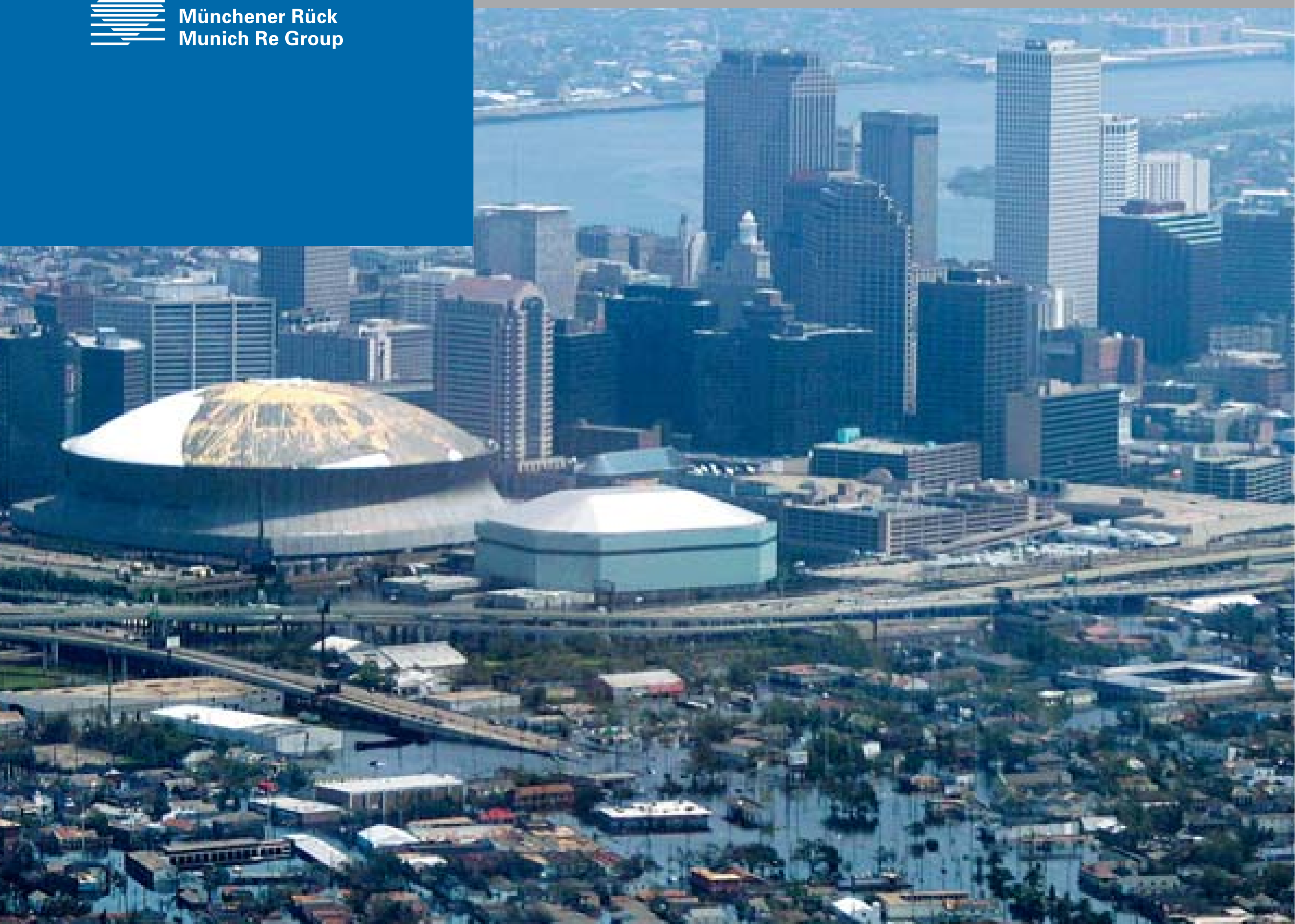
Knowledge series

Topics Geo
Annual review: Natural catastrophes 2005

Natural catastrophes in 2005
Great natural catastrophes since 1950
Hurricane season – Time to rethink
The Kashmir quake
The climate conference in Montreal
Climate review 2005

Münchener Rück
Munich Re Group




HOUSTON
Astros
NATIONAL LEAGUE
WESTERN DIVISION
CHAMPIONS
1986

Cover:
2005 was the most active hurricane season since recordings began and the most expensive in the history of the insurance industry. This was the flooded centre of New Orleans at the end of August after Hurricane Katrina. The Superdome provided shelter for 20,000 homeless people. However, a further evacuation was imperative as the Superdome's roof had been damaged in the storm, and supplying the people with provisions was difficult in the flooded city.

Left:
The first evacuees from New Orleans arrived in Houston on 31 August. More than 24,000 homeless people crowded into the Astrodome, where they received all they needed. It was the largest emergency shelter in the history of the American Red Cross.

Natural catastrophes in 2005 Review – Outlook

2005, the year of records

The year 2005 was marked by weather-related natural catastrophes. Roughly half of all the loss events recorded were windstorms, with costs to be borne by the world's economies exceeding US$ 185bn. The most severe human catastrophe was triggered by an earthquake that occurred in October in the border area between Pakistan and India and, with a death toll of 88,000, was one of the five most destructive quakes of the last 100 years.

Loss figures

Overall losses exceeding US$ 210bn set a new record (the most expensive year before that was 1995 with US$ 175bn, in original values), although, with some 650 loss events registered, the number of natural catastrophes was in line with the average of the last ten years. More than one hundred thousand people were killed as a result of natural catastrophes last year. Such a large number of fatalities has been recorded only twice in the last 25 years: in 1991, following a storm surge in Bangladesh, and 2004, following the tsunami in South Asia.

Consequently, it is not surprising that insured losses also reached unprecedented dimensions. The year's overall balance for the insurance industry was US$ 94bn, doubling the previous record set in 2004.

Windstorms

As in previous years, windstorms dominated the insurers' loss figures. In January, Winter Storm Erwin crossed Scotland and southern Scandinavia at up to 120 km/h on a path that took it as far as Russia. It was the strongest storm in Norway for over ten years, in Sweden for over thirty years. For the European insurance industry, it was the fifth most expensive storm of the past fifty years.

The hurricanes in the United States, the Caribbean, and Mexico alone destroyed insured values exceeding US$ 83bn. In the Atlantic, 27 tropical storms and hurricanes broke all meteorological and monetary records. For the first time since its introduction in 1953, the official list of 21 names was not long enough and had to be supplemented by the first six letters of the Greek alphabet.

Katrina was the sixth strongest hurricane since recordings began in 1851 – and losses amounting to US$ 60bn (private insurance: US$ 45bn; National Flood Insurance Program: US$ 15bn) made it the most expensive natural catastrophe loss in history. Rita, the fourth strongest hurricane ever registered, reached mean wind speeds of up to 280 km/h. Stan progressed at a relatively slow speed but carried enormous amounts of rain into Middle America, causing thousands of landslides, under which more than 800 people were buried. Wilma was the strongest hurricane ever registered in the Atlantic, with overall losses amounting to approx. US$ 18bn. At the end of November, Delta became the first tropical cyclone ever to be registered in the Canaries. You will find a detailed description of the 2005 hurricane season beginning on page 18.

Munich Re has also published a special brochure entitled "Hurricanes – More intense, more frequent, more expensive", which describes the effects on the insurance industry and summarises the conclusions to be drawn.

Geological events

In the past year, 70 damaging earthquakes and 13 volcanic eruptions were registered around the world. The overall loss came to approx. US$ 6bn.

In February 2005, a 6.5-magnitude earthquake occurred in Iran. Although the region affected is only sparsely populated, more than 600 people were killed. In March, an 8.7-magnitude earthquake occurred off the coast of Sumatra, demolishing thousands of houses on the island of Nias and killing 1,700 inhabitants. The earthquake that hit the border region between Pakistan and India in October 2005 triggered one of the worst human catastrophes of the last one hundred years. It only lasted 50 seconds, but more than 2,000 settlements were almost completely destroyed and 88,000 people were killed. Thousands of landslides blocked the roads to the areas with the greatest devastation and thus prevented international aid organisations from taking prompt and effective action. Further details may be found in the article beginning on page 30.

Floods

In August 2005, profuse rainfall caused floods in nearly all Alpine countries. You can read more on this occurrence, the largest loss incurred by the Swiss Natural Perils Pool in its 30-year history, in the article beginning on page 34. Mumbai, the megacity on the west coast of India with over 15 million inhabitants, was swamped by extreme rainfalls in July 2005. A precipitation depth of 944 mm was recorded within 24 hours, almost as much as the annual average. Our description of this natural catastrophe, the most expensive insurance loss in India to date, begins on page 38.

Wildfires, heatwaves, and droughts

In August, the scene in the Alps was dominated by floods and flash floods, whereas southern Europe had to contend with wildfires and droughts. Portugal experienced one of the most extreme dry periods of the last 100 years, Spain and France were forced to introduce water rationing, and the agricultural sector was confronted with widespread crop failures. The overall loss is estimated to exceed US$ 3bn.

Brazil's Amazon Basin went through its worst drought for more than 60 years. Many stretches of river dried up, resulting in losses for the shipping industry, agriculture, and fishery. The connections between the drought in the north of Brazil and the exceptional hurricane season in the Atlantic are illuminated in the climate review on page 51.

Disaster reduction – Risk awareness is the key

The series of dramatic natural catastrophes shows no sign of stopping. The Bam earthquake in 2003, the South Asia tsunami in 2004, the New Orleans floods, and the Kashmir earthquake in 2005: these are just a few examples.

With its motto “From Knowledge to Action“, the Munich Re Foundation commenced its work in April 2005. Its objective is to support people at risk and improve their living situation. The repercussions of natural catastrophes can only be reduced in a lasting way if the people are taught about the effects of earthquakes, cyclones, and floods and learn how to protect themselves. At an international symposium organised in November by the Munich Re Foundation, “Worldwide disaster reduction – Risk awareness is the key“, the ten leading challenges of the future relating to disaster prevention and reduction were formulated. The article beginning on page 45 informs you about the work packages of the Hohenkammer Charter that was adopted by one hundred experts.

Outlook

All loss records were broken in 2005, which finally led to the climate change debate taking on a new quality. The wind of change already made itself felt at the Montreal climate summit in December. The article beginning on page 48 has more about the outcome of the Canadian summit.

Munich Re has long been warning that increasing global warming will be accompanied by extraordinary weather-related natural catastrophes and explaining why there is a likelihood of greater loss potentials. The company's fears were confirmed in 2005.

The international insurance industry managed to cope with 2005's record losses, but the ability to provide cover for natural hazards in the future will depend on the development of adequate insurance solutions for catastrophe scenarios that have hitherto been inconceivable.

Angelika Wirtz

Hurricane Katrina made landfall on 29 August some 30 km east of New Orleans. Hours after the low-pressure vortex had passed, the levees and floodwalls were breached and large parts of the city were flooded. As the affected areas were below sea level, draining was only possible using pumps and by natural evaporation. It was three months before New Orleans was fully accessible again.

Pictures of the year

7–9 January
Winter Storm Erwin: Scandinavia, Baltic countries
Overall losses: US$ 5,800m
Insured losses: US$ 2,500m
18 fatalities

22 February
Earthquake: Iran
Overall losses: US$ 80m
612 fatalities

28 March
Earthquake: Indonesia
1,700 fatalities

April–August
Floods: Romania
Overall losses: US$ 1,600m
Insured losses: US$ 10m
67 fatalities

24–25 May
Severe weather: Brazil
Overall losses: US$ 100m
Insured losses: US$ 14m
5 fatalities

Summer 2005
Drought, wildfires: Southern Europe, esp. Portugal, Spain
Overall losses: US$ 3,650m
58 fatalities

17–20 July
Typhoon Haitang: China, Taiwan
Overall losses: US$ 1,100m
Insured losses: US$ 100m
17 fatalities

25–30 August
Hurricane Katrina: USA
Overall losses: US$ 125,000m
Insured losses: US$ 60,000m
1,322 fatalities

20–24 September
Hurricane Rita: USA
Overall losses: US$ 16,000m
Insured losses: US$ 11,000m
10 fatalities

8 October
Earthquake: Pakistan, India
Overall losses: US$ 5,200m
88,000 fatalities

25–27 November
Winter Storm Thorsten: Germany
Overall losses: US$ 300m
Insured losses: US$ 150m

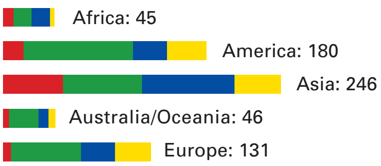
30 December 2005–3 January 2006
Winter storm, floods: USA
Overall losses: US$ 200m
Insured losses: US$ 100m
8 fatalities

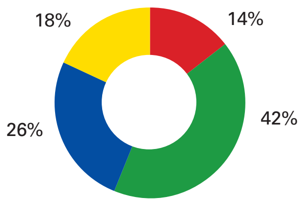
Statistics of natural catastrophes in 2005

Loss events and fatalities

In 2005, approx. 650 natural hazard events were analysed and stored in the NatCat*SERVICE* database. As in previous years, the number of events was dominated by weather-related natural catastrophes. The largest death toll was caused by the Kashmir earthquake in the border region between Pakistan and India, which killed more than 88,000 people and made more than three million homeless.

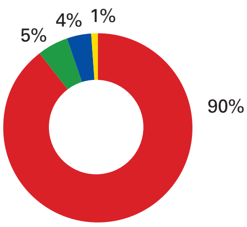
Number of loss events: 648





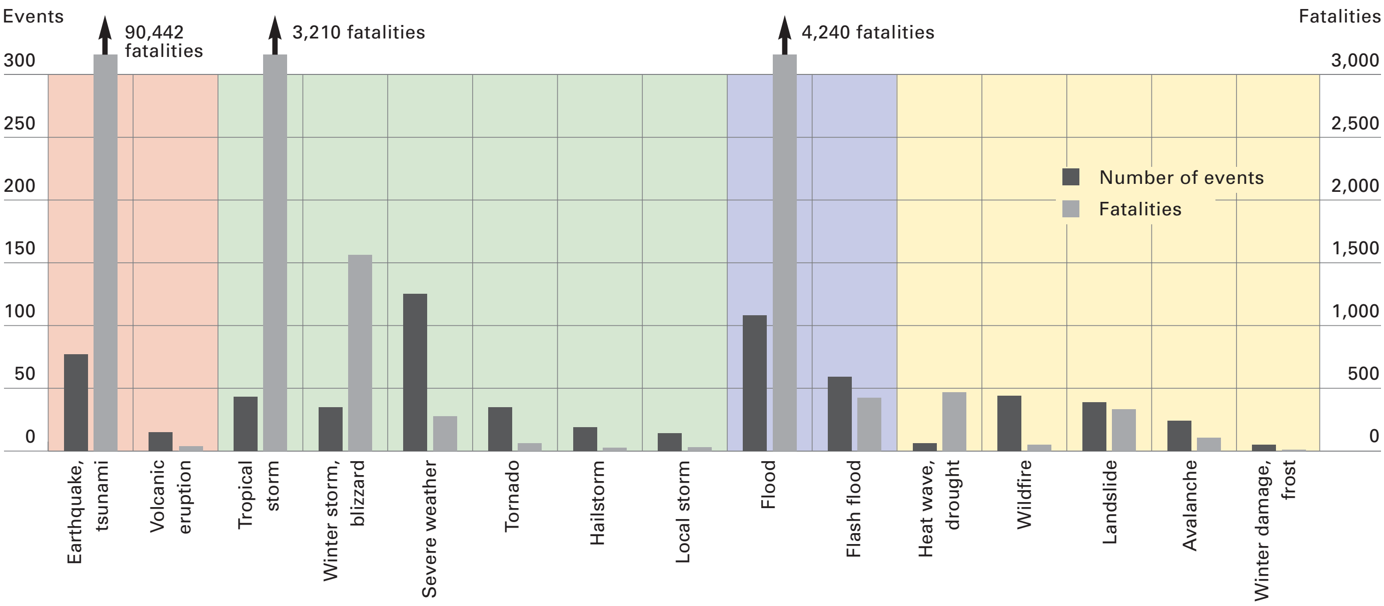
Percentage distribution worldwide

Number of fatalities: 100,995



Percentage distribution worldwide

Breakdown by type of event

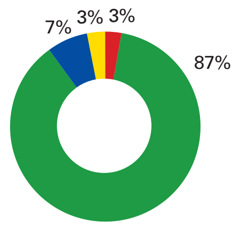


- Earthquake, tsunami, volcanic eruption
- Windstorm
- Flood
- Temperature extremes and mass movement (e.g. drought, frost, avalanche)

Overall losses and insured losses

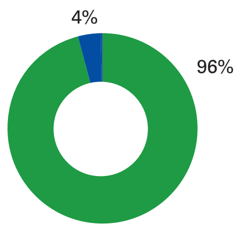
2005 was a record year: the most expensive natural catastrophe year in insurance history and for the world's economies as a whole. The hurricane losses in North and Middle America and in the Caribbean caused roughly 80% of the overall economic losses and 88% of the insured losses.

