

The potential for major loss arises primarily from property losses. However, other insurance lines such as marine, agriculture, engineering (construction sites), assistance (travel insurance), etc. may also incur substantial losses. Storage areas at automotive plants or port warehouses are particularly critical points. Values to the order of several hundred millions of euros are stored on one square kilometre of storage space in such facilities – values that are moreover extremely susceptible to hail or floodwaters for example.

Property insurance for weather risks can essentially be divided up into two types of coverage: storm insurance and elementary perils insurance. The policies usually separate buildings and contents, on the one hand, and private, commercial and industry on the other. Typical storm insurance covers damage by wind and hail but can also be extended to snow loads, as in Austria. Very frequently it is already included in the fire policy. Insured elementary perils generally include earthquakes, floods, landslides, subsidence, volcanic activity and snow loads. The details are provided in Munich Re (2007).

Storm and hail insurance penetration of the private sector is 80 percent to 100 percent in the western and central European countries, for flood risks it is generally much lower. In Switzerland, the insurance of natural hazard risks (except earthquake) is obligatory, so that the insurance penetration for weather risks is virtually 100 percent. One major event alone can cause insured losses in western and central Europe in the order of a two-digit billion euro figure (see Table 1). However, severe local weather events should not be underestimated either. Hailstorm scenarios in major cities incur losses running into the billions.

Due to the low level of insurance penetration, insured flood loss percentages are still relatively small. Furthermore, most losses involve uninsured public facilities such as roads, railway lines, dykes, river channels, bridges and other infrastructure installations (e.g. water supply and sewage systems). In Germany, private-property losses accounted for around 60 percent of the 350 million euro damage caused by the Whitsun 1999 floods in Bavaria, 43 percent of the 8.6 billion euro damage costs incurred in the Elbe River flood in Saxony in 2002, and just 15 percent of the 330 million euro loss caused by the River Oder floods in Brandenburg in 1997. The insured loss potential in Germany is growing, and national-scale scenarios project losses in the range of several billion euros.

The greatest potential for flood losses in Germany – in respect of overall and insured losses – is undoubtedly concentrated in the catchment area and along the Rhine, where the existing values are much greater than those of the flooded Elbe region in 2002. On the other hand, the hydrological characteristics of the Rhine are so different that a one-to-one comparison with the 2002 Elbe scenario cannot be made. However, it may be assumed that an extreme event on the Rhine could involve economic losses significantly greater than the 11.6 billion euro losses incurred in the Elbe and Danube regions in 2002. Various studies from the late 1990s indicate a property loss potential of over six billion euros for the reach of the Rhine between Iffezheim and Bingen (IKSR 1997), and for the stretch flowing through North Rhine Westfalia (MURL 2000), the loss potential is in the order of 13 billion euros for a 200-year flood. Losses of 3.5 billion euros have been estimated for the city of Cologne alone (Cologne City Council 1996). More than ten years have passed since the publication of these findings; it can be assumed that the figures cited would be much higher today. Although flood cover is not as prevalent in household policies in western Germany, insured losses could exceed the 5 billion euro mark, due to the high industrial values located along the Rhine.

Floods in Germany's neighbouring countries could also incur total losses to the order of several billion euros. A precipitation event in Austria on the scale of 2002 (over 400 million euros of insured losses) could unleash catastrophic floods along the Danube if the centre were slightly further south. In addition to losses on smaller rivers and streams, cities like Linz, and even Vienna (although the probability of the city area being flooded is very low as flood protection has been designed to withstand a 1,000-year event) account for a huge loss potential. Insured losses could be as much as 1 billion euros and more. In 2005, central Switzerland suffered the most disastrous flooding in its history, with total costs amounting to almost 2 billion euros, of which the greatest part was insured (1.3 billion euros = 67 percent). Even higher losses in the region of several billion euros are also conceivable, if the heavily industrialised areas around Zurich and Basle were also to be flooded.

Flood insurance penetration in Britain is similar to Switzerland. Insurance against natural hazards is included as a standard in British building insurance policies. Of the 6 billion euro total losses incurred as a result of the June-July events of 2007, 4.4 billion euros were paid by the insurance and reinsurance companies – this made them the most expensive floods in Europe for the insurance industry alongside the 2002 floods in central Europe (3.4 billion euros insured).

