Swiss Re

sigma

No 1/2010

Natural catastrophes and man-made disasters in 2009: catastrophes claim fewer victims, insured losses fall

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The editorial deadline for this study was
10 February 2010.

sigma is available in English (original language), German, French, Spanish, Chinese and Japanese.

sigma is available on Swiss Re's website:
www.swissre.com/sigma

The internet version may contain slightly updated information.

Translations:
CLS Communication

Graphic design and production:
Swiss Re Logistics/Media Production

Order no: 270_0110_en

Executive summary

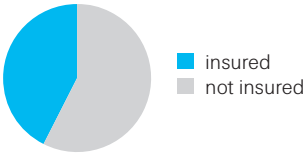
Catastrophes claimed nearly 15 000 victims and cost insurers over USD 26bn in 2009

In terms of lives lost and economic losses, 2009 was mild compared to previous years.

Natural catastrophes and man-made disasters claimed nearly 15 000 lives and led to economic losses of close to USD 62bn in 2009. The cost to insurers was approximately USD 26bn. In terms of insured losses, 2009 ranks as the eleventh highest year since 1970, when *sigma* began collecting natural catastrophe data. Insured losses in 2009 were moderate compared to 2005, when losses soared to nearly USD 117bn after Hurricanes Katrina, Wilma and Rita struck the US.

Less than half of the 2009 economic losses were paid by insurers.

The USD 36bn gap between the total economic loss and the insured loss in 2009 suggests that the lack of insurance cover continues to leave many individuals and governments vulnerable after a catastrophic event occurs. Since losses from natural catastrophes and man-made disasters have trended upwards over the last two decades, the need to maintain adequate cover is increasing in importance.



In 2009, 288 catastrophic events occurred, consisting of 133 natural catastrophes and 155 man-made disasters.

Asia was the hardest-hit region with approximately 9 400 victims.

Of the roughly 15 000 people who perished in catastrophic events in 2009, nearly 9 400 lived in Asia, the hardest-hit region. Typhoons and earthquakes claimed the most lives there, including:

- Typhoon Morakot, which struck Taiwan, the Philippines and China in August, resulted in over 900 victims.
- Typhoon Ketsana, which hit the Philippines, Vietnam, Cambodia and the Lao People's Democratic Republic in September, resulted in over 850 people dead or missing.
- An earthquake – measuring 7.6 on the moment magnitude scale – which struck Indonesia in September resulted in nearly 1 200 deaths.

The volatility of economic losses remains a concern.

In terms of economic losses, natural catastrophes and man-made disasters cost society approximately USD 62bn in 2009, versus USD 268bn in 2008. Volatility remains a concern.

Insured losses were the highest in North America, where they cost insurers over USD 12.7bn.

Insured losses were approximately USD 26bn in 2009. Most of these losses – ie roughly USD 22bn were due to natural catastrophes, while the remaining USD 4bn were the result of man-made disasters. Insured losses were highest in North America, where they cost insurers over USD 12.7bn.

Storms in the US and Europe triggered the largest insurance claims in 2009.

Storms triggered the largest insurance claims:

- Winter storm Klaus, which hit France and Spain in January, cost insurers over USD 3.4bn.
- Major US thunderstorms with winds up to 145 km/h in February, resulted in losses of USD 1.35bn.
- Hail storm Wolfgang with winds up to 130 km/h, caused insured losses of USD 1.2bn in central Europe.
- Tornadoes and storms in the US in April and thunderstorms in June each triggered losses of approximately USD 1bn.
- In Australia, Victorian bush fires caused damage of over USD 1bn.

Secondary perils are natural phenomena that can cause significant damage, but not usually on the scale of primary perils.

Most of the attention in recent years has been mainly focused on the primary perils – ie earthquakes, hurricanes and winter storms. However, many other natural phenomena, referred to as secondary or other perils, can also cause widespread damage to property. The most prominent secondary perils are all types of flooding, landslides, hail storms, tornadoes, winter storms outside Europe, snow and ice storms, droughts and bush fires. In 2009, more than half of the natural catastrophe loss burden was caused by secondary perils.

Few probabilistic risk assessment models exist for most secondary perils. Hence, premiums from primary perils are often used to cross-subsidise losses from secondary perils.

Premiums from primary perils are often used to cross-subsidise losses from secondary perils. The risk is that if premiums deteriorate, they could become insufficient to pay for the sum of losses caused by primary and secondary perils. More advanced probabilistic risk assessment models would help to better gauge and price the risk of secondary perils. Climate change is also expected to have a significant effect on the frequency and severity of secondary peril events.

This *sigma* also highlights the effect that earthquakes have on advanced and less developed economies.

This *sigma* also includes a special chapter on earthquakes. According to *sigma*, 360 damaging earthquakes have claimed over 1 million lives over the last four decades. These deadly events occurred in less economically developed countries and in regions that are usually densely populated and prone to earthquakes. These countries typically have low per-capita income and fewer resources for prevention- and post-disaster management.

Economic losses from earthquakes are highest in developed countries, but the death toll is usually lower.

Although the death toll is very much concentrated in the emerging markets, insured losses are by far highest in the developed countries. While insured losses are often high, the figures for economic losses are typically much higher. Even in developed economies, the current earthquake insurance take-up rates in heavily exposed areas seldom surpass 20%.

Developed countries mitigate losses by taking prevention measures, investing in infrastructure and buying insurance.

In less developed areas, the private and public sectors can work together to provide financing and reduce disaster risk.

In the developed economies, the death toll from earthquakes tends to be lower because advanced prevention measures are taken and because better infrastructure and building codes are in place to limit the consequences of disasters. Economically advanced nations also tend to purchase insurance cover, which helps to finance the costs of reconstruction. Less developed economies can also benefit from insurance cover if the public and private sectors – ie (re)insurers, brokers, governments and international agencies – work together to implement innovative (re)insurance and capital market solutions.

Overview of catastrophes in 2009

Selection criteria 2009

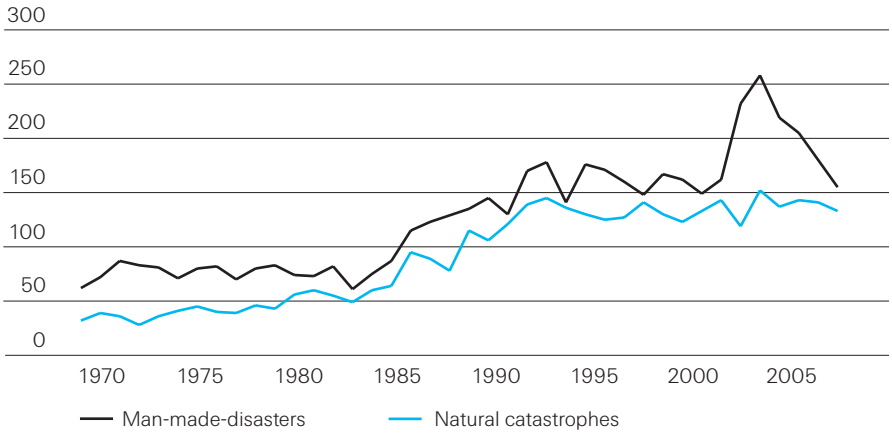
		in USDm
Insured claims:	Maritime disasters	17.1
	Aviation	34.3
	Other losses	42.6
or Total economic losses:		85.2
or Casualties:	Dead or missing	20
	Injured	50
	Homeless	2 000

Almost 290 catastrophic events occurred in 2009

Of the 288 catastrophic events that occurred in 2009, 133 were natural catastrophes, while the remaining 155 events were man-made disasters (see Figure 1).