Overall losses: US$ 212,127m



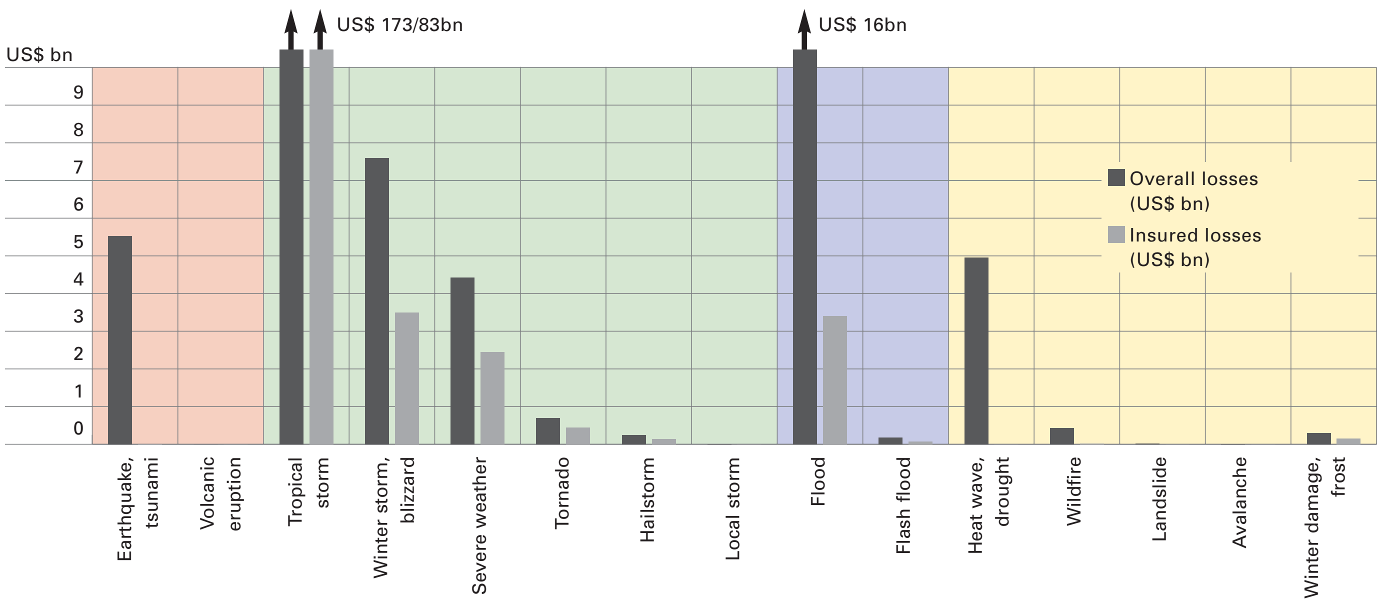
Percentage distribution worldwide

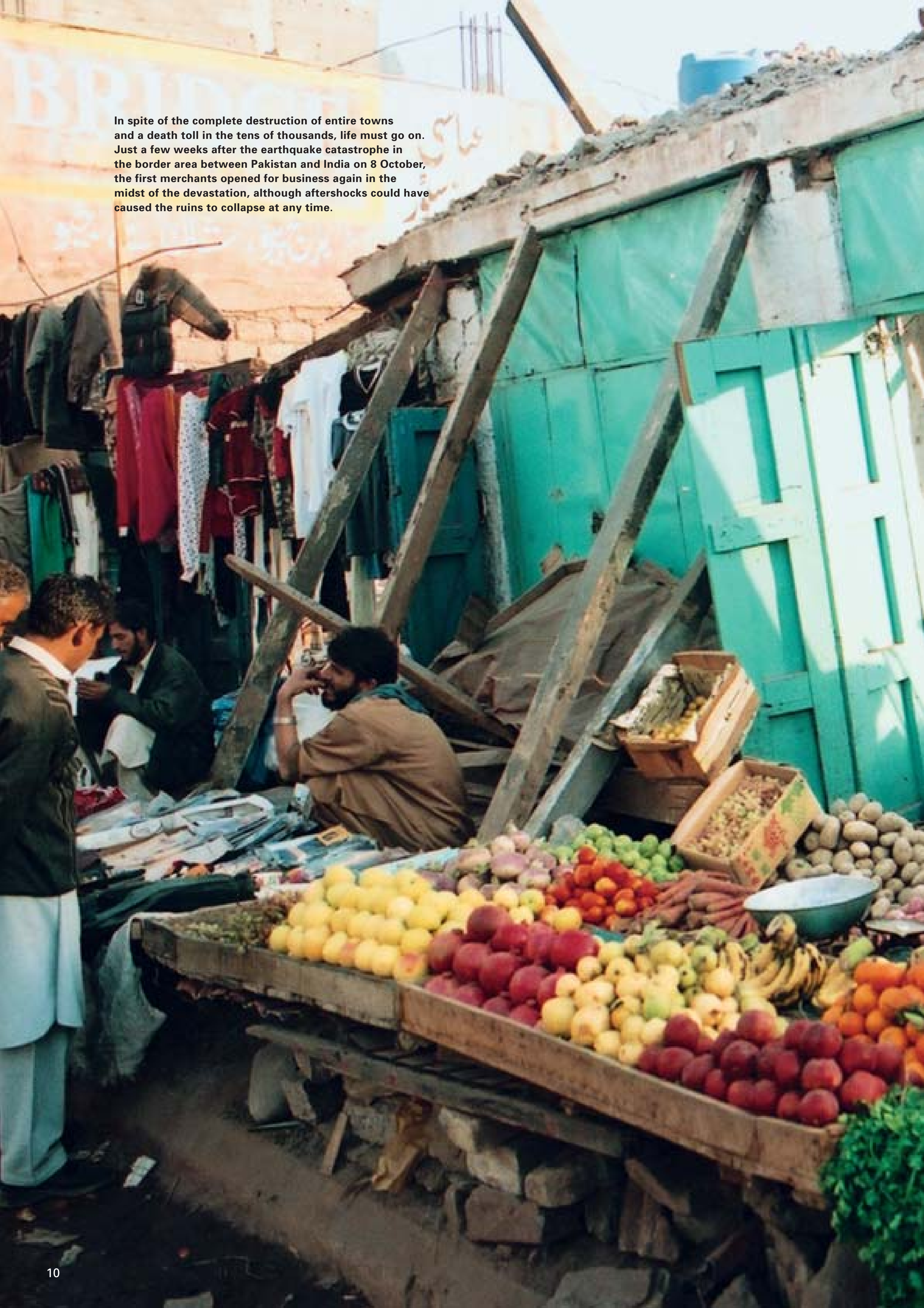
Insured losses: US$ 94,379m



Percentage distribution worldwide

Breakdown by type of event





In spite of the complete destruction of entire towns and a death toll in the tens of thousands, life must go on. Just a few weeks after the earthquake catastrophe in the border area between Pakistan and India on 8 October, the first merchants opened for business again in the midst of the devastation, although aftershocks could have caused the ruins to collapse at any time.

Great natural catastrophes 1950–2005

As in the previous year, great natural catastrophes set new records again in 2005, and the trend towards higher and higher losses continues.

About 650 loss events occurred around the world in 2005. They were duly analysed by Geo Risks Research and stored in NatCat*SERVICE*®, Munich Re's natural catastrophe database. The number of events registered was in line with the average of the last ten years. The monetary and human consequences, however, were extraordinary, since 2005 was the costliest natural catastrophe year ever for the insurance industry and one of the three deadliest years in the last quarter of a century.

Definition
"Great natural catastrophes"

In line with definitions used by the United Nations, natural catastrophes are considered "great" if the affected regions' ability to help themselves is clearly overstretched and supraregional or international assistance is required. As a rule, this is the case when there are thousands of fatalities, when hundreds of thousands of people are made homeless, or when the overall losses – depending on the economic circumstances of the country concerned – and/or insured losses reach exceptional orders of magnitude.

Six natural hazard events complied with the definition of "great natural catastrophes" in 2005. They accounted for more than 91,000 deaths (out of a total of 100,000); and generated overall losses of US$ 170bn (total: US$ 212bn) and insured losses of US$ 82bn (total: US$ 94bn).

- Floods, India (August)
- Hurricane Katrina, USA (August)
- Hurricane Rita, USA (September)
- Hurricane Stan, Middle America (October)
- Earthquake in Pakistan and India (October)
- Hurricane Wilma, Mexico, USA, Caribbean (October)

(See the insert "World map of natural catastrophes 2005" for the extent of losses from the six great catastrophes.)

Comparison of decades 1950–2005

The tables allow a comparison of the aggregate loss figures of recent decades. Comparing the last ten years with the 1960s makes the increase in natural catastrophes particularly clear. This applies both to the number of events and to the extent of the losses incurred.

Decade	**1950–1959**	**1960–1969**	**1970–1979**	**1980–1989**	**1990–1999**	**Last 10 years**
Number of events	21	27	47	63	91	57
Overall losses	48.1	87.5	151.7	247.0	728.8	575.2
Insured losses	**1.6**	**7.1**	**14.6**	**29.9**	**137.7**	**176.0**

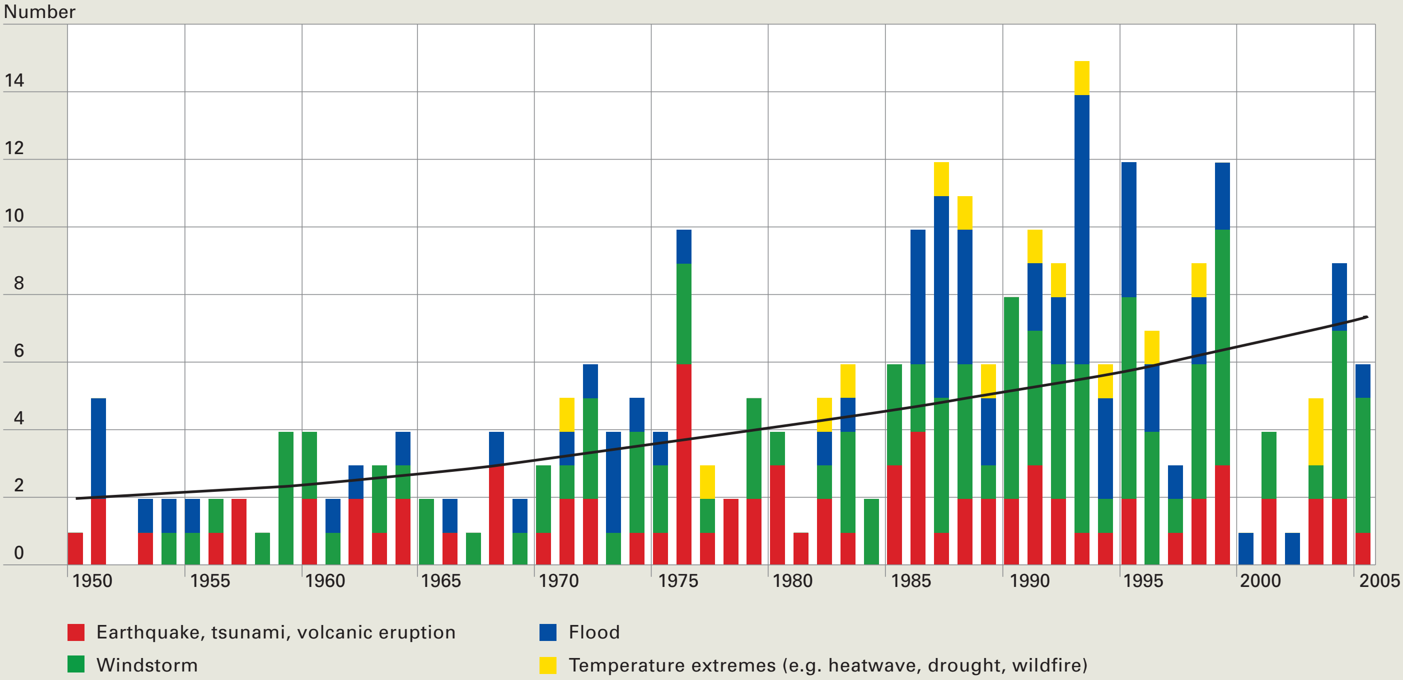
Losses in US$ bn (2005 values)

A comparison of the last ten years with the 1960s reveals a dramatic increase.

last 10:60s
2.1
6.6
24.8

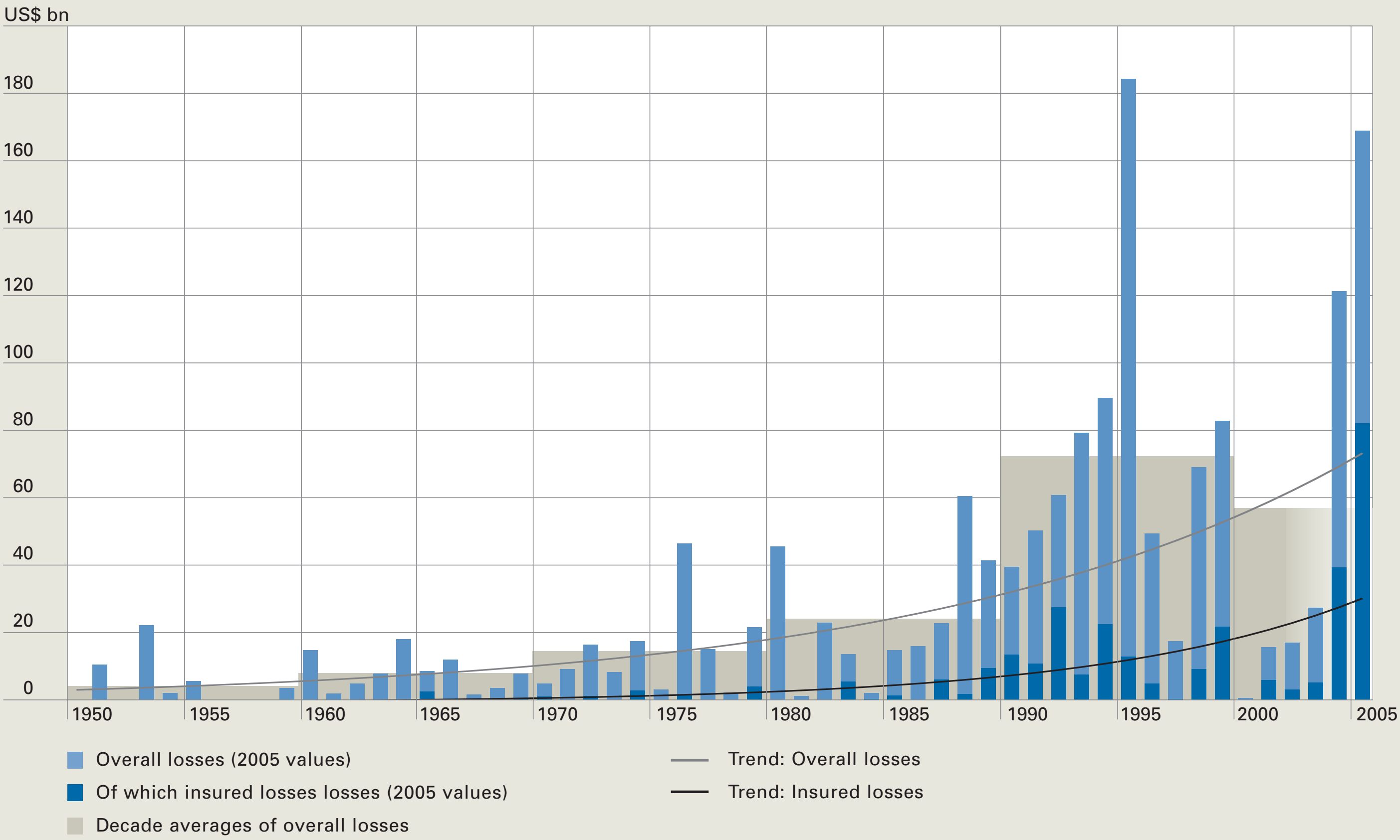
Number of events

The chart shows for each year the number of great natural catastrophes, divided up by type of event.