Weather derivatives

Government support is of major importance, particularly for yield losses in the agricultural sector. Austria offers one of the most comprehensive coverage concepts in central Europe: not only hail but also frost, storm, flooding, drought, persistent rain during harvesting and other risks are covered; the state grants a 50 percent premium subsidy. Such a comprehensive state-subsidised multi-peril harvest policy requires a risk partnership between farmers, insurers and the state.

A further possibility of insuring against weather-related losses, income losses or additional costs are so-called weather derivatives; the market for these products has been developing rapidly over the last decade. They were originally conceived for the energy sector, which is particularly exposed to the mercy of the weather, as less heating is required during mild winters and less air-conditioning in cooler summers thereby leading to less-than-average power consumption in both cases. Power suppliers are weather-sensitive not only on the consumer side but also on the production side. The tourism industry, too, is increasingly insuring itself against adverse weather conditions resulting in income losses. Many Alpine ski resorts reported a sharp fall in turnover as a result of the extremely mild 2006/2007 winter for instance.

Creativity knows almost no bounds when it comes to structuring weather covers. They may be based on minimum or maximum temperatures, precipitation (rain/snow), sunshine hours, wind or a combination of values recorded at independent, official weather stations. Risk transfer can take place over the entire relevant period based on accumulated values or by counting the days that meet certain criteria, such as a temperature of 31°C and higher. The predefined sum is then paid out in full as soon as the trigger value has been reached, or gradually, for example in instalments for each additional day with a maximum temperature of over 31°C.

For some time now it has also been possible to insure sports and music events not only against natural disasters such as windstorm but also explicitly against adverse weather. Classical open-air concerts are particularly vulnerable as the string instruments must on no account become wet. If persistent rain disrupts a major tennis tournament, finals may have to be postponed instead of being played at lucrative, weekend peak periods. Ski jumping and races must be cancelled or postponed in the event of storm, fog, heavy snowfall, rain or high temperatures. Event insurance policies therefore often offer the option of reimbursing the costs or the revenue losses if precipitation exceeds a predefined trigger value.

Climate change and the changing risk

Back in 1973, Munich Re was the first private sector company to draw attention to the problem, pointing out in a publication on flooding that the growing losses might be due to human-induced climate change (Munich Re 1973). The fourth IPCC report (IPCC 2007) confirms the statements and warnings issued by Munich Re over the past three decades. Climate change will lead to an increase in extreme weather events and consequently also in costs. Climate models unanimously forecast warmer, wetter winters in central Europe with much less snow. The higher concentration of water vapour in the atmosphere will not only lead to more precipitation in general but also to increasingly extreme rain intensities in the event of regional or local severe weather events. The variability of precipitation events is also growing and extreme weather conditions are becoming more frequent. Westerly weather patterns and Vb depressions in particular, both typical flood-generating situations, are becoming more and more frequent. They have already led to a 20 percent to 30 percent increase in precipitation in the west and south of Germany. The trend towards drier summers in certain regions does not necessarily mean a decrease in heavy summer rainfalls: heavy rain will be concentrated on fewer days and be extremely intensive. The result will be more flash floods. Temperatures in the summer seasons will continue to climb until the end of the 21st century, heatwaves will increase.

These trends are naturally taken into account in the price calculations of the insurance companies. This means that as the risk level increases so too does the price of insurance protection. One potentially positive effect could be that the insureds will endeavour to reduce their risks – and consequently also their premiums – by taking preventive measures. Planners too will have to take the higher level of a future hundred-year flood into account in their project design calculations. This process of adaptation has already begun: the German states of Baden-Württemberg and Bavaria have prescribed the incorporation of a load-case climate change, or a 15 percent increase in the design discharge for new flood control systems (Hennegriff *et al.* 2006).

Sir Nicholas Stern's report on the 'Economics of Climate Change' (Stern 2006) addressed the financial impact of climate change. The study predicted an annual loss of at least 5 percent, or 2,200 billion US dollars, of the worldwide gross domestic product (GDP) by the middle of this century. Stern suggests that the costs can be limited to 1 percent of annual global GDP (= 445 billion US dollars) if adequate action is taken early enough. It is furthermore crucial to finance adaptation to the impacts of climate change that can no longer be prevented. The insurance industry has a key role to play in this respect as it provides solutions for dealing with the financial losses.