An event is included in the statistics if insured claims, total economic losses or the number of casualties exceeds a certain limit (refer to the text in the margin). Each year, the claims threshold is adjusted for inflation.

Figure 1
Number of events 1970–2009



Source: Swiss Re, sigma catastrophe database

Almost 15 000 people around the world were victims of catastrophes

Natural catastrophes and man-made disasters claimed approximately 15 000 lives in 2009.

Natural catastrophes and man-made disasters claimed approximately 15 000 victims in 2009. Nearly 9 000 of these people died or were missing due to natural catastrophes; the remaining 6 000 were victims of man-made disasters (see Figure 2). 2009 ranks as the eighth lowest year in terms of the number of victims since 1970, when *sigma* began collecting catastrophe data. The number of victims in 2009 was especially low in comparison to 2008, when more than 240 000 people lost their lives to catastrophes and man-made disasters. Most of those casualties occurred after Tropical Cyclone Nargis struck Myanmar in May 2008, resulting in nearly 140 000 deaths. Shortly thereafter, a massive earthquake shook the Sichuan province of China, claiming close to 90 000 lives.

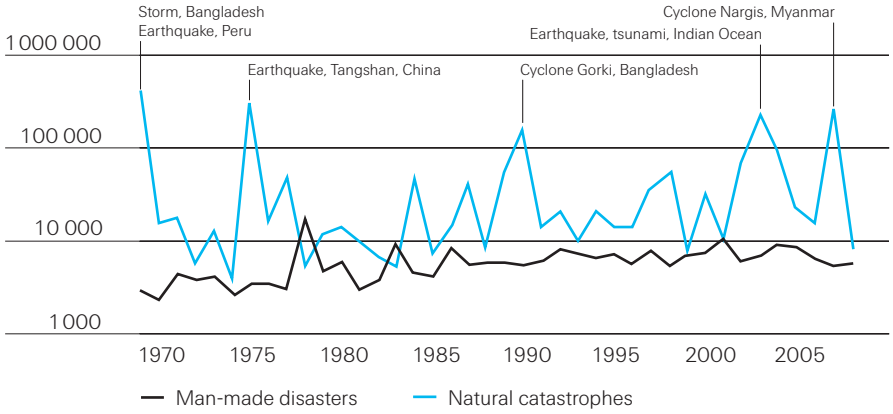
Asia was the hardest-hit region in 2009 with roughly 9 400 victims.

With roughly 9 400 victims, Asia was the region most affected by catastrophes in 2009, accounting for over 60% of the world's 15 000 victims. Two typhoons and an earthquake were the three single events that resulted in the highest death toll. Typhoon Morakot, which struck Taiwan, the Philippines, and China in August, resulted in over 900 victims. In September, Typhoon Ketsana, which hit the Philippines, Vietnam, Cambodia and the Lao People's Democratic Republic, resulted in over 850 people dead or missing. That same month, an earthquake measuring 7.6 on the moment magnitude scale struck Indonesia, resulting in nearly 1 200 deaths. In contrast, North America and South America were the regions least affected by catastrophes, with approximately 550 victims each.

Man-made disasters claimed approximately 5 900 lives in 2009.

Although the number of natural catastrophe victims can vary significantly from year to year based on the intensity of storms, earthquakes and hurricanes (and where and when they hit), the number of victims of man-made disasters tends to be more constant. In 2009, for example, approximately 5 900 people were victims of man-made disasters versus 5 650 in 2008. The man-made disasters that resulted in the most victims in 2009 were the sinking of the Ferry Teratai Prima in Indonesia in January (311 victims), the sinking of an overloaded boat carrying illegal immigrants in the Mediterranean Sea in March (234 victims), the crash of an Air France flight into the Atlantic Ocean in June (228 victims) and the July riots in Urumqi City in China's Xinjiang region (197 victims).

Figure 2
Number of victims 1970–2009



The scale is logarithmic – the number of victims increases tenfold per band.

Source: Swiss Re, sigma catastrophe database

Total economic losses estimated at USD 62bn

Natural catastrophes and man-made disasters cost society USD 62bn in 2009.

Natural catastrophes and man-made disasters cost society approximately USD 62bn in 2009. However, economic losses have continued to be volatile over the past decade, soaring as high as USD 268bn in 2008.

In 2009, economic losses were highest in Europe, where losses exceeded USD 20bn (see Table 1). Storms accounted for the majority of these losses.

Table 1
Economic loss by region and as a % of GDP

Region	Economic loss in USD m	as a % of GDP
Europe	20 107	0.11%
North America	20 086	0.12%
Asia	16 744	0.07%
Oceania/Australia	2 048	0.19%
Seas/Space	1 990	–
South America	559	0.02%
Africa	483	0.03%
World total	62 017	0.10%

Source: Swiss Re Economic Research & Consulting

Insured catastrophe losses were approximately USD 26bn

Insured losses due to natural catastrophes were USD 22bn.

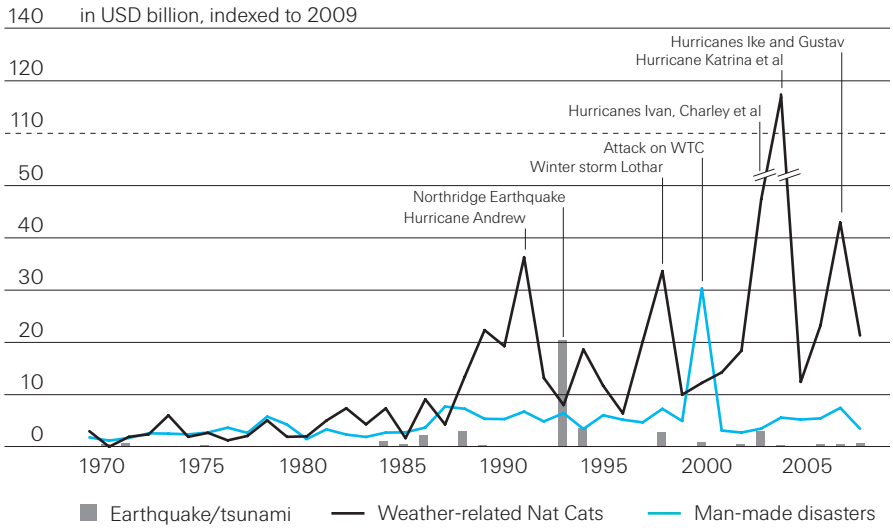
Individuals, companies or state institutions absorbed most of the USD 62bn in economic losses caused by catastrophe losses in 2009. Only about 40% of these losses (USD 26bn) were covered by insurers (see Figure 3). Of this USD 26bn, insured natural catastrophes losses accounted for USD 22bn, while man-made disasters accounted for the remaining USD 4bn in insured losses.