Overall losses and insured losses – Absolute values and long-term trends

The chart presents the overall losses and insured losses – adjusted to present values. The trend curves verify the increase in catastrophe losses since 1950.



NatCat*SERVICE* information

Increasing intensity and costs of natural catastrophes – Is this a long-term trend?

2005 broke all negative records. Natural catastrophes have never been so expensive, either for the world's economies or for the insurance industry. It was also one of the deadliest years of recent decades.

Over the past year we have continued our research into the possibility of identifying natural hazard trends with even greater accuracy and certainty. To this end, the data stored in Munich Re's natural catastrophe database, NatCat*SERVICE*®, was prepared to make it more amenable to systematic analysis. We are pleased to publish the results of our work for the first time in this edition of Topics Geo. This NatCat*SERVICE*® information examines whether there is a discernible trend towards larger natural catastrophes, where in the world such a trend may be evident and how it may manifest itself.

Data sources, data preparation, classification

The whole process of evaluating macroeconomic losses is subject to significant uncertainty and fluctuation, as we discussed in detail in topics – Annual Review: Natural Catastrophes 2000.

We used the Munich Re natural catastrophe categories as a basis for our investigation of possible trends (Fig. 1). This seven-level scale – from 0, natural event, to 6, great catastrophe – makes it possible to assign each loss event to a particular category, even if the exact extent of the overall losses are not known or cannot be determined.

Our analysis examined 16,000 natural catastrophes in the period between 1980 and 2005. Only about a quarter of all events were backed up by reliable official figures concerning the economic losses involved. Since the mid-1990s, however, there has been a distinct improvement in the reporting of overall losses (Fig. 3).

Munich Re's experts estimated the losses from the remaining 12,000 events on the basis of claims notifications and global comparisons with similar events, considering in each case the affected national economy.

Two examples of this procedure

Example 1

- Estimate of the overall losses on the basis of known insured losses using the factor of insurance penetration, a value that is known for all markets and for all the various types of event. This method factors in the type of natural hazard, the region of a country affected (urban, rural, population density, quality of buildings), and the classes of insurance business that were affected by losses. This information is the basis for a realistic loss estimate (Fig. 2).

Example 2

- If insured losses are not known, as is frequently the case in developing countries, Munich Re's loss estimate is based on the following parameters: type and duration of the natural catastrophe, region affected (urban, rural, population density,

Fig. 1 Natural catastrophes – Breakdown into seven catastrophe categories

					2000–2005	1990s	1980s
0	Natural event	No property damage (e.g. forest fire with no damage to buildings)					
1	Small-scale loss event	1–9 fatalities and/or hardly any damage					
2	Moderate loss event	10–19 deaths and/or damage to buildings and other property					
3	Severe catastrophe	20+ fatalities	Overall losses	US$	> 50m	> 40m	> 25m
4	Major catastrophe	100+ fatalities	Overall losses	US$	> 200m	> 160m	> 85m
5	Devastating catastrophe	500+ fatalities	Overall losses	US$	> 500m	> 400m	> 275m
6	Great natural catastrophe	Thousands of fatalities, economy severely affected, extreme insured losses (UN definition)					

Munich Re's natural catastrophe database NatCat*SERVICE*® records between 600 and 900 events every year. Depending on their financial and human impact, events are assigned to one of seven categories – from a simple natural event with very little economic impact to a great natural catastrophe. Our evaluations and statistics do not consider pure natural events (catastrophe category 0).

wealth structure), damage to property, infrastructure, and public utilities, the number of people involved, and the death toll. On the basis of this data, an approximation technique then searches for all comparative catastrophes in the affected region for which there is detailed and reliable information on overall losses. The events are clustered and realistic values derived for individual units (e.g. average value of a residential building in a rural area). In this way, the event can be assigned to a certain category of loss.

In order to determine the extent of the loss, all events were assigned to one of seven categories of natural catastrophe. Catastrophe category 0 was disregarded for the purposes of our analysis, as it is used for natural events which have little or no economic impact. The remaining events were divided into three main categories:

– Small-scale and moderate loss events (categories 1 and 2)
– Severe and major catastrophes (categories 3 and 4)
– Devastating and great natural catastrophes (categories 5 and 6)

The analysis

– There were hardly any noticeable differences in the percentage breakdown of the types of event across the three main categories. The exceptions to this are earthquakes and volcanic eruptions. The proportion of windstorms in the three main groups is in fact absolutely identical. Overall, weather-related natural catastrophes dominated with a share of over 85% in all catastrophe categories (Fig. 4).

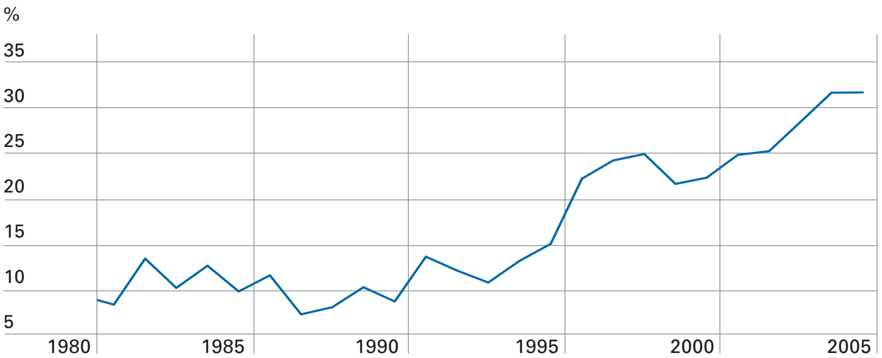
Fig. 2 Example of a loss estimate: Hurricane Ivan, USA, 2004

	Insured losses (US$ m)	Estimated direct overall losses (US$ m)
Insured property damage		
– USA (average loss US$ 11,500, especially Florida and Alabama, approx. 500 000 claims notifications)	7,110	10,000 *
– offshore facilities	3,000	3,000 **
– under the National Flood Insurance Program	1,000	2,000 ***
Damage to infrastructure and supply facilities		3,000
	approx. 12,000	**approx. 18,000**

* approx. 70% insurance penetration.
** 100% insured, no further effect on the overall losses.
*** 50–60% insurance penetration.

As a rule, the figures for direct economic losses are stored in the NatCat*SERVICE* database. These are immediately visible and countable losses, e.g. damage to homes and vehicles. The replacement costs including the costs of removing the damage are estimated.

Fig. 3 Percentages of natural catastrophes with very good reporting of economic losses from 1980 to 2005



Precise loss analyses and reports are compiled by governments and other official offices only after significant natural catastrophes. Since the mid-1990s, the quality of reporting has risen perceptibly.

– If one considers the number of events from 1980 up to the present day in their respective categories, it can be seen that the proportion of catastrophes in category 1 has diminished while there has been a significant increase in categories 2 and 3 (Fig. 5).

– A similar breakdown by continent shows that Asia – the continent with the most towns and conurbations – clearly dominates in terms of the number of events. Asia experienced 4,500 events, 70% of which were so-called “small loss events“. At the same time, however, Asia also experienced the greatest number of devastating and great natural catastrophes (225 events).

– Asia was also hardest hit in terms of the number of fatalities (800,000). Almost 90% of these fatalities were caused by events in catastrophe categories 5 and 6 (devastating and great catastrophes).

A comparison of Europe and North America (USA and Canada) shows that the two continents were affected by about the same number of natural catastrophes (Fig. 6). However, while Europe was hit primarily by small events, North America had to contend with a greater number of severe and great natural catastrophes (categories 3–6). This trend is also reflected in the loss figures: overall losses in North America were almost three times as high as those in Europe and insured losses about four times as high. In absolute terms, more people died in Europe, but this can be largely attributed to a single event: the 2003 heatwave, which affected the whole continent. The final death toll was more than 35,000.

Fig. 4 Percentage distribution of events (1980–2005) by catastrophe category and type of natural event

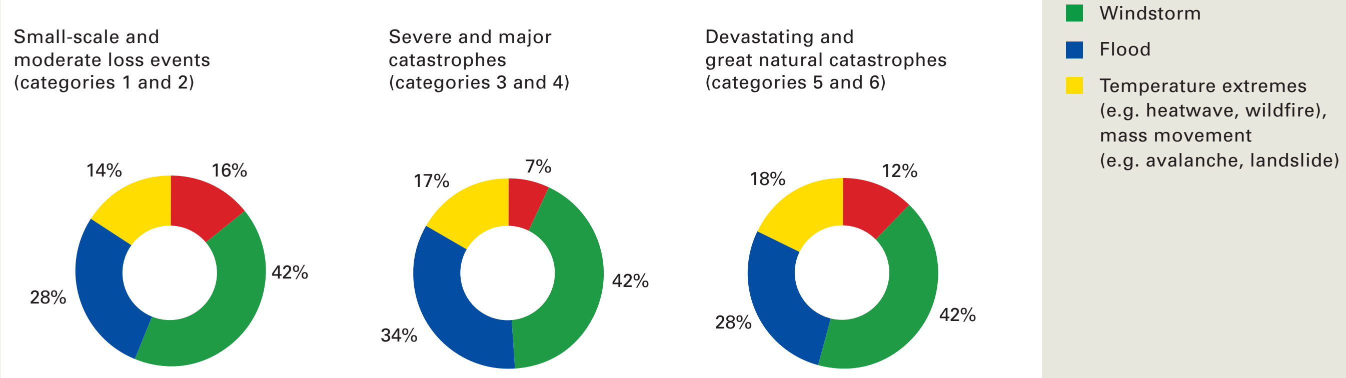
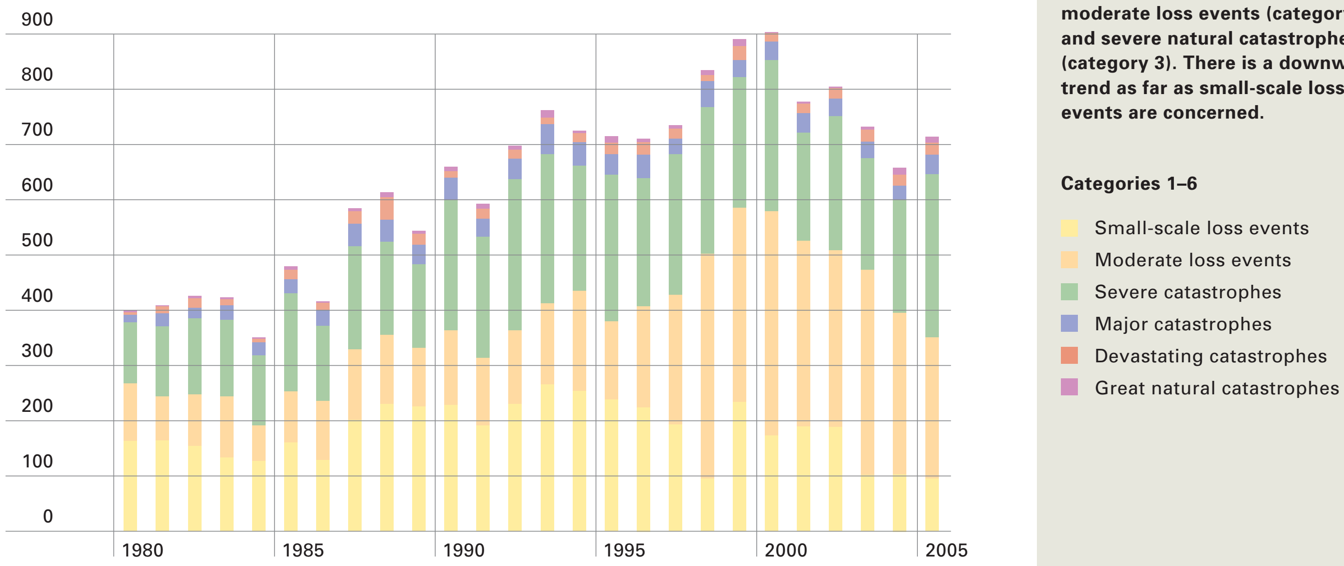


Fig. 5 Number of events per year (1980–2005) broken down into catastrophe categories



The breakdown of natural hazard losses into natural catastrophe categories reveals an increase in the moderate loss events (category 2) and severe natural catastrophes (category 3). There is a downward trend as far as small-scale loss events are concerned.

Results

The categorisation of natural hazard events into a seven-stage catastrophe scale marked an important step forward in this trend analysis. Assigning events to size categories makes it possible to analyse trends more accurately and reliably.

This reveals that the devastating and great catastrophes in categories 5 and 6 are responsible for most of the losses and deaths, causing 86% of all fatalities, 86% of overall losses, and 80% of insured losses. However, these categories account for only 3% of all events. The small loss events still predominate, but there is a distinct trend towards more intensive and costlier natural catastrophes. The quality of reporting by official institutions on the economic impact of natural hazard events has improved considerably in recent years. This is very good news, as the powers-that-be can only implement appropriate and effective measures to tackle, mitigate, or prevent losses if they have reliable information on the true extent of natural catastrophes.

Summary

Countless measures will have to be taken around the world in order to soften the effects of a persistent trend towards ever-larger and more catastrophic natural events. Knowledge must be imparted and awareness sharpened. For the people at risk it is quite literally vital to know what to do before an imminent catastrophe arrives and how to react when it strikes. Insurance cover remains the most effective way of protecting property and belongings. People in the poorer regions of the world could acquire such protection through so-called microinsurance programmes. Munich Re, the World Bank and local insurers already offer this option of affordable basic cover in some countries of the world – to the great benefit of the people concerned.

Angelika Wirtz

Fig. 6 Natural catastrophes 1980–2005 broken down into catastrophe categories – A comparison between Europe and North America

The 2005 hurricane season broke all records – with 27 tropical cyclones in the Atlantic. Hurricane Wilma was the strongest hurricane ever recorded, Katrina the most expensive. This photo shows the remains of a souvenir centre in Biloxi. Katrina almost completely destroyed this tourist attraction with its sculptures on the façade.