There have been cases of extreme events in the past too. For this reason, exceptional weather events cannot in themselves be considered proof of climate change. Only the sum total of the – increased – incidence of such events can serve as evidence. Governments, disaster management organisations, the population and insurance industry must be prepared to face increasingly frequent and increasingly disastrous events with ever heavier losses.

Risk partnership between government(s), individuals and companies affected, and the insurance industry

Loss reduction and minimisation call for an integrated course of action – particularly in the case of the risk posed by floods. At the same time, the flood risk must be borne on several shoulders. The German Federal States Working Group on Water Issues has made this very clear in its 'Guidelines for Future-oriented Flood Protection' (LAWA 1995). Essentially, risk reduction is based on three components:

1. the state, as in all public bodies from national to communal authorities including the local and district governments as well as governmental and non-governmental aid organisations such as the fire services, civil aid agencies, Red Cross, etc.;
2. those affected, i.e. private individuals, companies and – in respect of damage to roads, dykes and public buildings – the state; and
3. the insurance industry, composed of primary insurers and reinsurance companies.

Only when all three partners cooperate with each other in a balanced relationship in the spirit of a risk partnership is efficient disaster prevention possible. The principal task of insurance companies is to compensate financial losses that have a substantial impact on insureds or even constitute their ruin. As such they are therefore not social institutions (in the sense of charitable) but rather essential elements of the social system, as they distribute the burden borne by the individual over the entire insured community which, ideally, should be composed in such a way that each of its members could be affected, albeit with various degrees of probability.

Dealing with large losses

Accumulation control

Natural disasters are events posing a potential threat to the existence of insurance companies. In the case of insufficient risk control they could lead to a company's ruin. The accumulation risk, in other words the danger of a very high percentage of the portfolio being affected at a stroke, must be limited in such a way that the reserves for claims payments are sufficient and the financial base of a company is not impacted. This is achieved not only by means of a geographic balance within the portfolio but also by limiting the liabilities assumed. The third component is the – partial – transfer of the risk to other risk bearers (e.g. reinsurers).

Insurance companies are obliged to maintain an overview of their liabilities and carry out regular accumulation controls. Accumulation control is the exact analysis of liability distribution, including the aspect of liability accumulations that can lead to large losses in the event of natural disasters. Every additional insurance policy not only can improve the risk balance but also, under certain circumstances, increase the risk of high accumulation losses. The primary insurer requires accumulation control to keep track of its liabilities and also keep them under control. Reinsurers form their reserves on the basis of accumulation analysis. The most important objective of accumulation analysis is to determine the so-called 'Probable Maximum Loss' (PML). To do this, models (usually stochastic) for accumulation loss calculations are used. Such models have been available for storms and earthquakes for many years. The respective national insurance industries in Germany, Austria and Italy, in cooperation with some of the major reinsurers and state authorities, have now also developed accumulation models for flood risks that ought to be much more detailed and complex in design. They have been fully available since 2008.

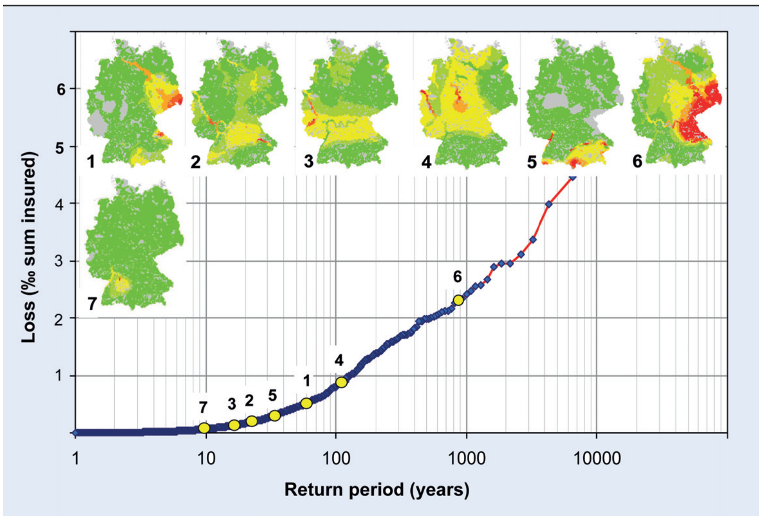
The main task of such accumulation models is to recognise and model possible catastrophe scenarios that could incur losses of previously unknown dimension. To do this it is necessary to simulate the relevant (flood) events that of course must also be physically plausible. One possible approach is to analyse historic events and use their hydrological and statistical characteristics to generate different scenarios that include much more intensive and widespread events than those observed and, consequently, lead to greater losses.