Weather-related events were the biggest contributor to global insured losses in 2009. Nevertheless, the extremely calm hurricane season in the US was a welcome relief to insurers who suffered heavy losses in 2008 due to Hurricanes Ike and Gustav.

Man-made disasters triggered insured losses of USD 4bn.

Man-made disasters triggered insured losses of USD 4bn in 2009. This figure includes losses from major industrial fires and explosions, as well as losses from the aviation, space and energy sectors. There have been no significant catastrophe losses in the international marine market. However, the energy sector was marked by two major incidents, a collision of a vessel with a platform in the North Sea and a blowout in the Timor Sea. These two incidents led to an insured loss of above USD 1bn. Despite this loss, the energy insurance market remains profitable overall.

Figure 3
Insured catastrophe losses 1970–2009



Source: Swiss Re, sigma catastrophe database

Storms in the US and Europe triggered the largest insurance claims in 2009.

Europe and North America registered the highest insured losses for 2009 at USD 7.7bn and USD 12.7bn, respectively (see Table 2). Losses were primarily driven by harsh winter and spring weather. Insured losses in Asia were USD 2.4bn, driven primarily by typhoons and floods.

Table 2
Catastrophes in 2009 by regions

					Insured loss	
Region	**Number**	**in %**	**Victims**	**in %**	(in USD m)	**in %**
North America	54	18.8%	543	3.7%	12 655	48.2%
Europe	32	11.1%	874	5.9%	7 697	29.3%
Asia	125	43.4%	9 386	62.9%	2 436	9.3%
South America	13	4.5%	547	3.7%	50	0.2%
Oceania/Australia	7	2.4%	706	4.7%	1 297	4.9%
Africa	26	9.0%	932	6.2%	180	0.7%
Seas/Space	31	10.8%	1 928	12.9%	1 955	7.4%
World total	288	100.0%	14 916	100.0%	26 270	100.0%

Source: Swiss Re, sigma catastrophe database

Six catastrophes each triggered losses in excess of USD 1bn.

Overall, six natural catastrophes each triggered losses in excess of USD 1bn. Winter storm Klaus, which struck France and Spain in January, was the costliest event in 2009 at USD 3.4bn. Hail storm Wolfgang, with winds up to 130 km/h, swept through Central Europe in July, causing insured losses of USD 1.2bn.

PERILS (Pan-European Risk Insurance Linked Services)

PERILS provides industry-wide European catastrophe insurance data.

PERILS was launched in January 2009 as a result of an initiative by the Chief Risk Officer Forum (www.croforum.org). The independent, Zurich-based company collects and aggregates industry-wide exposure and claims data for Europe and makes it available to interested parties. The body finances itself by charging fees for its data services.

PERILS data aims to stimulate growth of the ILS market and improve modelling.

The PERILS initiative has two main goals. First, it aims to provide transparent and independent industry exposure and loss estimates that will stimulate the development of new products and create additional insurance capacity. Second, it contributes to the improvement of modelling and assessment of natural catastrophe risks, as well as underwriting and risk management, based on the data provided by PERILS.

As industry losses become more transparent, the industry as a whole will benefit.

The creation of a market loss index will benefit the European insurance industry by improving the transparency of industry losses. Standardised, consistent and timely market loss data are expected to facilitate the future growth of the European cat bond and ILW markets. Furthermore, the data will help insurers identify exposure and claims trends, sharpen their reinsurance requirements and benchmark their own risk portfolio's performance against the industry data provided by PERILS.

In the US, a major thunderstorm in February, with winds up to 145 km/h, cost insurers USD 1.35bn. Tornadoes and storms in April and thunderstorms in June each led to insured losses of approximately USD 1bn.

In Victoria, Australia, approximately 400 bush fires, with winds up to 100 km/h, caused over USD 1bn of insured losses after a period of dry, hot weather in February.

Australian bush fires: natural catastrophe or man-made disaster?

It is not always clear if bush fires should be classified as natural catastrophes or man-made disasters.

It can be difficult under certain circumstances to determine if bush fires should be classified as natural catastrophes or man-made disasters. In early 2009, approximately 400 bush fires occurred in Australia. The event was considered the worst disaster on the continent in a century. Wildfires in the southern Australian state of Victoria wiped out entire towns, destroyed more than 2 000 houses and left 7 000 people homeless. Nearly 200 people died.

Natural catastrophe losses may ultimately be found to be man-made.

Opinions differ on how the fires started. Police arrested alleged arsonists, while a Royal Commission is investigating whether there were man-made causes due to placement and maintenance of power lines, local fire fighting responses and other causes.

In Australia, weather conditions were extreme before the bush fires occurred.

In a different setting, none of these human influences might have triggered such a terrible catastrophe, but the weather preceding the Victorian bushfires was extreme. For nearly one week, maximum daily temperatures exceeded 45 degrees Celsius (113 degrees Fahrenheit). Even at night, temperatures never dropped below 30 degrees (86 degrees Fahrenheit). Melbourne even recorded its hottest day ever. This heat combined with strong winds and low humidity created the "perfect" boundary conditions to fuel and maintain the raging fires.

The debate on the correct classification continues.

There is still an ongoing debate in the insurance industry as to the correct classification of bush fires. No consensus has yet been reached.

Secondary perils – the often underestimated exposure

Secondary perils contribute strongly to total natural catastrophe losses

Insured losses in 2009 were below the long-term average.

In 2009, the total insured loss due to natural catastrophes was below the long-term average. The main reason for the moderate loss amount was the absence of a large hurricane or earthquake in a developed country with high insurance penetration. The largest insured loss event in 2009 was winter storm Klaus, which struck Northern Spain and Southwest France. The total insured loss from Klaus amounted to USD 3.4bn, which is less than half of the losses generated by Lothar (USD 7.5bn[1]), which battered Europe in 1999.

Secondary perils are natural phenomena that can cause significant damage, but not usually on the scale of earthquakes and hurricanes.

If there was no truly large insured natural catastrophe loss event in 2009, then what triggered the insured losses of USD 26bn? So far, the industry has mainly focused on three types of perils – ie earthquakes, hurricanes and winter storms. However, many other natural phenomena, referred to as secondary or other perils, can also cause widespread damage to property. Thus far, these secondary or other perils have attracted little attention. However, in 2009, more than half of the natural catastrophe loss burden was caused by them.

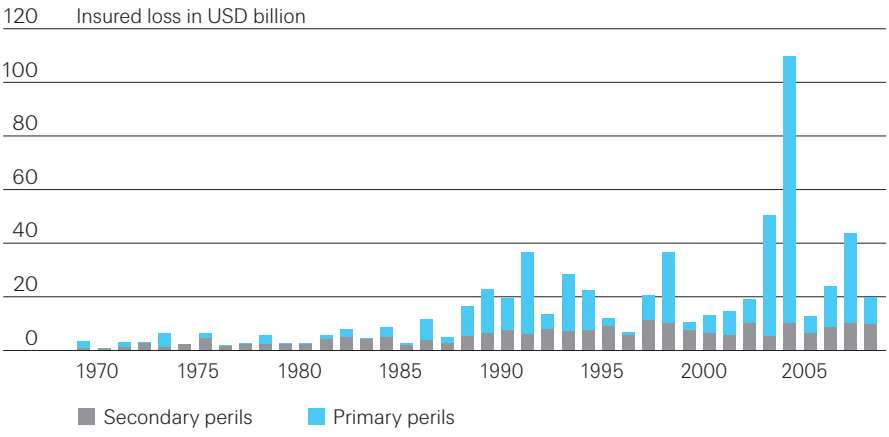
Nevertheless, secondary perils are high-frequency, low-to-medium severity events that contribute significantly to natural catastrophe losses.