Hurricane season 2005: Time to rethink

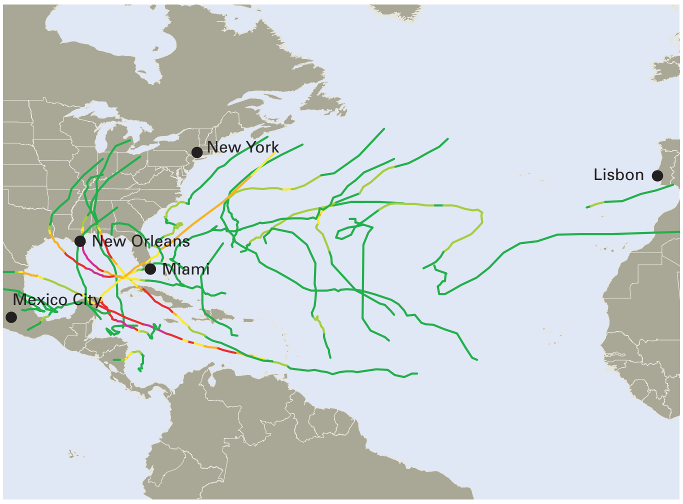
With insured losses of US$ 30bn from tropical cyclones, 2004 was considered an exceptional year. However, this new record did not last long and was already broken in 2005. The most active tropical cyclone season since recordings began in 1851 is costing the private insurance industry more than US$ 80bn.

New meteorological records and unusual tracks

An account of the 2005 hurricane season is virtually a list of unusual events, many of which have never been observed before – at least, not since recordings of the weather in the Atlantic have been made on a systematic basis.

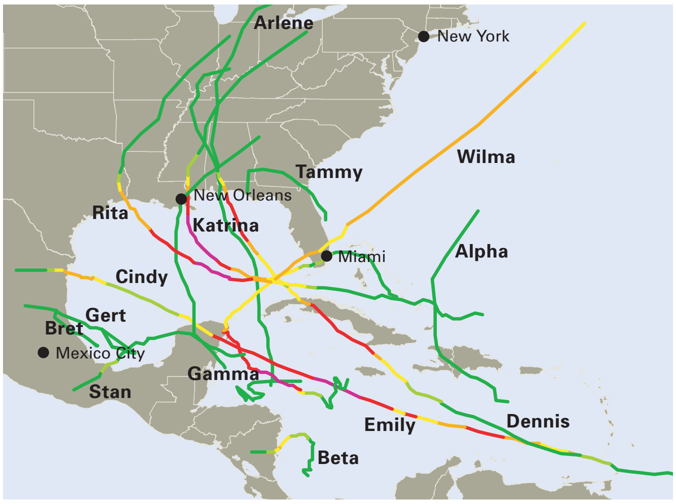
- Highly active start to the season
  - Seven tropical cyclones occur in June and July.
  - Previous to that, a maximum of five such storms had been observed before the end of July (1887, 1933, 1936, 1959, 1966, 1995, 1997).
- Peak intensity values
  - Three of the ten strongest hurricanes ever recorded occurred in 2005.
  - Hurricane Wilma had the lowest central pressure ever recorded in the Atlantic (882 hPa) and hence, in all probability, the highest wind speeds (Fig. 1).
- Record number of tropical cyclones
  - The 27 named tropical cyclones in 2005 (15 of which reached hurricane force) broke all past records: 21 tropical storms in 1933 and 12 hurricanes in 1969.
  - For the first time ever, the list of 21 names chosen by the World Meteorological Organisation (WMO) was not long enough. The last six cyclones were therefore named after the first six letters in the Greek alphabet: Alpha, Beta, Gamma, Delta, Epsilon, and Zeta.
- New areas affected: Europe and Africa
  - At the beginning of October, Hurricane Vince formed near the island of Madeira, the most easterly and northerly tropical cyclone ever to occur in the Atlantic. Its track ran northeast towards the European mainland. Vince weakened and reached the Spanish coast near Huelva as a tropical depression on 11 October.

Fig. 1 Tracks of all tropical cyclones in the North Atlantic in 2005



Source: NOAA, NHC, Miami

Fig. 2 Tropical cyclones in the Gulf of Mexico and the Caribbean



Wind speeds in km/h (categories on the Saffir-Simpson Hurricane Scale)

- Tropical storm (< 118 km/h)
- Cat. 1 hurricane (118–153 km/h)
- Cat. 2 hurricane (154–177 km/h)
- Cat. 3 hurricane (178–209 km/h)
- Cat. 4 hurricane (210–249 km/h)
- Cat. 5 hurricane (≥ 250 km/h)

Source: NOAA, NHC, Miami

- At te end of November, Tropical Storm Delta passed over the Canaries and continued towards the Moroccan coast. It was the first tropical cyclone ever in this region.

– Last hurricane of the season in December
- According to the US National Hurricane Center, the Atlantic hurricane season lasts from the beginning of June to the end of November; but when Epsilon developed into a Category 1 hurricane, it was already December. The 2005 season finally came to an end with Tropical Cyclone Zeta at the end of December.
- There have only been four other years since 1851 in which a tropical cyclone strengthened to a hurricane in December: 1887, 1925, 1954, 1984.

The most significant events of the 2005 hurricane season

Katrina – The costliest windstorm of all time

Hurricane Katrina, which developed out of a low-pressure vortex over the Bahamas on 23 August and made landfall on the evening of 25 August as a Category 1 hurricane near Miami, was the 11th tropical cyclone of the season. It generated insured losses in southern Florida amounting to roughly US$ 1bn.

In the days that followed, Katrina moved over the eastern part of the Gulf of Mexico with a rapid increase in intensity. On 28 August, it was already a Category 5 hurricane over those areas where the water temperature was currently 1–3°C above the long-term average, with peak gusts of around 340 km/h. Katrina maintained this strength as it crossed the oilfields off the coast of Louisiana and Mississippi. On 29 August, shortly before hitting the mainland some 50 km east of New Orleans, it weakened to a Category 3 windstorm.

The wind and storm surge damage was horrendous: parts of New Orleans were flooded when levees along Lake Pontchartrain and artificial drainage canals failed; many offshore plants in the Gulf of Mexico were destroyed; more than 1,300 people were killed. The direct overall losses are at least US$ 125bn. It will probably cost the private insurance industry some US$ 45bn (as at February 2006), making it the most expensive loss ever from one single event. In addition, there are also insured flood claims from the National Flood Insurance Program (NFIP), currently estimated to be approaching the two-digit billion dollar range.

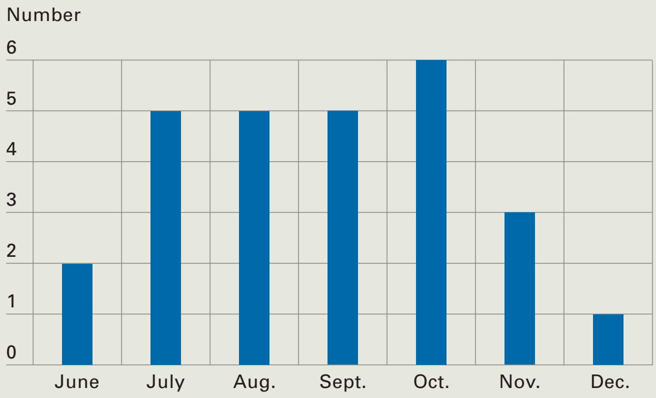
The full extent of the loss was still not clear even at the beginning of 2006. The scale of the insured losses and the experience from the years 2004 and 2005 suggest that this kind of event is no longer a meteorological anomaly. The insurance industry is therefore giving intense thought to the question of how the hurricane hazard must be evaluated in the future. The focus of the current scientific debate is on the effects of the natural climate oscillation in the North Atlantic and the impact of global warming on the frequency and intensity of tropical cyclones.

A further question is whether the knowledge gained from Katrina makes it necessary to re-analyse the loss accumulation levels of other perils (e.g. earthquakes) and other regions and countries.

Fig. 3 The ten hurricanes with the lowest central pressures

Year	Name	Lowest pressure (HPa)	Sea area
2005	Wilma	882	Caribbean
1988	Gilbert	888	Caribbean
1935	Labor Day Hurricane	892	Florida Keys
2005	Rita	897	Gulf of Mexico
1980	Allen	899	Caribbean
2005	Katrina	902	Gulf of Mexico
1998	Mitch	905	Offshore Honduras
1969	Camille	905	Gulf of Mexico
2004	Ivan	910	Caribbean
1955	Janet	914	Caribbean

Fig. 4 Tropical cyclones and hurricanes in the Atlantic in 2005



This relates to the following aspects:

– Dimensions of the storm surge
The storm surge triggered by Katrina hit the states of Louisiana, Mississippi, and Alabama along a 150-km stretch of coast. The flood wave, which was 10 m high in parts, was able to penetrate several hundred metres inland and in some cases, where the topography allowed, as much as a kilometre. In those areas where the hinterland is traversed by a network of natural water courses (bayous), wind set-up drove the storm surge distances of several kilometres.

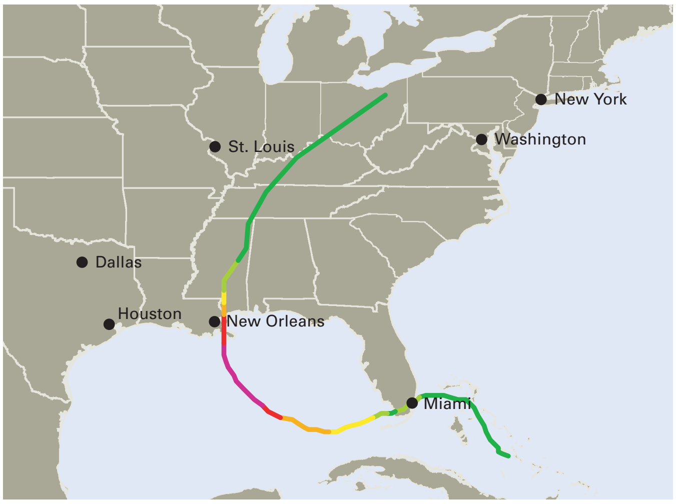
This resulted in areas being flooded that were outside the 500-year zone (areas which, on a long-term average, are flooded less than once in 500 years) on the flood hazard map used by the Federal Emergency Management Agency (FEMA). The majority of buildings in this region were total losses. The restoration of risks with business interruption cover is likely to take time as the infrastructure (roads, bridges, utility lines) was also damaged or destroyed.

– Partial flooding of New Orleans following levee failures
The insurance industry must not only reconsider the structural engineering methods and design criteria for the levee protection around Lake Pontchartrain but also the accumulation assessment of other well-known loss scenarios. In spite of the warnings from scientists and disaster management organisations, the insurance industry underestimated New Orleans' exposure to storm surges and floods.

– Inordinate increase in insured losses as a result of macroeconomic influences
After the 2004 hurricanes in Florida, an attempt was made to explain the often underestimated losses by citing such effects as demand surge and major catastrophe surcharges. Following Katrina, many insurers found that the losses they finally had to pay were often far higher than their initial forecast. This was due to the fact that the scale of a major catastrophe is enhanced by the shortage of resources (construction materials and workers needed for reconstruction work) and the limited availability of infrastructure installations. A number of fundamental questions emerge: Do the methods used hitherto in the analysis of accumulation loss potentials need to be supplemented by appropriate components? Can past experience be applied to future megacatastrophes in the form of a quasilinear approximation or are new approaches needed here too?

– Differentiation between wind and water losses in windstorm policies
The standard US policies for the windstorm hazard basically exclude flood damage to residential buildings and contents. The same applies to small commercial risks as well. Owners of residential and small commercial buildings in the USA can insure their property against floods and other water-related causes of loss that are not covered by private insurance through the National Flood Insurance Program (NFIP). Accordingly, flood damage is explicitly included in the scope of cover provided by the NFIP, and this has always been acknowledged in the loss adjustment process up to now. Building owners

Abb. 5 Track of Hurricane Katrina

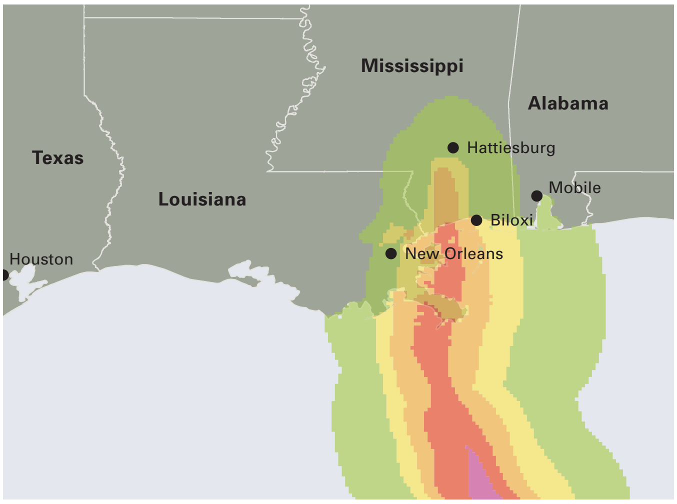


Wind speeds in km/h (categories on the Saffir-Simpson Hurricane Scale)

Tropical storm (<118 km/h)
Cat. 1 hurricane (118–153 km/h)
Cat. 2 hurricane (154–177 km/h)
Cat. 3 hurricane (178–209 km/h)
Cat. 4 hurricane (210–249 km/h)
Cat. 5 hurricane (≥ 250 km/h)

Source: NOAA, NHC, Miami

Abb. 6 Wind field of Hurricane Katrina



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Cat. 5 hurricane (≥ 250 km/h)

Source: NOAA, HRD, Miami

without an additional NFIP policy carried the flood risk themselves. Katrina has triggered an intense discussion on this approach in both legal and political circles. The outcome of this debate will show whether insurers, which had not included a premium for flood damage in their policies, can count on the distinction between wind and water covers being maintained or whether, and if so how, the legal situation will change.

– High death toll from weather-related natural catastrophes in industrial countries too
The death toll from windstorm and flood events in industrial countries has been falling continuously in recent decades. This is due to the success of improved early-warning systems and resolute evacuation measures, particularly in the United States. Since the worst natural catastrophe in US history – the Galveston hurricane in 1,900 with a death toll exceeding 8,000 – the number of people killed in hurricanes has been steadily decreasing. It was not until Hurricane Katrina that the threshold of 1,000 deaths was surpassed for the first time since 1928 (Fig 7).

Although the large number of Katrina victims cannot be taken as an indication of what will happen in future events, it does show that weather-related events can have serious human repercussions even in industrial countries if there is a coincidence of unfavourable factors. For the insurance industry this means additional claims costs above all in life, personal accident, and workers' compensation and an increase in the overall accumulation from life and non-life policies.

Hurricane Rita – A close call for Houston, Texas

Hardly a month had passed after Katrina when Rita formed in the southern part of the Bahamas as the second Category 5 hurricane of the season. It had a central pressure of 897 hPa, one of the lowest readings ever for a North Atlantic hurricane (Fig. 3). Some of the prediction models used by the National Hurricane Center in Miami (Florida) indicated temporarily that Rita would make landfall near Galveston/Houston (Texas) with a force of 4 to 5. This scenario would have meant an even more serious case of accumulation for the insurance industry, with insured losses that would have far surpassed those caused by Katrina because the insured values in Galveston/Houston (residential buildings, contents, and commercial and industrial risks) were about twice as high as in the areas affected by Katrina (even including New Orleans). Also, given a Category 5 landfall, the vulnerability of buildings and contents would have been much higher again, as it increases exponentially with wind speed.