Following the development of the German insurance industry's ZÜRS flood hazard zones (Falkenhagen 2005), a set of synthetic flood events was created within the framework of the 'HQ-Kumul' project by the Institute for Applied Water Resources and

Geoinformatics in Ottobrunn (Willems 2005). The event set was based on the discharges (daily average values) recorded over a time period of over 40 years at 131 river gauges in Germany. The gauge data were used to select the 100 largest flood events for the 1960 to 2002 time period. The statistical relations between the individual discharges of these 100 events were analysed. The result was a multivariate probability distribution for all the discharge data and a variance-covariance matrix that describes, in particular, the simultaneous occurrence of extreme flood discharges. Based on these findings, Monte Carlo simulation was used to generate 10,000 flood events which reflect the characteristics of the historic floods and contain variations of these events. The event set comprises the regional intensity of the flood for the individual stretches of the rivers for each event, expressed as the return periods of the discharges. This now makes it possible to simulate losses with low occurrence probability or a long return period (> 100 years).

Figure 2

Calculation of a PML Curve Based on a Large Number of Stochastically Simulated Loss Events (Presentation of seven generated events as an example)



Source: Munich Re.

Loss calculation and determination of the so-called PML curve describing the relationship between loss probability and loss size is basically carried out in five steps:

1. The liability data of the insurance portfolio – either for each single property or, for example, aggregated into five-digit post code areas – are read into the model.
2. Using the above-mentioned local discharge return periods generated by the HQ-Kumul model and the hazard maps (for example ZÜRS), the local areal extent of the flood and flood intensity are determined for each property/post code area.
3. Now the probable loss for each single risk or for the aggregated insurance sum for each post code area can be calculated. This is done by means of loss functions that have either been generated on the basis of technical engineering data (water level-loss-relationships) or of empirical data from past loss events. As a rule, private, commercial and industrial buildings and their contents are treated differently.
4. The losses for all properties/all post code areas are totalled for each single event.
5. The losses are now arranged according to size to form an empirical distribution function. This function, allowing the graphic representation of losses in relation to exceedance probabilities or return periods, is the PML curve (Figure 2).

The PML curve now allows the expected loss for a given return period (for example 100 or 1,000 years) to be determined, or the return period of an historical event with a known loss (such as the Elbe 2002 event) to be read off. The first possibility is primarily needed for calculating the prices for reinsurance coverage, but is becoming increasingly important in connection with Solvency II, which requires that insurance companies determine their exposure and the losses to be expected at certain probability levels.

Cat bonds

The traditional type of risk distribution transfers part of the risk assumed by the (primary) insurer to the reinsurance market. The loss potential of weather-related natural disasters has now reached a critical point. This poses new challenges for the insurance industry. Munich Re, like all leading international reinsurers, is particularly exposed to the accumulation loss issue and must diversify its risks as widely as possible. As a result, alternative methods of risk transfer have been developed to exploit the capacity of the international capital markets to absorb such risks.

In recent years, especially in the wake of hurricane Katrina, this new form of risk distribution, the securitisation and transfer of catastrophe risks via insurance risk bonds – better known as 'catastrophe bonds' – has gained a strong foothold on the capital market. A cat bond transfers a specified risk (such as winter storm losses in Europe) from a risk bearer (known as the sponsor) to investors. The sponsor is normally the reinsurer but can also be a large company (such as a national rail service operator). The investor purchases tranches of the bond. If the catastrophe event for which the bond was issued does not occur during its term, the invested capital plus interest is returned to the investor upon the bond's maturity. If a catastrophe does occur, the investor looses the principal or part of it and no interest is paid. There are various ways of defining the trigger event, in other words the event for which losses must be paid: a) the actual financial losses of the sponsor (indemnity trigger), b) the overall registered – or modelled – insurance industry loss from an event (industry loss trigger), or c) certain physical thresholds (such as wind speeds at certain points or discharges), or an index based on several such parameters, are exceeded (parametric trigger).