The most prominent secondary perils are river floods, flash floods, torrential rainfall, storm surges, landslides, hail storms, tornadoes, winter storms (extra tropical cyclones) outside Europe, snow and ice storms, droughts and bush fires. Secondary perils are typically high-frequency, low-to-medium severity events that occur around the globe. Since 1980, there have been an average of 33 secondary peril loss events per year, compared to an average of 6 primary peril loss events per year. When such a high number of events is multiplied by their individual losses, it becomes clear why secondary perils are a significant portion of the total natural catastrophe loss amount.

Insured losses from secondarily perils have been USD 6.5bn, on average, over the last 30 years.

Secondary perils contributed about 30% to the total insured natural catastrophe losses over the last 30 years. In recent years, insured losses were often approximately USD 10bn, well above the 30-year average of USD 6.5bn (see Figure 4).

Figure 4
Natural catastrophe losses at 2009 prices split into primary and secondary perils



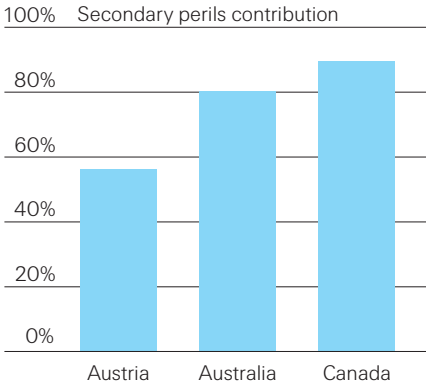
Source: Swiss Re, sigma catastrophe database

[1] All loss figures at 2009 price levels.

On a global level, primary perils contribute more to total natural catastrophe losses than secondary perils. At the country level, this is not always the case.

While the losses from secondary perils are significant, primary perils contribute the most to total natural catastrophe losses on a global level. However, for many individual countries, the opposite is true. For example, in Austria, Australia and Canada, secondary perils are the main loss drivers. Their contribution has exceeded 50% of the total natural catastrophe loss over the last 30 years (see Figure 5).

Figure 5
Relative contribution of secondary perils to total natural catastrophe losses in Austria, Australia and Canada, 1980–2009



Source: Swiss Re, sigma catastrophe database

The impact of climate change

The effects of climate change will vary by region. Current global climate models are unable to simulate all small scale weather patterns.

The Earth's climate is a complex system and the impact of changes can only be assessed by coupling sophisticated climate and socio-economic models. Such studies reveal that the effects of climate change vary strongly by region. Currently, global climate models are not able to directly simulate all small scale weather patterns which are related to most of the secondary perils. Some causal connections would favour an increase in the frequency and severity of secondary perils. However, there is still uncertainty about the overall impact of climate change on these perils.

Rising temperatures will cause more water vapour to form. Rainfall and flooding will increase, and larger hailstones will form, resulting in higher insured losses.

Rising temperatures are associated with an increase of energy in the atmosphere. In addition, warm air stores disproportionately more water vapour than cold air. Therefore, when rain storms or hail events occur, the potential exists for more water vapour to condense to rain drops or hailstones. More rainfall will lead to more flooding, while larger hailstones will cause more damage upon impact. Both effects would increase insured property losses.

Climate change will intensify the energy exchange between the mid and high latitudes.

It is also expected that climate change will intensify the horizontal energy exchange between the mid and high latitudes in the form of water vapour. If it happens in summer – especially in continental Europe – extreme energy differences will trigger storm events with strong winds, heavy precipitation and heavy hail. Similarly, in North America, warm and cold air will collide more often in spring and summer, resulting in more tornadoes. Climate change will favour the conditions that lead to both types of events. However, in the case of tornadoes, for example, there is still some uncertainty about the final outcome since other forces like wind shear effects, which climate change also influences, dampen their outbreak.

History of natural catastrophe models

Few probabilistic risk assessment models exist for most secondary perils.

For most secondary perils, few probabilistic risk assessment models exist. This may be due to the lower loss potentials for these types of perils. However, model development history also plays a role. In the 1970s, the insurance industry was surprised by several earthquake events in South America. This eventually led to the introduction of accumulation control, exposure reporting and the development of natural catastrophe models. The first probabilistic models dealt with earthquake risks only and were available during the late 1980s. At that time, probabilistic models were not widely used in the insurance industry. However, this changed substantially with the second wave of natural catastrophe models.

A series of events during the early 1990s led to the further development of risk assessment models for earthquakes, hurricanes and winter storms. Models for secondary perils are still very rare.

The growth in popularity of the natural catastrophe risk assessment models was triggered by an accumulation of events in the early 1990s. A series of winter storms in 1990 (Daria: USD 7.7bn, Vivian: USD 5.2bn, Herta: USD 1.4bn and Wiebke: USD 1.3bn) and finally Hurricane Andrew in 1992 (which caused insured losses of USD 24.5bn) triggered the development of probabilistic European winter storm and US hurricane risk assessment models. Since then, the use of probabilistic models for earthquake, hurricane and European winter storms has become common practice in risk assessment. In the late 1990s and early 2000s, additional models – especially for flood in Europe and tornado/hail in the US – were developed. However, these latter models have never achieved the same importance as the risk assessment tools for earthquakes, wind storms and hurricanes. The current commercially available tools have little to offer when it comes to secondary perils, especially on a global level.

Why should secondary perils be a concern for the industry?

The contribution of secondary perils is frequently underestimated or ignored when assessing exposures.

While the use of sophisticated probabilistic risk assessment models has helped to substantially increase the accuracy when determining expected losses for primary perils (ie earthquakes, hurricanes and European winter storms), few advanced risk assessment models exist for secondary perils. As a result, their loss costs are often underestimated or not considered at all.

Because of the lack of a standard modelling approach for secondary perils, they are often subsidised with premiums from primary perils.

In these cases, premiums from primary perils are often used to cross-subsidise losses from secondary perils – especially in those countries where primary perils dominate. In such countries, secondary risks are priced simply as a fixed percentage of the premium for primary perils. If there are no large losses caused by earthquakes or windstorms for several years, there is a risk that premium levels deteriorate and become inadequate. The risk of underestimating secondary perils is more pronounced for reinsurers that participate in an excess position than for insurers which cover losses from the ground up and are confronted with more regular loss experience.

To mitigate the risk of underpricing secondary perils, risk-adequate experience pricing is needed. The development of probabilistic pricing models is also key.

The risk of underpricing secondary perils can be mitigated by risk-adequate experience-based pricing. However, in countries where secondary perils represent a high share of natural catastrophe losses, the development of probabilistic risk assessment models would help raise risk awareness and improve premium adequacy.

The increasingly sophisticated probabilistic loss models used by insurers have been accepted by investors, regulators and other stakeholders.

The catastrophe insurance industry has embraced in the last decade the use of increasingly sophisticated probabilistic loss models for the traditional major perils such as earthquakes, tropical cyclones and winter storms in Europe. Investors, regulators and other stakeholders have developed a certain level of comfort with the loss estimation provided by such models.