Fig. 7 Tropical cyclones in the United States with more than 100 fatalities

Year	Region	Number of fatalities
1856	LA, Last Island	400
1875	TX	176
1881	GA, SC	700
1886	TX, Indianola	150
1893	LA, Cheniere Caminada	1,250
1893	GA, SC	1,500
1896	FL, GA, SC	130
1898	GA, SC, NC	179
1900	TX, Galveston	8,000
1906	FL (southeast)	164
1906		134
1909	LA, Grand Isle	350
1915	LA, New Orleans	275
1915	TX, Galveston	275
1919	FL, Keys, TX (south)	287
1926	FL, Miami, MS, AL, Pensacola	372
1928	FL, Lake Okeechobee	2,500
1935	FL, Keys	408
1938	Northeast coast	600
1955	Hurricane Diane, east coast	184
1957	Hurricane Audrey, LA (southwest), TX (north)	400
1969	Hurricane Camille, MS, FL, TN, LA, VA	256
1972	Hurricane Agnes, FL, northeast coast	122
2005	Hurricane Katrina, AL, FL, LA, MS	1,322

However, when Rita made landfall on 24 September near Sabine Pass in the border area between Texas and Louisiana, it was a Category 3 hurricane with peak gusts of 250 km/h. This near miss made many insurers suddenly aware that they had seriously underestimated the loss potential in the Gulf of Mexico, both in terms of the losses from one single event and in terms of the accumulation from several moderate to major hurricanes hitting coastal areas with high concentrations of values within a single year.

The insured loss from Rita is estimated to be around US$ 5bn from residential, commercial, and industrial risks in the United States and a further sum of up to US$ 6bn from offshore energy plants in the Gulf of Mexico (as at February 2006). In the case of Rita too, the overall loss amount was increased by a storm surge in the border area between Texas and Louisiana.

Hurricane Stan – A death toll exceeding 1,500 likely in Middle America

One of the worst human catastrophes in the history of Middle America was triggered in 2005 by Hurricane Stan. The storm developed on 1 October some 200 km east of the Mexican peninsula of Yucatan, crossing it the day after as a tropical storm and intensifying to a Category 1 hurricane over the Bay of Campeche. Stan reached the Mexican mainland for the second time at Veracruz and gradually weakened as it moved southwest over large parts of the country. Although its track was restricted to Mexico, the resulting torrential rain had a much greater impact in other Middle American countries. More than 840 people were killed by floods and landslides in El Salvador, Guatemala, Nicaragua, and Mexico, whilst 800 are still listed as missing in Guatemala following a landslide.

Hurricane Wilma – Lowest central pressure measured since 1851

The season's 21st tropical cyclone and 13th hurricane in the North Atlantic was an event of meteorological superlatives, causing record losses in Mexico and high insured losses in Florida. On 19 October, over the warm Caribbean water, Wilma had a central pressure of 882 hPa, lower than any other recorded in a hurricane. With a drop in pressure of 88 hPa in 15 hours (including 53 hPa in just 4 hours) this storm counts as a "meteorological bomb" on account of its explosive intensification.

For the first time since Hurricane Gilbert in 1988, the tourist centres on the Mexican peninsula of Yucatan and the offshore island of Cozumel were hit by a major hurricane. When it made landfall in Mexico on 21 October, Wilma was a Category 4 hurricane, with average wind speeds of 225 km/h. As the region's infrastructure had been undergoing massive development in recent years, the property values were concentrated in the immediate vicinity of the coast (many of them with business interruption covers). The resulting insured loss will come to some US$ 2bn (as at February 2006), making it the most expensive loss ever for the insurance industry from one single event in Mexico.

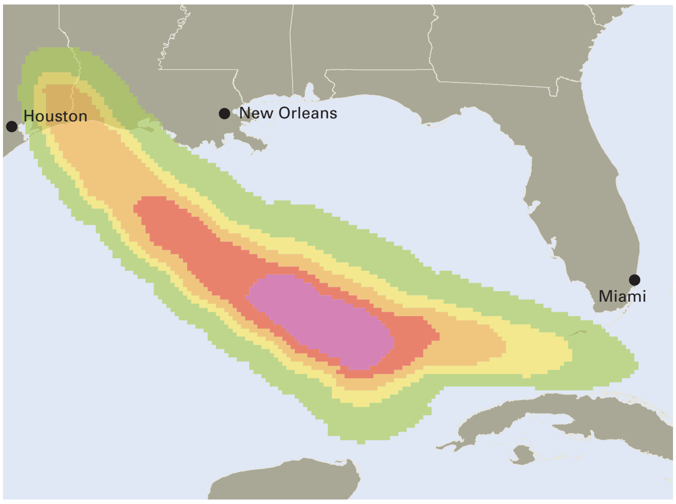
Fig. 8 Track of Hurricane Rita

Wind speeds in km/h (categories on the Saffir-Simpson Hurricane Scale)

Tropical storm (<118 km/h)
Cat. 1 hurricane (118–153 km/h)
Cat. 2 hurricane (154–177 km/h)
Cat. 3 hurricane (178–209 km/h)
Cat. 4 hurricane (210–249 km/h)
Cat. 5 hurricane (≥250 km/h)

Source: NOAA, NHC, Miami

Fig. 9 Wind field of Hurricane Rita



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Cat. 4 hurricane (210–249 km/h)
Cat. 5 hurricane (≥ 250 km/h)

Source: NOAA, HRD, Miami

After remaining more or less stationary over Yucatan for several hours, the low-pressure vortex weakened and, on 23 October, slowly shifted northeast towards Florida. The next day, Wilma crossed over the west coast of Florida as a Category 3 hurricane near Cape Romano. It moved forwards at high speed and after less than five hours swept out into the open Atlantic again, north of Palm Beach, as a Category 2 hurricane.

The insured market loss in Florida is currently estimated to be US$ 8.5bn, an amount similar to that generated by both Charley and Ivan in 2004.

Hurricane activity – Climatic setting

Recent findings of climate research confirm that the cyclone hazard in the North Atlantic has increased markedly since the mid-1990s. Cyclones there have become more intense, reaching very high wind speeds for longer and longer periods.

The increase in intensity is associated with a global increase in sea surface temperatures, averaging approx. 0.5°C during the summer season in all tropical ocean regions since 1970. A comparison of the recorded trend and computer simulations reveals that this warming can only be the result of anthropogenic climate change. Globally, the annual number of strong storms (categories 4 and 5 on the Saffir-Simpson Scale) has more than doubled from around 8 at the beginning of the 1970s to 18 in the period 2000–2004. An average of about 80 cyclones form every year.

In the North Atlantic, it is not only the intensity that is increasing but also the frequency. The prime factor for this is the natural cycle of sea surface temperatures. The record number of cyclones in the 2005 season coincides with what current data indicates to be the highest mean annual temperature measured in the North Atlantic since recordings began in 1880.

This is due to the simultaneous influence of two processes which determine sea temperatures and hurricane activity: the natural climate oscillation and the linear warming process caused by anthropogenic climate change.

The natural climate oscillation involves phases of exceptionally warm and exceptionally cool sea surface temperatures, each lasting several decades. The margin of deviation is roughly 0.5°C, with an oscillation period in the 20th century of about 65 years. This oscillation is driven by large-scale ocean currents. Warm phases generate distinctly more hurricanes and a higher intensity, whereas cold phases have the opposite effect. Since the mid-1990s, we have been in a warm phase which will continue for a number of years, if not decades. In this phase, there have been 4.1 major (Category 3–5) hurricanes on a yearly average, compared with only 1.5 in the last cold phase – an increase of about 170%. Needless to say, the definitive average level of activity can only be calculated when the current warm phase has ended.

At the same time, the natural oscillation between these phases is being intensified by a long-term warming process so that sea surface temperature and hurricane

Fig. 10 Tracks of Hurricanes Stan and Wilma

Wind speeds in km/h (categories on the Saffir-Simpson Hurricane Scale)

Tropical storm (<118 km/h)
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Cat. 4 hurricane (210–249 km/h)
Cat. 5 hurricane (≥250 km/h)

Source: NOAA, NHC, Miami

The tourist centres on the Mexican peninsula of Yucatan and the offshore island of Cozumel were badly hit by Hurricane Wilma. The hard gypsum panels mounted on the steel-frame structure of this apartment block in Cozumel were not sturdy enough to withstand the persistent high wind speeds.

The storm surge wave and high wind speeds of Hurricane Katrina wrenched the floating casinos from their moorings on the Gulf Coast of Mississippi and carried them several hundred metres inland.

activity are increasing from warm phase to warm phase. The rise in the number of strong hurricanes per year from 2.6 to 4.1 from the previous warm phase to the current warm phase corresponds to an increase of around 60%. There are strong indications that climate change is responsible for this long-term warming.

The change in the level of activity also influences the number of landfalls and hence the losses incurred. In the case of major hurricanes, the annual average number of landfalls in the United States has increased by about 230% from 0.3 to 1.0 compared with the last cold phase (approx. 1971–1994) and by about 70% from 0.6 to 1.0 compared with the last warm phase (approx. 1926–1970).

What conclusions can the insurance industry draw from these observations? We must expect a different loss distribution in the current warm phase than in the years before. As the models have a loss distribution based usually on all loss events since 1900 and make no differentiation between the various phases, it is inevitable that the current loss level is underestimated, because the loss distribution of the current warm phase is likely to deviate significantly from that of the entire period since 1900. This is borne out by a comparison of hurricane intensity distributions for the whole period 1900–2005 and the current warm phase (1995–2005). Category 4 hurricanes account for 14% of all hurricanes since 1900 and Category 5 hurricanes 6%, compared with 21% and 10% respectively in the current warm phase distribution. Weaker hurricanes (categories 1 and 2) have been less frequent in the current phase. In Munich Re's analyses, the annual loss expectancy increases distinctly if the loss distribution of the current warm phase is taken as a basis rather than one that does not consider the different phases.

To sum up, the higher frequencies and intensities of hurricanes in the North Atlantic are almost certainly due to the combined impact of an unfavourable natural climate phase and anthropogenic climate change. Our analyses suggest that the natural climate oscillation is responsible for about two-thirds of the overall effect and global warming about one-third. The effect of the natural climate oscillation will weaken in a few years or decades and then go into reverse, whilst global warming must be expected to accelerate.

Hurricane season 2005

Name	Date	Maximum category on Saffir-Simpson Scale	Maximum wind speeds	Affected areas	Fatalities	Estimated overall losses (US$ m)	Estimated insured losses (US$ m)
Tropical Storm Arlene	8–13 June		110 km/h	USA: FL	1		
Tropical Storm Bret	28–29 June		65 km/h	Mexico	2	10	
Hurricane Cindy	3–7 July	1	120 km/h	Mexico. USA: AL, LA, MS, GA	3	250	160
Hurricane Dennis	5–13 July	4	240 km/h	Jamaica. Haiti. Cuba. USA: FL, AL, MS, GA	76	3,100	1,200
Hurricane Emily	11–21 July	4	245 km/h	Caribbean. Mexico	13	400	250
Tropical Storm Franklin	21–29 July		110 km/h	Bahamas			
Tropical Storm Gert	23–25 July		75 km/h	Mexico			
Tropical Storm Harvey	2–8 Aug		105 km/h	Bermuda			
Hurricane Irene	4–18 Aug	2	175 km/h				
Tropical Storm Jose	22–23 Aug		80 km/h	Mexico	6		
Hurricane Katrina	23–31 Aug	5	280 km/h	USA: AL, FL, LA, MS	1,322	125,000	60,000
Tropical Storm Lee	28 Aug–2 Sept		65 km/h				
Hurricane Maria	1–10 Sept	3	185 km/h				
Hurricane Nate	5–10 Sept	1	145 km/h	Bermuda			
Hurricane Ophelia	6–18 Sept	1	140 km/h	USA: NC, SC	1	50	35
Hurricane Philippe	17–24 Sept	1	130 km/h				
Hurricane Rita	18–26 Sept	5	280 km/h	USA: FL, LA, TX, MS	10	16,000	11,000
Hurricane Stan	1–5 Oct	1	130 km/h	Mexico. Guatemala	> 840	3,000	100
Tropical Storm Tammy	5–6 Oct		80 km/h	USA: FL, GA			
Hurricane Vince	9–11 Oct	1	120 km/h	Portugal. Spain			
Hurricane Wilma	15–25 Oct	5	280 km/h	Mexico. USA: FL	38	18,000	10,500
Tropical Storm Alpha	22–24 Oct		80 km/h	Dominican Republic. Haiti	28		
Hurricane Beta	27–31 Oct	3	185 km/h	Nicaragua. Colombia. Honduras		10	
Tropical Storm Gamma	18–21 Nov		80 km/h	Honduras. Belize	37		
Tropical Storm Delta	23–28 Nov		110 km/h	Spain: Canary Islands. Morocco	20	375	
Hurricane Epsilon	29 Nov–8 Dec	1	140 km/h				
Tropical Storm Zeta	30 Dec 2005 –6 Jan 2006		100 km/h				

Source: NHC and MRNatCat*SERVICE*®.

Models require adjusting

The extremely active windstorm years of 2004 and 2005, tropical cyclones in regions where such events were not previously expected, and new scientific findings on natural climate oscillations and the effect of climate change on the hurricane hazard make it absolutely essential to revise the hurricane simulation models.

The central issue is the risk of change and its repercussions with regard to risk measurement (e.g. accumulation exposure and pricing). Because one thing is clear: short-term measures will probably be able to contend with the new hazard situation for no more than a few years. The more realistic approach would be for science and the insurance industry to join forces in a longer-term process in order to analyse the new conditions and find adequate solutions.

Munich Re had already adjusted its methods and models in the past with a view to keeping them in line with current scientific knowledge. However, it has made further adjustments in its frequency and intensity assumptions in the wake of Katrina and other major hurricane events. Loss-aggravating effects in complex large and extremely large losses have also been accounted for in the risk analysis. The loss distributions with which the hurricane risk is evaluated have therefore changed radically.

These new distributions have an impact on many processes – pricing, the calculation of the required risk capital, and profit-oriented portfolio management. The adjustments that need to be made will vary from insurer to insurer, but they will be substantial in every case.

Dr. Eberhard Faust, Ernst Rauch

The windward façade of this high-rise in Fort Lauderdale, Florida was damaged by wind-blown objects and building debris during Hurricane Wilma.

Earthquake report

Kashmir quake claims 88,000 lives

The earth only shook for 50 seconds on the morning of 8 October 2005. But that was enough to make hundreds of schools in Kashmir collapse, obliterating a whole generation in many places.

Kashmir and parts of North Pakistan were devastated when the magnitude 7.6 earthquake struck at 8.52 local time on 8 October 2005. The tremors lasted for 50 seconds, causing the collapse of some 200,000 houses and razing entire towns and villages to the ground. With 88,000 fatalities, approx. 200,000 injured, and more than three million homeless, the Kashmir quake ranks second only to the December 2004 tsunami as the worst natural catastrophe of the past decade. A generation of young people was almost completely wiped out when hundreds of schools collapsed.

Inadequate construction methods have devastating effects

Several million people live in the regions affected – some in cities like Muzaffarabad and Balakot, but many more in the innumerable small mountain villages and houses that cling to the steep flanks of the valleys. The houses of the rural population are simple, made of irregular bricks and poor-quality mortar. The stone walls caved in during the quake, burying the inhabitants under heavy roofs. Large parts of the infrastructure were destroyed by hundreds of landslides. Transport helicopters were needed to carry the heavy clearance and rescue equipment into the destroyed towns and villages. Many areas could not be reached on the ground and had to be supplied from the air.

In spite of enormous efforts on the part of local authorities, the military, and international aid organisations, the work had to concentrate initially on the larger towns. Here too the construction of the buildings was not commensurate with the hazard to which they were exposed. The picture was the same in many districts. The few houses that did not collapse were made uninhabitable, and will remain so for a long time to come. Although the majority of public buildings (schools, hospitals, public offices) were reinforced concrete frame structures, both the material and the construction work were of inadequate quality. Many of the concrete columns buckled, and the heavy concrete ceilings gave way.