Cat bonds have high interest rates but also carry a high risk and are largely purchased by professional investors. They prefer such investments due to the lack of correlation with other asset classes in the financial markets in the event of losses which helps them achieve diversification. Only one cat bond has ever been paid out to its sponsor (because of hurricane Katrina), as the triggers in the past were set very high.

Conclusion and outlook

Insurance companies play an important role in providing protection against extreme natural events, particularly within the framework of developing strategies for adaptation to climate change. Not only are they instrumental in distributing part of the risk over many shoulders but they also can succeed in taking the decisive step of encouraging, motivating and even obliging citizens and the private sector in general to prepare for loss events. All home or company owners are aware that it is their own responsibility to insure their property against windstorms. They can roughly estimate their personal share of the risk and arrange for suitable protection in the form of a mix of structural (e.g. adding window shutters), organisational (e.g. storm warnings) and financial (e.g. insurance) measures. In contrast to this, the state is often considered responsible for the flood risk. Many people are not even aware of the fact that everyone must shoulder part of the responsibility for personal flood risk.

Nevertheless, it is evident that active risk management and loss prevention pays off. Every euro invested in a flood protection measure can reduce the losses many times over. However, for the state this raises questions: What are the right preventive measures? Which are the most efficient? Which measures are feasible? And: is universal flood control even feasible, and if so, is it affordable? As far as fundamental protection is concerned the answer is 'Yes'. But as regards protection against extreme events, the answer must be 'No'. The only remedy is to promote a keen sense of risk awareness through all levels of society. The most effective form of loss prevention it not to build in the vicinity of water. The local building authorities must stop approving new development sites in flood risk zones. Although the German Flood Control Act from 2005 restricts such activities it cannot prevent them entirely. It is inacceptable that an individual or a local authority can benefit from building in the risk zone but society as a whole must pay for the consequences when disaster strikes.

However, correct government risk management also involves bringing all those at risk on board. The first step in this direction is the adequate adaptation of building activities to the risk situation. This does not mean permitting adapted construction in new housing development areas thereby creating a loophole for utilisation of areas that are not suitable for development due to the risk of floods. On the contrary, it concerns the structural adaptation of existing building stock and the refurbishment and construction of buildings in existing housing areas. Secondly, the precautionary measures taken by those affected must be taken into consideration in the state support provided following flood disasters – and this must be clear, or made clear, to all the stakeholders. Obviously, there are cases when the state must help. But the willingness to take precautionary measures is undermined if those who invest money in protecting themselves receive the same amount of compensation as those who do nothing other than rely on the government.

Ultimately, the people affected must take appropriate action. Homeowners must ask themselves if it makes sense to install a heater or oil tank in the basement, and if they really need a carpeted party room down there. They should know what to do in the case of a disaster, and decide 'in dry times' about whether they can cope with possible losses – without state support – or if it would not be better to take out insurance.

The risk of flooding is generally underestimated in places far away from rivers. It scarcely occurs to people that a local thunderstorm could cost them thousands, or even ten thousands, of euros, even though the nearest watercourse is miles away. The best examples for this were the floods in Baiersdorf/Bavaria in June 2007 and in Britain during the same summer. These floods were not caused by rivers. House owners often are not aware that insurance for this type of loss can be obtained with an annual premium of just a few dozen euros. This awareness must not only be promoted by the insurance industry alone, as this quickly gives rise to the suspicion that it just wants to do business, but also by the state and the media. If risk awareness is heightened as a result, then the penetration of elementary peril insurance increases. In that case, the discussions on obligatory insurance that invariably flare up in the wake of major flood events – as in 2002 on the Elbe and the Danube or 2007 in Bavaria – would be a thing of the past. A large insured basis could allow the risk of people who are almost or completely uninsurable due to their high level of risk exposure to be borne by the insured community, or the state could focus its financial aid on this segment of the population. The situation would certainly be more acceptable for all involved than the customary discussions, often dominated by (electoral) politics, on post-disaster compensation and reconstruction aid.

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