Nevertheless, secondary perils are important loss drivers and will need to be addressed in a world increasingly affected by climate change.

Nevertheless, the ability to adequately assess the loss potential of secondary perils remains important for natural catastrophe policies and reinsurance programmes. In many markets, secondary perils are the main loss drivers and thus deserve much more attention and diligence in risk assessment than in the past. Their importance will continue to grow in a world increasingly affected by climate change.

Earthquakes disproportionately affect the emerging markets and developing economies

Destructive earthquakes can strike at any time.

The massive earthquake that struck Haiti in January 2010 served as a sad reminder of the destructive force of earthquakes. From a global perspective, earthquakes happen very frequently, but they are either too small to notice or affect areas that are either sparsely populated or not populated at all. However, when a major earthquake occurs in a heavily populated area, the effects can be devastating, often resulting in large loss of life, disease, a lack of basic necessities, general property damage, road and bridge damage and the collapse or destabilisation of buildings and slopes.

Since 1970, 360 damaging earthquakes have claimed over 1 million lives.

Loss of life

According to *sigma*, 360 damaging earthquakes have claimed over 1 million lives over the last four decades (See Table 3). The most recent decade, 2000–2009. was the deadliest, with earthquakes causing nearly 450 000 deaths. The highest number of earthquakes (134) occurred during the 1990s.

Table 3
Number of victims and deadly events by decade since 1970

Period	Victims[2]	Number of events
2000–09	446 371	126
1990–99	108 004	134
1980–89	88 629	47
1970–79	417 001	53
Total	1 060 005	360

Source: Swiss Re, sigma catastrophe database

Nine earthquakes since 1970 have each caused more than 25 000 deaths.

Nine earthquakes since 1970 have each resulted in more than 25 000 deaths (See Table 4). These events all occurred in less economically developed countries with low per-capita incomes and in regions that are usually densely populated and prone to earthquakes. These countries tend to have fewer resources for prevention- and post-disaster management.

Table 4
Deadliest earthquakes since 1970

Earthquake location	Year	Magnitude*	Number of victims[2]
Armenia	1988	M_L 6.9	25 000
China	1976	M_L 7.5	255 000
	2008	M_w 7.9	87 449
Indonesia, Thailand et al	2004	M_w 9.0	220 000
Iran	1978	M_L 7.7	25 000
	1990	M_L 7.7	40 000
	2003	M_L 6.5	26 271
Pakistan	2005	M_w 7.6	73 300
Peru	1970	M_L 7.7	66 000

* M_L = Richter scale; M_W = moment magnitude

Source: Swiss Re, sigma catastrophe database

Unlike other perils, earthquake activity is not influenced by humans or climate change.

No clear trend emerges from these figures. The earthquake activity itself is largely random, and the activity rates from a global perspective would not have changed in the last century and will likely not do so. In contrast to atmospherically influenced natural perils, earthquake activity – generally speaking – is not directly influenced by human interaction or the effects of climate change.

[2] Dead and missing

As population density increases, the risk of a damaging earthquake with a high death toll also increases.

A significant trend, however, has been happening on the exposure side: the size of the population as well as population density have been increasing steadily over time, with a particularly strong trend towards urbanisation in the last three decades. Nowadays, several large conurbations – ie cities with more than 10 to 15 million inhabitants (eg Istanbul, Teheran, Jakarta, Los Angeles and Tokyo) – are located in very seismic areas. This has dramatically increased the probability of damaging earthquakes that result in a high death toll.

Certain areas of the world are more prone to earthquakes than others.

Frequency of damaging earthquakes

Earthquakes tend to occur more frequently in certain areas of the world. Earthquake activity is very much concentrated along the plate boundaries. The continental rims of the Pacific Ocean as displayed in Figure 6 are characterised in part by their high frequency of strong earthquakes. However, not all of the activity results in damaging earthquakes. Luckily, most earthquake activity affects less inhabited areas.

Indonesia, Iran and China have had the most earthquakes since 1970.

According to the global seismological records, about 15 to 20 major earthquakes with a moment magnitude of 7.0 or larger occur each year around the world with some regularity. Most of them are not widely reported. Indonesia, Iran and China have had the most earthquakes since 1970 (see Table 5). Figure 6 provides an overview of the areas that are most prone to earthquakes with a moment magnitude of 6.0 or higher.

Table 5
Countries with the most earthquakes

Country	Number of earthquakes since 1970	Country	Number of earthquakes since 1970
Indonesia	35	Colombia	9
Iran	25	Japan	9
China	21	India	7
Turkey	13	Italy	7
Afghanistan	10	Greece	6
Mexico	10	Philippines	6
Pakistan	10	Algeria	5
Peru	10	Papua New Guinea	5

Source: Swiss Re, sigma catastrophe database

CatNet

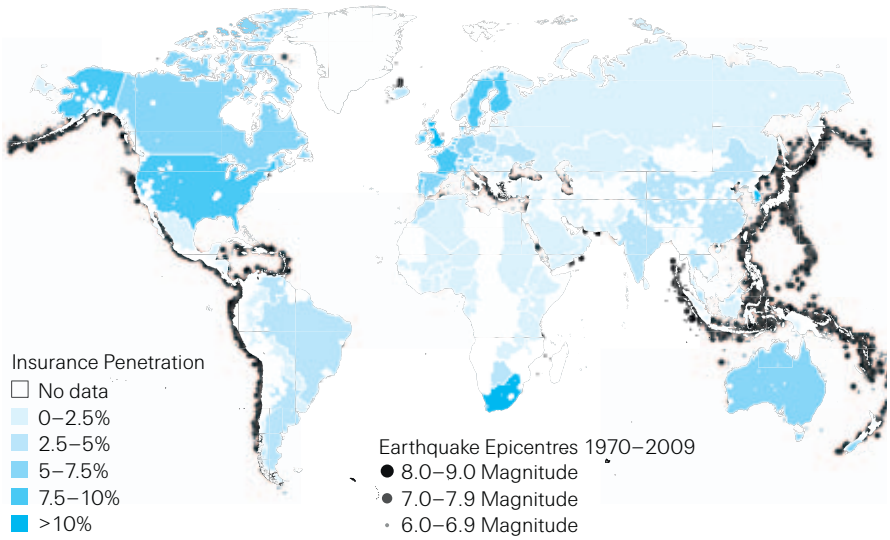
Swiss Re's CatNet service provides comprehensive information on worldwide natural hazards.

CatNet, a service provided by Swiss Re, offers comprehensive information on worldwide natural hazard data over the internet. It focuses primarily on NatCat insurance business and enables the user to obtain a quick overview of natural hazard data worldwide using an interactive atlas. Since 2008, business, hazard and geographical data have been combined with Google Maps and Images to help users improve natural catastrophe risk management.

CatNet, which covers 24 markets, provides information on natural catastrophe loss experience and loss potential.

CatNet provides information on natural catastrophe loss experience, assessments of loss potential and descriptions of the natural catastrophe insurance situation in 24 markets (Australia, Belgium, Canada, China (incl. Hong Kong), Colombia, France, Germany, India, Indonesia, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Philippines, Portugal, Puerto Rico, South Africa, Switzerland, Taiwan, Turkey, US, UK).