At a distance of 25 km from the epicentre, more than 50% of the buildings were badly damaged. In Islamabad, however, there were hardly any notable losses – apart from the collapse of an apartment complex.

Further quakes to be expected in the Himalayas

The epicentre was a little less than 100 km north of Islamabad in the mountainous Kashmir region of Pakistan. The fracture face stretched over a length of 90 km and reached into the Indian part of Kashmir. The whole region had long been classed as highly exposed to earthquake. The hypocentre was at the western end of a fault system running a distance of almost 2,000 km along the Himalayas. This fracture was caused by the Indian subcontinent drifting northwards and colliding with Eurasia and is frequently the location of extreme earthquakes with magnitudes of 8 and above. The last major quake in the northwest of India and the Kashmir region was in 1555. Since then, an enormous amount of seismic energy has built up, of which no more than 10–20% was released in this most recent quake. Seismologists expect even more destructive earthquakes to occur in future along the southern edge of the Himalayas.

Clean-up operations are making slow progress, and, just months after the catastrophe, it is still too early to think of rebuilding. Many years will pass before normal living conditions are restored in the disaster region.

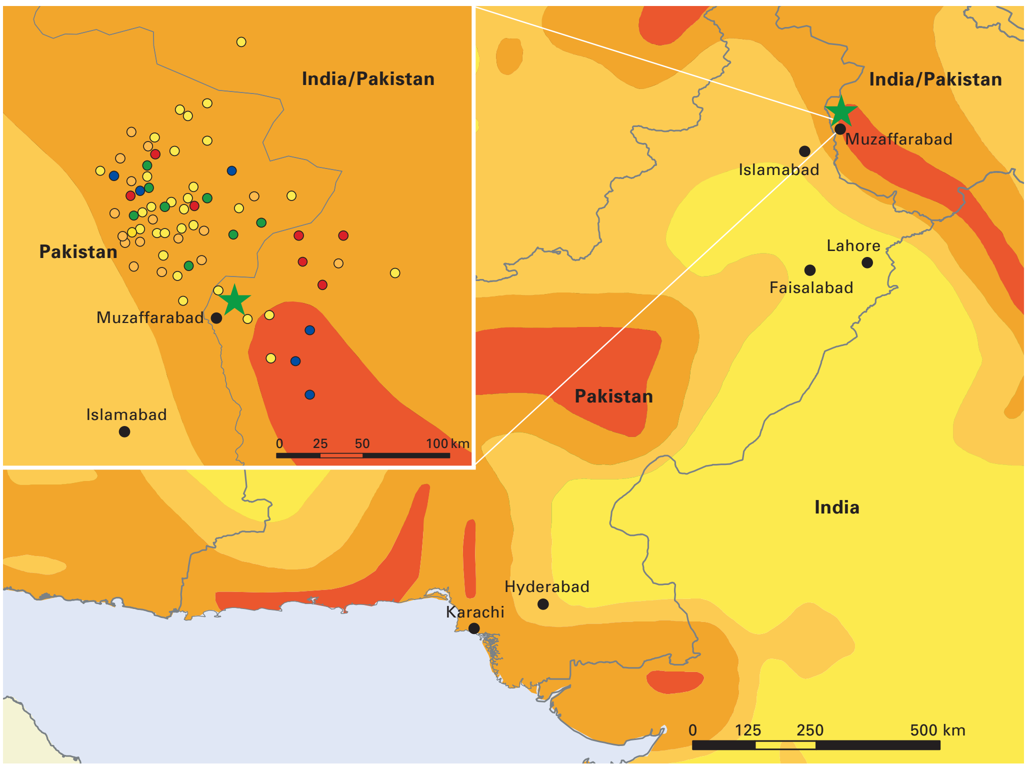
Microinsurances can help

An antagonism only at first sight: one of the biggest natural catastrophes in recent decades was practically a non-event for the insurance industry. In Pakistan, most of the risks covered by earthquake insurance are large industrial plants. Since the region affected is very rural, the insured loss was low. As in the earthquakes that hit India in 2001 (20,000 deaths) and Iran in 2003 (26,000) and the tsunami of 2004 (more than 200,000), it was the poor sections of the population that had the most fatalities to mourn. Those who survived the quake were left with nothing. Hundreds of thousands have to endure the fierce winter in tents that were pitched on or immediately next to the remains of their ruined houses. Although an international aid conference promised funds of roughly €5bn, the question is whether earthquake-resistant rebuilding will be possible given the time constraints and the adverse geographical conditions.

The people in the poorer regions of the world must be given assistance proactively and not only when a catastrophe occurs. The insurance industry can contribute to this process and provide affordable insurance solutions. The microinsurance sector, for example, has an important role to play in the fight against poverty, and a successful start has already been made in the agricultural sector and in life and health insurance. It is possible to extend these concepts to natural hazard covers as well. Better insurance protection can be attained – in cooperation with development banks, for example – by setting up insurance pools for residential buildings, as happened after the 1999 earthquake in Turkey, for instance. Supported by building codes and education measures, this helps bring about the risk minimisation that is so urgently required.

Alexander Allmann

Seismic hazard map of Pakistan and North India and the location of the epicentre



Probable maximum intensity (Modified Mercalli Intensity Scale) with an exceedance probability of 10% in 50 years (corresponding to a return period of 475 years) given average subsoil conditions.

Earthquakes

- MM ≤ V
- MM VI
- MM VII
- MM VIII
- MM ≥ IX

Epicentre

Aftershocks

- 8 October 2005
- 10 October 2005
- 12 October 2005
- 14 October 2005
- 16 October 2005

Source: Munich Re, World Map of Natural Hazards

Hundreds of thousands are homeless and must spend the harsh winter at tent camps in the valleys. Although access to clean water and food is largely assured, diseases are spreading rapidly, and particularly colds. Many of the tents are not winterproof and warm winter clothes are in short supply.

The ruins of collapsed houses pile up wherever one looks. To gather building materials from the piles of debris, people use sledgehammers or even their bare hands. Given the wintry conditions, the clean-up operations are making slow progress, and so far there has been little chance of anything being restored.

Many districts present a picture of total destruction, with every single building having collapsed. Low hills like the one in the background appear to have been hit particularly hard, probably because topographical focusing effects amplified the tremors during the earthquake. In many cases, the buildings slid down the hill as the simple foundations were not able to withstand the ground motion.

2005 was a year of exceptional floods, not only on the US Gulf Coast, but also in Middle America, China, India, Romania, and the northern Alpine region. This is a flooded petrol station in the Swiss capital of Berne during the most expensive natural catastrophe in the country's history.


CITROËN
AVIA

Summer 2005 in central Europe: Many Alpine valleys under water

While southern Europe was labouring under drought-like conditions, people in the Alps had more water than they could cope with, with extreme floods hitting the entire northern Alpine region.

The events as they unfolded

On 20 August, a low-pressure system (Norbert) formed over southern France. It slowly made its way eastwards across the Gulf of Genoa, picking up substantial quantities of moisture on its southern flank along the way. As low-pressure vortices in the northern hemisphere always rotate in an anticlockwise direction, the moist air first impinged on the eastern end of the southern Alps and then, following further rotation, advanced towards the mountains from the north. The air cooled as it was forced upwards and heavy rainfall ensued in the entire region north of the main Alpine ridge – in places there was more than 200 mm rain in 24 hours and over 300 mm in 72 hours, setting new rainfall records at many places in this area.

Perilous slopes

Torrential rain has a much more devastating effect in the mountains than in flat terrain. The water flows down the mountainside at a much faster pace and causes significant erosion of slopes and channels. Infiltrating water can trigger landslides, which then deposit easily erodable material in the river valleys. This may lead to dangerous and destructive debris flows – a mixture of water and solid materials. In such circumstances, a mountain stream can be transformed from a babbling brook into a raging torrent in the space of just a few minutes, leaving little or no time for effective protection measures. It is therefore vitally important to have accurate forecasts of the expected rainfall. However, this is particularly difficult in mountain regions and fraught with uncertainty.

The damage in figures

Switzerland

Summer 2005 surpassed anything Switzerland had ever experienced in terms of flooding, especially as regards the size of the area affected. There was hardly a single mountain stream, river, or lake in central Switzerland that did not burst its banks. Discharge return periods of well over 100 years were widespread. Worst hit were the catchments of the Aare upstream of Lake Biel, the Emme, and the Reuss. Several lakes not only reached record levels but exceeded the previous 1999 records by as much as a metre. Thousands of people had to be evacuated, tens of thousands were without electricity and drinking water. Six people died. Some 5000 buildings were damaged in the Berne region alone. In other areas the water flooded thousands of buildings and filled many with mud, sand, or gravel. Traffic was severely disrupted and many vehicles were swept away by the flood waters. Not surprisingly, business interruption losses were enormous. This was Switzerland's costliest natural catastrophe of all time, with economic and insured losses around 50% higher than those generated by the previous record event (Winter Storm Lothar in 1999). One especially significant figure is the average loss for buildings of approx. sfr 30,000 (sfr 1 = US$ 0.80). It was roughly double the figure for the 1999 losses, which helps illustrate the intensity of the 2005 event. Average losses were even as high as sfr 100,000 in some regions.

Germany (Bavaria)

In many ways, the hydrological event in 2005 was on a par with the Whitsun floods of 1999. The amounts of precipitation were higher in 1999 but the peak intensities were lower. However, overall losses remained comparatively low in 2005: economic losses came to approx. US$ 220, insured losses a little under US$ 50m – barely half the 1999 levels in spite of the increase in values during that period.

Austria

Heavy flooding in 2005 was essentially restricted to the western states of Vorarlberg and Tyrol. By contrast, the two floods in quick succession in 2002 hit pretty much all of northern Austria and caused losses of US$ 3,000m, of which US$ 400m was insured. The absolute loss figure in 2005 came to about one-third of the 2002 amount. However, the value per unit area is higher than three years ago.

Floods in the Alpine region in the summer of 2005

Country	Overall losses (US$ m)	Insured losses (US$ m)
Switzerland	2,100	1,250
Germany	220	50
Austria	700	150

A Vb cyclone track signifies a low-pressure system moving eastwards from the Gulf of Genoa around the Alps and bringing moist air to central Europe, where it can produce enormous amounts of rainfall.

Many towns and villages in Switzerland, southern Bavaria, Vorarlberg, and Tyrol felt the full destructive force of mountain floods in August 2005.

Partnerships to enhance risk prevention

Flood management in all three countries worked quite well on the whole. In Bavaria, the 2005 floods hit many of the same towns and villages as the floods in 1999. All those concerned, both authorities and local people, had learned from the floods just six years before. Technical protection measures had been improved and the right conditions created for much more efficient catastrophe management. However, one possible problem is that this largely positive experience, coupled with political promises to further improve local flood protection in many areas, may lead to a false sense of security, which would be counterproductive to maintaining risk awareness.

Switzerland is well prepared for the financial burden of tackling flood catastrophes. Most of the cantons have joined forces in a common risk community. They all contribute to the costs and have a major say on rural and urban development policy and on structural flood protection for individual buildings. Germany also passed a law in May 2005 restricting building development in flood plains. However, it remains to be seen whether this law will significantly reduce loss potentials in the future.

The German zoning system to assess the flood risk (ZÜRS) is now proven and firmly established. It is soon to be enhanced by a new accumulation loss model, developed with the help of Munich Re. ZÜRS classifies flood exposure nationwide into four categories of statistical return periods (0–10, 10–50, 50–200, >200 years). The accumulation model is based on the stochastic simulation of 10,000 artificially generated flood events. A similar system (HORA) will be in place for Austria as of mid-2006.

Outlook

There are clear signs that there has not only been an increase in the number of westerly weather conditions, responsible for winter floods in western parts of central Europe, but also a significant rise in so-called Vb weather conditions. In recent years, these systems have been the cause of the flood catastrophes on the Odra (1997), the Elbe, and the Danube (2002), and in the northern Alps (1999, 2005). What was new in 2005 was that there were three instances of Vb conditions within the space of just six weeks – a clear sign that climate change is already happening in central Europe. This will result in more frequent and more severe events – and, of course, more loss and damage, to which the insurance industry and society as a whole must devise an effective response.

Dr.-Ing. Wolfgang Kron

Floods in Mumbai

Severe monsoon rains on the west coast of India caused high losses and claimed many lives in the summer of 2005. The areas worst hit were the states of Gujarat at the end of June and Maharashtra at the end of July.

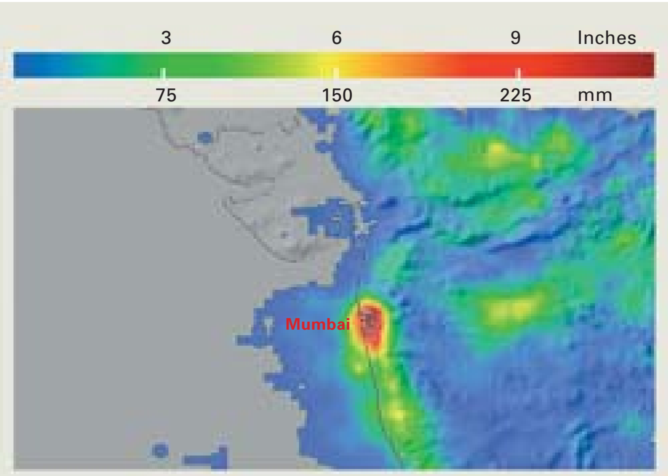
Meteorological background

The precipitation pattern in India is primarily governed by monsoons. The southwest or summer monsoon that blows inland from the sea between June and October brings copious rainfall to most parts of the country. The largest volumes of rain are recorded on the west coast, in the Western Ghats, on the slopes of the Himalayas, and in northeast India (Cherrapunji: 11,000 mm/year). In the majority of the country, the summer monsoon accounts for 80–90% of annual rainfall. Prolonged heavy downpours regularly cause large-scale flooding, often accompanied by landslides. The valleys of the Jumma, Ganges, and Brahmaputra are severely affected, with hundreds of people being killed every year.

The first monsoon rains of 2005 claimed no fewer than 200 lives in the state of Gujarat between 25 June and 4 July. 400,000 people had to be evacuated, and insured losses amounted to approx. US$ 50m. On 26 and 27 July, the heaviest rainfall ever recorded in India fell in the state of Maharashtra, including the financial and commercial centre Mumbai. A precipitation depth of 944 mm was recorded in just 24 hours – surpassing the previous record for one single day in India (Cherrapunji, 1910). 94% of this amount (885 mm) fell in just 12 hours (between 11.30 a.m. and 11.30 p.m. on 26 July). The downpour was accompanied by heavy thunderstorms and storm gusts. The meteorological reasons for this particularly extreme event are still uncertain. Prior to 26 July 2005, there had already been heavy rain in Goa and on the coast of Karnataka, which is an indication of strong convection over the eastern Arabian Sea. Generally, rainfall activity in the Mumbai region reaches its highest intensity in the last two weeks of July. However, the volumes varied widely from area to area. Whilst it was the meteorological station at Santa Cruz in the north of Mumbai that registered the amount of 944 mm, Colaba in the south of the city only recorded 73 mm.

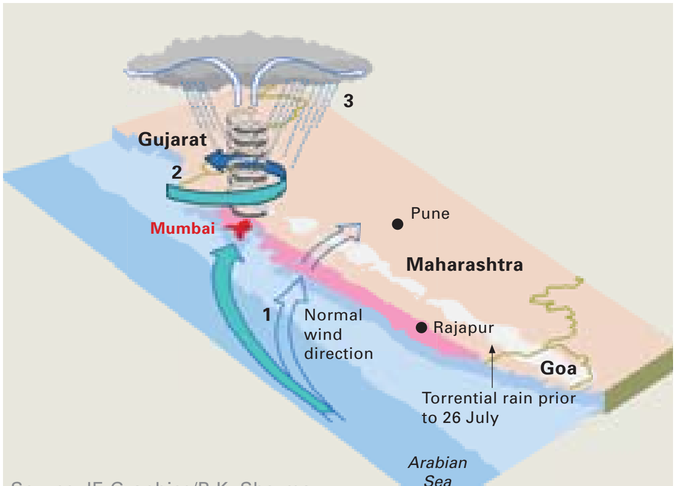
The entire system had an expanse of only 20–30 km, but radar measurements put the height of the cloud towers at 15 km.