Figure 6
Historical epicentres with a moment magnitude of 6 or higher



Source: Swiss Re CatNet
http://www.nxtbook.fr/webapp/nxt/CatNet-Guide/Geoportal/index.php#/0

Economic losses from earthquakes are highest in economically advanced countries

Economic losses from earthquakes are highest in developed countries, but the death toll is usually lower.

Although the death toll is very much concentrated in the emerging markets, insured losses are by far the highest in the developed countries. The two costliest events were the 1994 Northridge earthquake in the US, which caused inflation-adjusted insured losses of over USD 20bn, and the 1995 Great Hanshin earthquake in Japan, which led to insured losses of USD 3.5bn. Although insured losses are often high, the figure for overall damages and economic losses is typically much higher.

Developed countries mitigate losses by taking preventative measures and investing in infrastructure.

The areas where the Northridge and Great Hanshin earthquakes occurred are earthquake-prone. Losses were extremely high in absolute terms because of the level of wealth in these areas. However, despite the fact that the epicentre of the Great Hanshin earthquake was below a densely populated and heavily industrialised large city area, the death toll (6 500) was relatively low compared to other earthquakes. This is even more true for the Northridge earthquake, which caused 61 casualties. Modern construction and advanced prevention measures for some of the buildings that were affected saved many lives and prevented even more damage. Most wealthier countries like the US and Japan also have better infrastructure (eg transportation, medical support) in place to limit the consequences of disasters.

Making the case for catastrophe insurance[3]

Earthquake insurance cover is still not commonplace around the world.

Earthquake insurance is still not commonplace in many countries with high earthquake exposure (See Figure 6). Typically, the majority of residential and small business risks do not have earthquake insurance cover in place. Even in developed economies, the current earthquake insurance take-up rates in heavily exposed areas seldom surpass 20%.

When earthquakes occur, interest in prevention and financing temporarily increases.

Each major earthquake temporarily heightens the awareness of seismic risk, damage, and pre-event and post-event mitigation solutions. As a result, new anti-seismic provisions in building codes are introduced, and certain structural design types are re-evaluated. The heavy financial burdens for government and society caused by earthquakes also trigger various initiatives to create financial risk management tools. Severe events are often a major driver for establishing pre-financing programmes for earthquake risk.

Insurance is important for disaster recovery. Without it, a region's economy could be adversely affected.

Insurance is a key component of disaster recovery. Catastrophe insurance provides individuals, business and states with the financial means to cope with and recover from a loss when resources are scarce. Without such catastrophe insurance, a community can stagnate and drop years behind in its development.

Insurers are willing to provide cover, but the awareness of earthquake risk is low.

Today's insurance industry is ready to provide more cover. However, countries with earthquake insurance programmes in place must improve awareness of earthquake risks even though earthquakes may not occur on a frequent basis.

Table 6
Top 10 costliest earthquakes since 1970

Earthquake location	Year	Magnitude*	Insured loss (in USD m indexed to 2009)	Victims[4]
US	1994	M_L 6.6	20 276	61
Japan	1995	M_L 7.2	3 482	6 425
Indonesia, Thailand et al	2004	M_W 9.0	2 273	220 000
US	1989	M_L 7.1	1 662	63
Taiwan	1999	M_L 7.0	1 289	3 400
Turkey	1999	M_L 7.0	1 289	19 118
Ecuador	1987	M_L 6.8	1 266	5 000
Australia	1989	M_L 5.5	1 207	11
Japan	2004	M_L 6.9	680	39
US	1987	M_L 6.0	676	8

* M_L = Richter scale; M_W = moment magnitude

Source: Swiss Re, sigma catastrophe database

Prevention- and post-disaster management are particularly important in emerging market countries, such as Haiti. Insurance plays a key role in financing reconstruction after a catastrophe. Contrary to most developed markets, private insurance often faces huge operational impediments in emerging countries. Frequently, the basic preconditions necessary for private insurance are missing; for example, broad access to payment systems may be lacking, property rights may be unclear, and deficiencies in the legal system may exist. In certain cases, large segments of the population are so poor that insuring themselves against adverse events is still a very low priority compared to their more urgent needs.

[3] Swiss Re (2005). A Shake in Insurance History: the 1906 San Francisco Earthquake
[4] Dead and missing

Public Private Partnerships (PPP)

For risks to be insurable, they must be quantifiable and random, and not too big compared to the capital available.

Insurers have developed several criteria that must be met for risks to be insurable. For example, risks must be quantifiable and random (eg it is difficult to insure terror risk). Risks must not be too big compared to the capital available in the insurance industry, and insurance has to be economically viable. Policyholders must also be able to afford a premium that reflects the risk transferred to the insurer. Based on these criteria, hurricane risk in the US is insurable, as well earthquake risk in most developed countries. However, affordability is often an insurability issue in emerging markets. Many people are simply too poor to afford insurance for their homes in earthquake-prone regions.

Public Private Partnerships (PPP) are a way to make uninsurable risks insurable.

Public Private Partnerships (PPP) can be used for making uninsurable risks insurable. A good example is government-defined land zones and building restrictions. Prudently chosen restrictions make insurance more affordable and may minimise the number of homeowners without insurance. A more interventionist example of PPP is when a government caps losses for the private insurance industry. Such measures became necessary after September 2001 to eliminate the least quantifiable – and hence least insurable – portion of the risk. This brought stability to the insurance market place, and made it possible for insurers to provide cover for airplanes and buildings.

PPPs are increasingly used in emerging markets. Private insurance solutions are also available to absorb catastrophe risk.

PPPs are also increasingly used in emerging markets. Subsidies from international organisations are used to provide coverage to people who otherwise could not afford it. Private market insurance solutions include microinsurance systems to organise distribution and claims management as well as reinsurance solutions or capital market solutions to absorb catastrophe risk.

PPP should be confined to situations where the insurability of otherwise uninsurable risk is supported.

It is important that PPP is confined to situations where the insurability of otherwise uninsurable risk is supported. Otherwise, the important economic feature of insurance, which assigns a price to each risk, is lost. It sometimes happens – for political reasons – that government-run insurance or reinsurance programmes do not charge enough for risk: premiums may be too low and there is not enough rate differentiation. The result is that individuals and corporations assume too much risk and neglect prevention. This increases the total economic loss and is bad news for taxpayers who usually have to pay for excess losses.

Tables for reporting year 2009

Table 7
List of major losses in 2009 according to loss category

	Number	in %	Victims[5]	in %	Insured loss[6] (in USD m)	in %
Natural catastrophes	**133**	**46.2%**	**8 977**	**60.2%**	**22 355**	**85.1%**
Floods	46		2 696		1 667	
Storms	51		3 188		13 548	
Earthquakes	12		1 699		609	
Droughts, bush fires, heat waves	8		603		1 748	
Cold, frost	6		538		586	
Hail	8		20		4 197	
Tsunami	1		190			
Other natural catastrophes	1		43			
Man-made disasters	**155**	**53.8%**	**5 939**	**39.8%**	**3 915**	**14.9%**
Major fires, explosions	**30**	**10.4%**	**756**	**5.1%**	**1 605**	**6.1%**
Industry, warehouses	14		134		1 245	
Oil, gas	3		11		140	
Department stores	1		29			
Other buildings	11		449		220	
Other fires, explosions	1		133			
Aviation disasters	**15**	**5.2%**	**783**	**5.2%**	**752**	**2.9%**
Crashes	11		783		285	
Space	4				467	
Maritime disasters	**39**	**13.5%**	**2 146**	**14.5%**	**1 359**	**5.2%**
Passenger ships	35		2 146			
Freighters/tankers	2				109	
Drilling platforms	2				1 250	
Rail disasters (incl. cableways)	**10**	**3.5%**	**70**	**0.5%**	**1**	**0.0%**
Mining accidents	**11**	**3.8%**	**544**	**3.6%**	**43**	**0.2%**
Collapse of buildings/bridges	**10**	**3.5%**	**410**	**2.7%**	**86**	**0.3%**
Miscellaneous	**40**	**13.9%**	**1 230**	**8.2%**	**69**	**0.2%**
Social unrest	12		477		4	
Terrorism	16		517			
Other miscellaneous losses	12		236		65	
Total	**288**	**100.0%**	**14 916**	**100.0%**	**26 270**	**100.0%**

Source: Swiss Re, sigma catastrophe database

[5] Dead or missing
[6] Property and business interruption, excluding liability and life insurance losses

Table 8
The 20 most costly insurance losses in 2009

Insured loss[7] (in USD m)	**Victims**[8]	**Date** (start)	**Event**	**Country**
3 372	25	24.01.2009	Winter storm Klaus, winds up to 170 km/h, heavy rain	France, Spain
1 350	15	10.02.2009	Thunderstorms, winds up to 145 km/h, hail	US
1 193	11	23.07.2009	Hail storm Wolfgang, winds up to 130 km/h	Switzerland, Austria, Poland et al
1 130	2	09.04.2009	Tornadoes, storms, winds up to 105 km/h, hail	US
1 079	173	07.02.2009	Victorian bush fires, winds up to 100 km/h	Australia
1 050	1	10.06.2009	Thunderstorms, winds up to 128 km/h	US
995	6	25.03.2009	Thunderstorms with hail	US
800	–	20.07.2009	Storms, heavy rain, hail	US
760	2	26.05.2009	Hail storm Felix, winds up to 90 km/h	France, Germany, Belgium
615	5	08.10.2009	Typhoon Melor/No 18, winds up to 204 km/h	Japan
570	–	07.05.2009	Storms, thunderstorms, winds up to 145 km/h; floods	US
569	–	01.04.2009	Losses to crops due to drought	Canada
565	23	26.01.2009	Winter storm, snow, ice, power outages	US
502	296	06.04.2009	Earthquake (M_W 6.3), aftershocks	Italy
500	–	05.06.2009	Storms, hail, heavy rain; floods	US
430	37	07.09.2009	Flash floods after heavy rain	Turkey
422	1	01.08.2009	Hail, storm, winds up to 100 km/h	Canada
400	854	26.09.2009	Typhoon Ketsana/No 16, winds up to 160 km/h; floods	Philippines, Vietnam, Cambodia et al
ns[9]	–	08.06.2009	Collision between vessel and platform	Atlantic Ocean, North Sea
ns[9]	–	21.08.2009	Leakage of gas, oil at oil field; explosion on drilling platform	Indian Ocean, Timor Sea

Source: Swiss Re, sigma catastrophe database

Table 9
The 20 worst catastrophes in terms of victims 2009

Victims[8]	**Insured loss**[7] (in USD m)	**Date** (start)	**Event**	**Country**
1 195	50	30.09.2009	Earthquake (M_W 7.6), aftershocks	Indonesia, Indian Ocean
930	130	07.08.2009	Typhoon Morakot/No 8, winds up to 148 km/h; floods	Taiwan, Philippines, China et al
854	400	26.09.2009	Typhoon Ketsana/No 16, winds up to 160 km/h; floods	Philippines, Vietnam, Cambodia et al
539	–	03.10.2009	Typhoon Parma/No 17, winds up to 195 km/h, heavy rain	Philippines, China, Taiwan et al
520		01.07.2009	Floods caused by monsoon rain	India
311	–	11.01.2009	Ferry Teratai Prima sinks	South China Sea, Indonesia
304	–	27.01.2009	Heat wave with temperatures of over 43 degrees Celsius	Australia
300	51	29.09.2009	Floods caused by heavy rain	India
296	502	06.04.2009	Earthquake (M_W 6.3), aftershocks	Italy
274	–	01.05.2009	Low temperatures, hail and snow	Peru
265	–	25.05.2009	Cyclone Aila, winds up to 120 km/h; floods	Bangladesh, India, Bhutan et al
234	–	28.03.2009	Overloaded boat carrying illegal immigrants sinks	Mediterranean Sea, Libya
231	–	08.09.2009	Overloaded ferry Tay Chay sinks during bad weather	North Atlantic, Sierra Leone
228	ns[9]	01.06.2009	Air France Airbus 330 crashes into the ocean	Atlantic Ocean
215	–	07.11.2009	Floods and mudslides caused by heavy rain	El Salvador
213	–	27.03.2009	Situ Gintung dam bursts after heavy rain	Indonesia
197	ns[9]	05.07.2009	Riots in Urumqi City	China
190	–	29.09.2009	Earthquake (M_W 8) triggers tsunami in the Pacific Ocean	Samoa, American Samoa et al
173	1 079	07.02.2009	Victorian bush fires, winds up to 100 km/h	Australia
172	10	27.10.2009	Typhoon Mirinae/No 21, winds up to 148 km/h; floods	Vietnam, Philippines, Cambodia et al

Source: Swiss Re, sigma catastrophe database

[7] Property and business interruption, excluding liability and life insurance losses; US natural catastrophe figures: with the permission of Property Claim Services (PCS)/incl. NFIP losses (see page 34 "Terms and selection criteria")
[8] Dead or missing
[9] ns: not shown