Precipitation distribution in Maharashtra, 25–27 July 2005



Source: http://earthobservatory.nasa.gov

Schematic representation of an offshore vortex



Source: IE Graphics/B.K. Sharma, Indian Express Newspapers, Mumbai

1 High winds blow in from the Arabian Sea.

2 The winds turn northwards, forming throughs and eventually vortexes.

3 Low pressure forms and strong winds shoot upwards, resulting in heavy rain.

There were several determining factors

This kind of cloud system may be the result of an “offshore vortex“, in which strong winds with a high concentration of water vapour flow from the Arabian Sea onto the west coast of India and come up against the Western Ghats mountain range. As they cannot overcome this obstacle, the winds change direction and stream northwards along the mountains. This finally results in a vortex, which makes the air masses spiral upwards in an anticlockwise direction and leads to heavy precipitation. Unlike a normal cloudburst, which is of short duration because the rainfall volume is limited by the amount of moisture transported, this particular cloud system was fed for quite some time with moist air masses from the Arabian Sea. It is still not known why an essentially short-lived vortex should have stayed in a stationary position over Mumbai for such a long time. The theory of an offshore vortex being the cause of the torrential rain in Mumbai is therefore contentious. The most probable explanation is that there was a combination of various interrelated factors. The Intertropical Convergence Zone, for example, which leads to intense convection processes in the atmosphere (and hence to large volumes of rain), was directly at the latitude of Mumbai during the precipitation event.

Mumbai flooded

The torrential rain swamped many districts of the city up to a depth of 3 m. Schools, banks, the stock exchange, and the airport had to be closed. Traffic came to a standstill, and suburban and long-distance rail links were cut. 150,000 people were stranded in railway stations. The situation was particularly critical in the area around Bhiwandi in the northeast of the city, where large warehouses were badly damaged. Bhiwandi is an important terminal for goods and cargo intended for Mumbai and the western Indian states.

The situation deteriorated east of Mumbai when the upriver dams were opened, causing the river to rise by about 2 m within the space of an hour. Conditions in the slums, where about 70% of the city’s population live, were catastrophic. Countless huts were so flimsy that they collapsed, and the occupants lost all their worldly possessions. The immense volumes of rain triggered scores of landslides. Many people were electrocuted, buried under collapsing walls, or drowned in flooded vehicles. The death toll in Maharashtra was about 1,100. Hundreds of cases of gastrointestinal diseases like cholera and dysentery were registered because the water was contaminated. With the warehouses in Bhiwandi damaged, there were inadequate supplies of medication for the people.

The population was exposed to a further health hazard in the form of chemicals like cyanide, lead, zinc, and sulphates which were found in the Mithi, the river that flows through Mumbai. Most of these toxins came from illegal industrial plants in the region and had been washed into the river network by the rain.

The strong monsoon downpours put whole areas of the state of Maharashtra under water, causing severe agricultural losses and damaging roads and railway lines.

From mid-June onwards, India experienced its first heavy monsoon storms of 2005. This photograph of Ahmadabad in the state of Gujarat was taken on 2 July.

Mumbai, the financial and commercial centre, experienced record rainfalls at the end of July. Public life largely came to a standstill, in many areas there was no electricity or drinking water.

For the Indian insurance industry, the floods in Mumbai generated the most expensive natural catastrophe ever at US$ 770m. A loss adjuster indicates the water level in the storage depot of a pharmaceutical company.

Overall claims picture and consequences for the insurance industry

The floods in Mumbai were not only a human disaster but also the costliest natural catastrophe in the history of the Indian insurance market. Munich Re's estimate puts the overall loss at US$ 770m. The main reason is that, unlike the rest of the country, Mumbai has a high property insurance penetration. India's largest primary insurance company, for example, earns approx. 20–22% of its premium income in the Mumbai region. The average insurance premium per person in Maharashtra is US$ 12, compared with about US$ 4 in India as a whole.

Although motor own damage accounted for the majority of claims, the overall loss amount is dominated by fire insurance claims. This was due to the fact that the standard fire policy in India automatically includes flood damage. Most of the policies in this sector cover depots and warehouses for pharmaceutical products, electrical household appliances, electronic equipment, and textiles. The largest individual loss involved a sum of US$ 18m, which was due to a refinery being flooded. The Indian insurance industry saw the floods in Mumbai as a landmark event – in a year already characterised by natural catastrophes. As far as primary insurers were concerned, however, its direct effects were limited because the greater part of the loss was carried by the national and international reinsurance market.

In the short term, risk awareness may be expected to increase in the industrial sector of the Indian economy, but hardly among the population at large. Nevertheless, insurance companies and the authorities resumed their discussion of the insurability of such accumulation losses and the possibility of setting up a natural hazard reinsurance pool in India. Regardless of how natural hazards are reinsured in the future, by a pool or in the reinsurance market as in the past, the central issues for the Indian insurance industry after the Mumbai floods are improved transparency of liabilities and risk-adequate premiums.

Tobias Ellenrieder

Geographical underwriting – A central component of risk management

Geoinformatics is a discipline that Munich Re has pursued for more than ten years. Originally a piece of visionary thinking, it has developed over recent years into applications that are now an indispensable part of risk management.

Even in the mid-1990s, Geographical Information Systems (GIS) were still used at most as standalone solutions to support geo experts. Nowadays, complex GIS applications are an integral part of the IT environment at insurance companies and are widely used by underwriters in their daily business. The potential fields of application include virtually all phases of the underwriting process, ranging from data capture and geocoding of insured risks to risk analysis (accumulation issues and the identification of concentrations and patterns of values), risk modelling, and the visualisation of results. Our clients also benefit from this array of uses in the form of portfolio and claims analyses.

Success with address-based geocoding of risks

High-quality geocoding of portfolio and claims data is crucial for risk management and portfolio optimisation in lines of business involving natural hazards and man-made risks like terrorism. More than ten million risks have been geocoded with their streets and house numbers in 18 European core markets and the US market – an important step towards more risk transparency in the underwriting process (Fig. 4).

Munich Re's innovative web technologies provide underwriters with access to the Geo Data Service (GDS) and thus to the address-based geocoding of risks. Portfolio and claims data may be georeferenced in unlimited numbers and used for detailed simulations and analyses.

Thanks to the excellent performance, large treaty portfolios with over a million risk addresses can now be processed. In countries with no address-based data, coarser geocoding is carried out on the basis of the known CRESTA zones and a global city database.

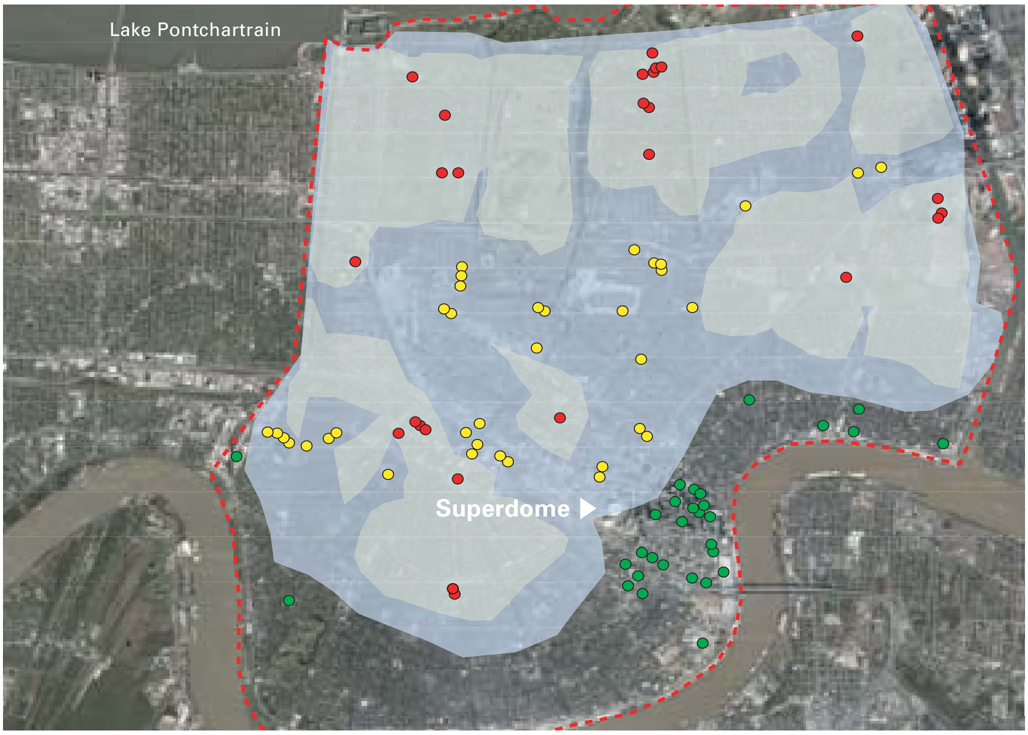


Fig. 1 Identification of risks affected in flooded New Orleans after Hurricane Katrina on 29 August 2005.

Flooded areas
- Severely affected
- Moderately affected

Risks in the affected area
- Major damage
- Slight damage
- No damage

City centre New Orleans

Sources:
Google Earth.com, fema.gov, digitalglobe.com

These functions are also used in our products NATHAN and CatLossEstimation. The latter system is still being tested. Taking liability data and the latest information on windstorms and severe weather events as a basis, it provides a quick estimate of the losses to be expected and their focal areas. The aim is to optimise loss management in the medium term.

As many primary insurers make little use of address-based geocoded portfolio data, Munich Re offers its clients a special service: MRGAP (Geographical Analysis of Portfolios), which is based on anonymised portfolio and claims data. The spatial analyses of property insurance portfolios make it possible to identify unknown accumulation situations (hot spots) and potential accumulation effects of multi-location policies. Primary insurers are using this information more and more not only in traditional hazard-related analyses but also for the purposes of managing their sales operations and client acquisition.

Crucial test following Hurricane Katrina

In the aftermath of Hurricane Katrina, a team of Munich Re staff planned and performed a loss inspection using for the first time ever a mobile GIS unit (Fig. 2). These mobile systems make it possible to link up the damage identified during the inspection with the liability data stored at the company. This kind of unit is usually made up of a robust Personal Digital Assistant (PDA) and a powerful GPS receiver. The apparatus is fed with the geo data and software it needs for a specific situation. Before the team left for its loss inspection in August 2005, the section of the portfolio for the region affected was projected onto maps and satellite images stored in the system. Street data were used to plan the best possible route, and risks were soon identified. The incorporation of preliminary loss maps provided by the Federal Emergency Management Agency (FEMA) permitted speedy identification and assessment of significant individual losses. The team's impressions from the inspection of numerous individual losses and the different levels of damage to residential, commercial, and industrial buildings made it possible to make a preliminary estimate of the overall loss (Fig. 1).

Fig. 2 Munich Re's geo experts were on the spot inspecting losses just a few days after Hurricane Katrina struck.

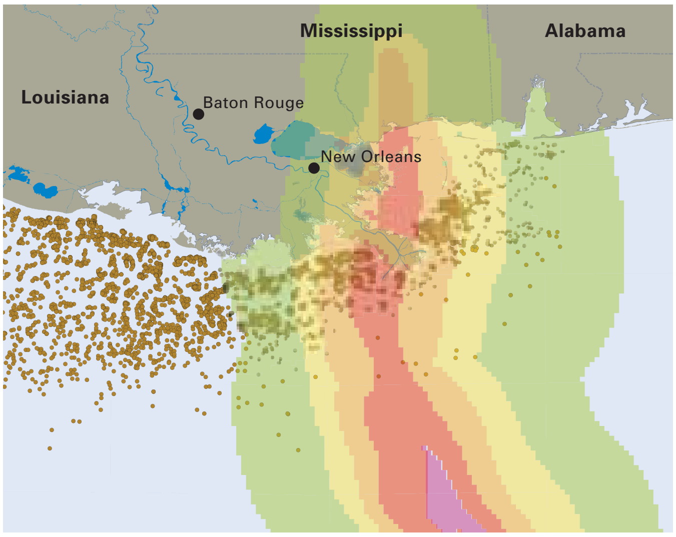


Fig. 3 Distribution of offshore business in the Gulf of Mexico. Superimposing the hurricanes' wind speeds gives an indication of the exploration fields and rigs that will be most seriously affected and the losses that are to be expected.

Wind speed in km/h
Saffir-Simpson Scale

- Category 1 (118–153 km/h)
- Category 2 (154–177 km/h)
- Category 3 (178–209 km/h)
- Category 4 (210–249 km/h)
- Category 5 (≥ 250 km/h)
- Offshore rigs

Geodatabases were also set up last year for the oil rigs in the Gulf of Mexico. A good estimate of the losses caused by the hurricanes in 2005 was possible on the basis of wind speed data. Firstly, liability values and the scope of cover had to be specified for all the rigs. This information forms the basis for simulating historical events, which is necessary in order to calibrate the loss estimation model. Approaching storms can also be examined in terms of their loss potential for offshore business (Fig. 3).

Options far from being exhausted

These examples demonstrate only some of the methods that are already in use today, and represent only a fraction of the complete range of applications. Internet-based tools like Google Earth (http://earth.google.com/) are a striking illustration of how Geographical Information Systems can be made available to new target groups. Because once every point on earth can be accessed with just a few mouse clicks on satellite images, this technology represents an efficient and practical tool for risk managers and underwriters. What is more, all kinds of cartographic data, such as risk locations, can be superimposed on the images (Fig. 5). If these techniques can be integrated in operative processes in the coming years, they will mark the beginning of a new era in risk transparency.

Dr. Jürgen Schimetschek, Andreas Siebert

Europe
Austria
Belgium
Denmark
Finland
France
Germany
Ireland
Italy
Luxembourg
Netherlands
Norway
Poland
Portugal
Spain
Sweden
Switzerland
United Kingdom
Czech Republic
North America
USA

Fig. 4 Countries covered by Munich Re's street-based or address-based geocoding (January 2006).

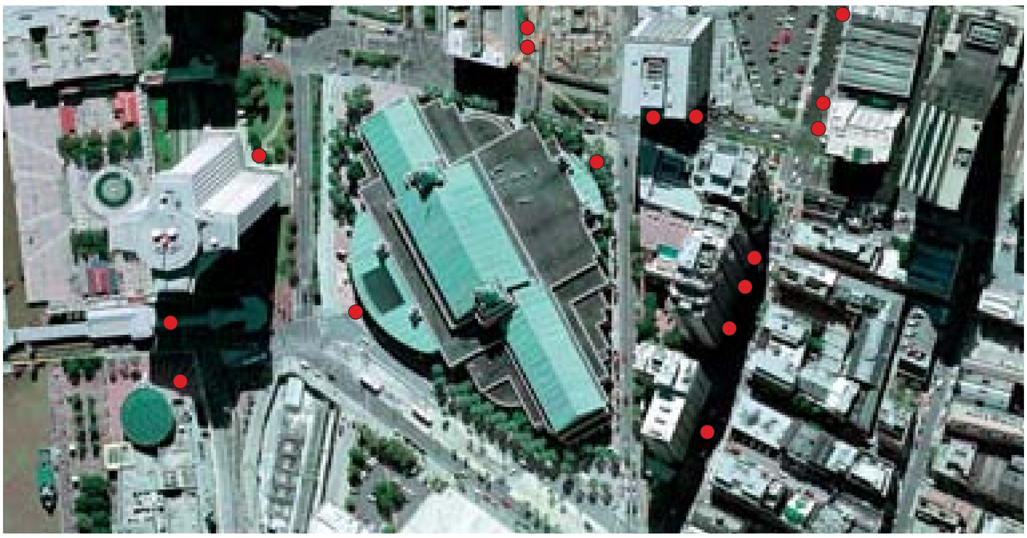


Fig. 5 Detail from Google Earth. The fascinating combination of satellite imaging and specialist information will influence risk management in the future.

● **Street-based or address-based geocoded locations of commercial risks in New Orleans.**

Source:
Google Earth, image©2006, Sanborn, detail
New Orleans

NATHAN

Global risk assessment of natural hazards – NATHAN (NATural Hazards Assessment Network):

NATHAN is based on "World of Natural Hazards", a CD-ROM originally published in 2000, which has continuously been updated since then. More than 100,000 copies have now been produced, making it the most widely distributed media product in Munich Re's 125-year history.

Our aim is to share our knowledge with the public. A free version of NATHAN can be accessed on the internet:

>> http://mrnathan.munichre.com

NATHAN – home page

These are the features offered by NATHAN.

NATHAN is composed of three modules:

In the **Natural Hazard Maps** module, you place the Hazard Pointer on any desired point on the earth's land surface and immediately get a qualitative estimate of the natural-hazard situation there.

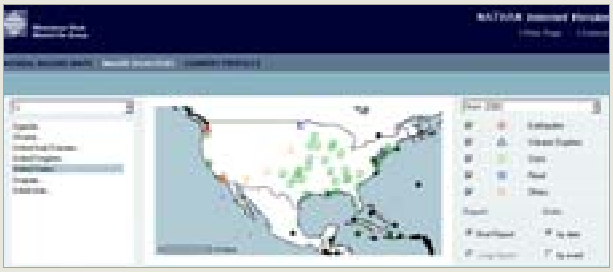
The **Major Disasters** module provides information on economic and human losses from current and historical natural catastrophes worldwide.

The **Country Profiles** module provides an overview of the selected country's geography, population, and economy, and shows its overall natural hazard situation.

Our clients can also access an extended version of NATHAN at connect.munichre, which provides exclusive use of additional functions:

>> http://connect.munichre.com

Natural Hazard Maps



Major Disasters

Country Profiles

Munich Re Foundation – From Knowledge to Action

Risk awareness is the key

The series of dramatic natural events shows no sign of stopping. The year 2005 has shown us once again that these kinds of catastrophes are unavoidable. The first requirement for effective disaster reduction is investment in greater risk awareness.

New records are being set every year. The sheer number of events that happen, as reflected again in this edition of Topics Geo, almost makes us forget that it is only one year since the huge tsunami in the Indian Ocean with its death toll of more than 200,000 people.

No let-up

A look back: The United Nations declared the 1990s the "International Decade for Natural Disaster Reduction" (IDNDR) following the alarming catastrophe trends of the 1980s. Subsequently, numerous national and international initiatives were set up (e.g. UN-ISDR) with a view to optimising disaster reduction, many of which are still in place today. Although disaster victims have benefited from this in many countries, we are still a long, long way from being able to issue any kind of all-clear signal. In Bangladesh, which was hit by severe cyclones and devastating storm surges in 1970 (300,000 fatalities) and 1991 (140,000 fatalities), a protection programme has been developed which significantly reduces the number of victims. Today, people at risk from a natural catastrophe can seek protection at specially built shelters. A warning signal tells them when it is time to go there.

And yet every year natural catastrophes still claim the lives of countless victims in countries around the world. The Bam earthquake in Iran with 26,000 fatalities, the tsunami in Asia and the earthquake in Pakistan are sad reminders that natural catastrophes still cause enormous damage and loss of life. Numerous factors point to an equally bleak outlook for the future. Catastrophes will continue to increase around the world. The reasons for this include population growth, an increasing concentration of people and values as a consequence of urbanisation, the settlement and industrialisation of exposed areas such as coasts and river basins, the greater susceptibility of modern societies and technologies and – especially hazardous – changes in the climate and the environment.

Early warning and the "last mile"

In January 2005, the Japanese city of Kobe hosted the second World Conference on Disaster Reduction (WCDR) after 1995. More than 3,000 delegates from 120 countries discussed how we can improve disaster reduction across the globe. The tsunami tragedy in the Indian Ocean cast a long shadow over the conference.

The phrase "last mile" featured prominently in the Kobe discussions on improved early-warning systems. This revolves around the issue of how to ensure that a technically improved system – involving satellites, monitoring buoys, streams of messages, etc. – reaches the people at risk. It is possible to develop an early-warning system which can sound the alarm many minutes before a tsunami strikes. The important thing, however, is to ensure that the warnings reach the people affected, such as the fishermen in Sri Lanka or the tourists in Thailand. This was the central message of the deliberations.

There is no doubt that effective early-warning systems are vital. But it is here that the debate reveals its first inherent flaw. Doesn't disaster reduction have to be designed with the people at risk and their immediate needs in mind? Do the people that make such decisions in the donor countries really understand what a basket weaver in Vietnam or a fisherman in Indonesia needs? Shouldn't the very concept of protecting people consider first and foremost the different needs in different regions of the world and use them as a basis for developing an adequate system of protection? Such a system acknowledges that people at risk in different cultural backgrounds and with many different levels of education and needs will inevitably react in different ways to natural hazards. If we consider the people at risk to be in the "last mile", we will continue to be confronted with devastating images and tragedies in the very first mile.

Prominent figures such as Irmgard Schwaetzer (DKKV), Bernd Eisenblätter (GTZ), Sálvano Briceño (UN/ISDR) and Johan Schaar (IFRC) emphasised the importance of partnership between politicians, industry, science and potential victims as a basis for answering the central questions of risk reduction.

How can disaster reduction be improved for people at risk? This was one of the questions to be clarified at the symposium. Representatives from the Philippines, Mozambique, and Kenya spelt out their wants and needs.

At the end of the symposium, the experts agreed on the Hohenkammer Charter, which contains the ten most important challenges for the future.

The last micrometre

The USA has excellent early-warning systems. Today, we can follow live images of a hurricane as it happens. We are given "real time" reports on the size of a storm, its intensity, path, landfall area, and the people at risk. In 2005, when Hurricane Katrina claimed the lives of more than 1,300 people in one of the richest countries in the world, it helped to illustrate a particularly vital point: that even the best and most sophisticated warning system is useless if the alert fails to reach the people at risk, or if the people are not aware of how to act in a way that is appropriate to the risk. In New Orleans, a range of factors meant that many people did not heed the calls to evacuate – most of the reasons were poverty-related. Only if the people at risk are adequately informed about the consequences of earthquakes, cyclones and floods and know how to protect themselves in such a situation is there any chance of actually reducing the devastating effects of catastrophes. It is therefore not a question of the first or the last mile, it is about the final micrometre, the switch in your head that triggers appropriate individual action. Risk awareness is the key here. If the people around the Indian Ocean had known more about tsunamis and flood risks, thousands of lives would have been saved.

What can be done?

In November 2005, the Munich Re Foundation staged an event at Hohenkammer near Munich, which was attended by 100 participants from 30 countries, including leading representatives of international government and non-government organisations, financial experts, and practitioners. It was a symposium entitled "Worldwide disaster reduction – Awareness is the key" for insurance specialists and experts from such institutions as the International Red Cross, the GTZ (German Association for Technical Cooperation), the United Nations and the World Bank. The delegates addressed the most pressing tasks needed to optimise disaster reduction.

Thomas Loster

Hohenkammer Charter
The ten most important challenges for optimised risk reduction

Poverty
People living in poverty are especially vulnerable; poverty relief is therefore a key element.

People
Disaster reduction efforts must start with the people in the areas at risk.

Decision-makers
The swift implementation of viable preventative measures presupposes the committed involvement of decision-makers from communal to national government level.

Dialogue
The exchange of views between those concerned must be actively pursued in order to achieve a common understanding of the problems and solutions.

Partnerships
Politicians, trade and industry, scientists and those affected have to cooperate better and more efficiently. Alliances – public-private partnerships – have to be infused with life.

Development policy
Risk reduction has to be singled out as one of the central components of development cooperation and national programmes, and implemented accordingly.

Propagation
Promising approaches in respect of risk-adequate precautions that currently exist at local level must be transmitted and propagated worldwide.

Incentives
Political, legal and economic incentives are called for to support investment in disaster reduction, and to accelerate the processes involved.

Insurance
Risk transfer, such as insurance and solidarity networks, helps reduce the vulnerability of governments and people in risk situations.

Raising risk awareness
Developing awareness is the key to the implementation of adequate measures before disaster strikes.

Respectable negotiating success:

Results of the UN climate conference in Montreal stabilise the emission-related carbon markets

The international climate negotiations in Montreal ended with an agreement on the steps to be taken next in the struggle against global warming. The central issue on which the government delegations reached a consensus was the question of extending the Kyoto Protocol beyond 2012.

The meeting in Montreal was the first UN climate conference to take place since the Kyoto agreement came into force in February 2005 and was attended by a record 10,000 participants. Two major objectives were achieved:

The climate conference accepted the rules for implementing the Kyoto Protocol that had been negotiated in Bonn and Marrakech in 2001. This means that emissions trading and other so-called flexibility mechanisms laid down in the Kyoto Protocol can finally be implemented in full. A compliance committee was also established to ensure that all Kyoto signatory countries observe the binding rules on how the flexibility mechanisms – emissions trading, the clean development mechanism, and joint implementation – are to be applied. The possible imposition of penalties is intended to ensure that all the countries meet their reduction targets. Failure to meet emission targets will lead to the imposition of even stricter reduction obligations for the time after 2012 or the exclusion from emissions trading with the ensuing negative economic effects. Binding reduction targets will continue to apply after 2012 when the Kyoto commitment period ends. In May 2006, a working group will begin proposing new and stricter emission standards for industrial countries (Annex I countries) for the time after 2012. Preparations for this time are also being made in other ways. In the form of a non-binding dialogue in which the United States will participate, the states will discuss various subjects within the frame of the UN climate convention, including adaptation to climate change and technological and market-based options that will facilitate a response to climate change. Finally, the general review of the Kyoto Protocol is also meant to clarify which obligations the developing countries should adopt after 2012.

Negotiations end with respectable success:

With the full implementation of the Kyoto Protocol and the path that will be adopted for the time after 2012 with the prospect of further emission obligations, every possible effort has been made to avoid a gap between commitment periods. This means that a long-term perspective beyond 2012 has been established for political decision-making and for branches of the economy that are geared to emission-related carbon markets and the Kyoto mechanisms. On this basis, insurance products can be developed that are geared to emissions trading or the insurance of CDM projects (carbon delivery guarantee).

Munich accents

Way back in 1995, Munich Re attended the very first climate summit in Berlin, giving active support to the endeavours against climate change.

Munich Re was in Montreal too, presenting the Munich Climate Insurance Initiative (MCII), which was launched in April 2005 and whose members include the World Bank, the Potsdam Institute for Climate Impact Research, IIASA, and Germanwatch. Its objective is is to develop insurance solutions that will enable people in developing countries to obtain better protection against the impact of climate change than is possible today.

The Climate Change Working Group of the UNEP Finance Initiative, of which Munich Re is an active member, presented a study on the financial sector's expectations with regard to climate policy after 2012. Its central demands are the formulation of a long-term objective for future climate policy, the establishment of a clear target for the development of renewable energies, an increase in energy efficiency.

Dr. Eberhard Faust

In April 2005, Munich Re launched the Munich Climate Insurance Initiative. Its objective is to devise insurance solutions with which people in developing countries can protect themselves against the impact of climate change better than they can at present. The initiative was presented and discussed at the UN climate conference in Montreal.

At the end of the climate conference, former US President Bill Clinton gave a spirited speech championing climate protection and highlighting the opportunities it presents for business and the economy.

The Amazon Basin went through its worst drought for 60 years. Many stretches of river dried up, and hundreds of villages were cut off from the outside world. The agricultural sector and the fishing industry suffered large losses, whilst the overall loss is estimated to exceed US$ 1.6bn.

Climate review 2005

Climate change continues unabated. This is clearly confirmed by the results of research in 2005, a year that is likely to go down as the second warmest year ever recorded.

According to provisional calculations by the World Meteorological Organisation (WMO), the mean global temperature in 2005 deviated by +0.47°C from the average of the climate normal period 1961–1990. It is thus one of the warmest years since recordings began in 1861 and currently ranks as the second warmest year worldwide. The WMO will publish the final figures in February 2006. Nothing provides more striking evidence of the continual warming of our planet than the fact that the nine warmest years have all occurred between 1995 and 2005. In fact, in the northern hemisphere, 2005 is likely to go down as the warmest year ever recorded, with an anomaly of +0.65°C.

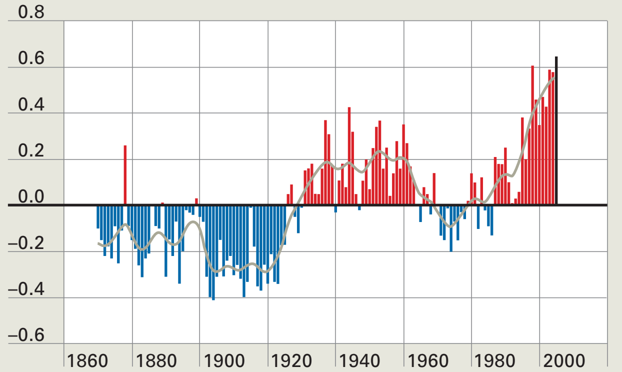
In September 2005, ocean ice in the north covered less than six million square kilometres for the first time since satellite observations began in the 1970s. September is the month in which it typically reaches its minimum. The sea ice cover registered at the end of that month showed a reduction of 8% in the last 25 years.

A major part in this development was played by the North Atlantic, where the surface temperature in 2005 currently ranks as the warmest annual mean figure ever registered (Fig. 1). The exceptionally large anomalies in a belt around 50°N and record values in the Caribbean and the tropical Atlantic were particularly noticeable. One of the effects of this was the extreme drought in the Amazon region. This was due to the higher level of evaporation and precipitation formation over the warm sea surfaces, whilst in the neighbouring region of North Brazil the prevailing conditions were a subsidence of air and cloud dispersion.

A study by the Scripps Institute of Oceanography was the first to show that anthropogenic climate change is responsible for the rising temperatures in the upper layers of all the earth's oceans. This influence far outweighs the effects of natural climate variability and external forcings like changes in solar radiation and volcanic activity.

Fig. 1 Annual average sea surface temperature in the North Atlantic

Difference (°C) in relation to 1961–1990



Source: The Met Office and the University of East Anglia statement on the climate of 2005, 15 December 2005.

Fig. 1 Anomalies in the mean annual sea surface temperature in the North Atlantic relative to the average for the years 1961–1990. Black bar: average for January–November 2005. Grey: smoothed curve.

Examples of extreme weather patterns in 2005

- Between October 2004 and June 2005, the total volume of precipitation in western France, Spain, Portugal, and the United Kingdom was only half the long-term average. As a consequence, Spain and Portugal suffered their worst drought since the 1940s, resulting in many wildfires. And that only two years after the hot and dry hundred-year summer of 2003.

- With an anomaly of +1.75°C in the first five months, 2005 was the hottest year in Australia since recordings began in 1910.

- There was hardly any rain in Brazil, leading to extreme dryness in the south (Rio Grande do Sul) and the Amazon region and producing the worst drought for 60 years.

- In contrast, July presented Mumbai with the greatest 24-hour precipitation volume ever recorded in India.

Dr. Eberhard Faust

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