Table 10
Chronological list of all natural catastrophes 2009

Floods (46)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
8.1.–15.1.	Philippines Island of Mindanao, Caraga, Visayas, Catanduanes	Floods and landslides caused by heavy rain	20 dead, 13 missing 15 injured USD 2m total damage
8.1.–21.1.	Fiji Islands Vanua Levu and Viti Levu, Nadi, Ba, Sigatoka, Labosa	Floods caused by heavy rain	11 dead 2 000 homeless AUD 55m (USD 49m) total damage
31.1.–14.2.	Australia NSW, Queensland, Ingham, Mackay, Cairns	Floods caused by heavy rain and the two cyclones Ellie and Charlotte	7 dead USD 18m insured loss AUD 335m (USD 301m) total damage
2.2.–15.4.	Namibia, Angola Omusati, Ohangwena, Oshana, Oshikoto, Cunene, Luanda	Floods caused by heavy rain	92 dead 10 000 homeless
5.2.	Solomon Islands, South Pacific Ocean Guadalcanal, Savo	Floods caused by heavy rain	8 dead, 13 missing
16.2.–4.3.	Australia Western Australia, Pilbara	Floods and landslides caused by heavy rain; damage to infrastructure	USD 200m insured loss USD 250m total damage
16.2.–24.2.	Colombia Tumaco, Barbacoas, Roberto Payán, Magui Payán	Floods caused by heavy rain; Mira River bursts its banks: 1 125 houses destroyed, 20 000 hectares of farmland flooded	1 dead, 22 missing 5 000 homeless
17.2.	Bolivia La Paz	Mudslide caused by heavy rain	300 injured
2.3.	Peru Carabaya , Huanchumay	Land and mudslides caused by heavy rain	13 dead, 20 missing
25.3.–24.5.	Afghanistan Takhar, Balkh, Sari-i-Pul, Baghlan	Heavy rain and snowmelt cause avalanches and landslides; over 400 000 hectares of farmland destroyed	170 dead 35 injured
26.3.–30.4.	Zambia	Floods caused by heavy rain	31 dead
26.3.–31.3.	United States ND, Fargo	Wet snow, storms with winds up to 72 km/h; floods along the Red River	2 dead 60 injured USD 166m total damage
16.4.	Peru La Libertad, Chamanacucho, Aricapampa	Mudslide caused by heavy rain; 25 homes buried	1 dead, at least 30 missing 90 homeless
21.4.–1.6.	Tajikistan Khatlon	Floods, land- and mudslides caused by heavy rain; 2 000 houses, 40 bridges, 40 000 hectares of crops destroyed	23 dead 10 000 homeless USD 100m total damage
22.4.–28.5.	Brazil Maranhão, Ceara, Pará, Piauí	Floods, landslides, dam burst after heavy rain, town Trizidela do Vale flooded	57 dead 267 000 homeless USD 500m total damage
16.5.–25.5.	Haiti, United States, Dominican Republic Les Cayes, Camp Perrin, FL, Volusia	Floods and landslides caused by heavy rain	at least 13 dead, 5 missing 2 000 homeless USD 55m total damage
7.6.–9.6.	China Hunan, Guizhou	Floods caused by heavy rain; 16 060 hectares of crops destroyed	14 dead, 2 missing CNY 1.92bn (USD 281m) total damage
20.6.–1.7.	Czech Republic, Austria, Poland, Slovakia Jeseniky, Vienna	Floods caused by heavy rain; rivers burst their banks; 500 hectares of crops destroyed, roads, railway tracks flooded	16 dead EUR 240m (USD 344m) insured loss USD 500m total damage
22.6.–3.7.	Benin	Floods caused by heavy rain; 2 000 homes destroyed	7 dead 11 000 homeless

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
28.6.–5.7.	China Jiangxi, Guangxi, Hunan, Zhejiang, Anhui, Hubei, Chongqing, Sichuan, Guizhou, Yunnan, Fujian	Floods caused by heavy rain; 101 000 houses, 358 800 hectares of crops destroyed	18 dead, 10 missing 250 000 homeless CNY 4.7bn (USD 688m) total damage
1.7.–27.7.	India Assam, Orrisa, Bihar, West Bengal, Kerala, Gujarat, Karnataka	Floods caused by monsoon rain	520 dead 25 000 homeless
5.7.–7.7.	China, Vietnam Bac Kan, Lai Chau, Hunan, Guangxi, Fujian, Jiangxi, Guangdong	Floods and landslides caused by monsoon rain	48 dead, 5 missing
10.7.–11.9.	Sierra Leone, Burkina Faso, Senegal, Niger, Liberia, Guinea, Chad, Mauritania	Floods caused by heavy rain; damage to buildings, infrastructure	159 dead 150 000 homeless USD 300m total damage
14.7.–23.7.	China Sichuan, Beichuan, Wenchuan, Qingchuan, Kangding	Landslide caused by heavy rain; over 2 000 houses destroyed	4 dead, at least 50 missing 4 injured CNY 950m (USD 139m) total damage
17.7.–27.7.	Mongolia Ulaanbaatar, Bayanzurkh, Khan-Uul	Floods and landslides caused by heavy rain	26 dead 500 homeless
17.7.–27.7.	Japan Fukuoka, Kyushu, Chugoku, Honshu, Yamaguchi	Floods and landslides caused by heavy rain	31 dead 57 injured JPY 12.7bn (USD 136m) insured loss
18.7.–20.7.	Pakistan Karachi	Floods caused by heavy rain	52 dead 70 injured
23.7.	Colombia Choco, Novita	Land- and rockslide caused by heavy rain; prospectors caught in avalanche	5 dead, 25 missing 7 injured
25.7.–31.7.	Nepal Takdoo	Floods and landslides caused by heavy rain	30 dead
25.7.–27.7.	China Sichuan, Guizhou, Jiangxi	Floods and landslides caused by heavy rain	29 dead 38 injured CNY 225m (USD 33m) total damage
9.8.	India Uttarakhand, Pithoragarh	Floods and landslides caused by heavy rain; villages Jhakla and Leh washed away	45 dead
16.8.–18.8.	Pakistan North West Frontier, Mardan, Swabi	Floods caused by heavy rain; over 400 houses destroyed	27 dead, 9 missing
26.8.–29.8.	India Bihar, Darbhanga, Purnia, Sitamarhi, Saharsa, Madhubani	Floods caused by heavy rain	52 dead
7.9.–16.9.	Turkey Istanbul, Ikitelli, Halkali	Flash floods after heavy rain; roads, highways, houses, industrial facilities flooded	37 dead 20 injured EUR 300m (USD 430m) insured loss EUR 750m (USD 1.08bn) total damage
15.9.–18.9.	Indonesia North Sumatra, Muara, Batang Gadis, Mandailing Natal	Floods caused by heavy rain	15 dead, at least 25 missing
18.9.–22.9.	United States GA, Douglas, Floyd, Carroll, Atlanta	Floods caused by heavy rain; roads theme park flooded	9 dead USD 100–300m insured loss* USD 500m total damage
23.9.	Tunisia Redeyef, Gabes	Floods caused by heavy rain	17 dead, 3 missing
29.9.–12.10.	India Karnataka, Andhra Pradesh, Kurnool, Mahabubnagar, Krishna	Floods caused by heavy rain; Tungabhadra and Krishna Rivers burst their banks, cropland, sugarcane plantations flooded	300 dead 2 000 000 homeless INR 2.37bn (USD 51m) insured loss INR 100bn (USD 2.15bn) total damage

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
1.10.–6.10.	Italy Sicily, Messina, Taormina, Giampilieri	Land- and mudslides after rain bury neighbourhoods in villages	35 dead 140 injured 500 homeless USD 20m total damage
6.10.–7.10.	Nepal Sadi, Bhajang, Baridya, Salyan, Dang	Floods and landslides caused by heavy rain; over 3 000 houses destroyed, damage to infrastructure	60 dead 100 injured 25 000 homeless USD 5m insured loss USD 60m total damage
7.11.–9.11.	El Salvador San Vicente, San Salvador, Verapaz	Floods, land- and mudslides caused by heavy rain and winds; 2 000 houses, 37 bridges, roads, infrastructure destroyed	157 dead, 58 missing 3 000 homeless USD 880m total damage
7.11.–11.11.	Tanzania Morogoro, Dodoma, Goha	Floods and landslides caused by heavy rain	20 dead
8.11.–11.11.	India Tamil Nadu, Nilgiris, Ooty, Coonoor	Floods and landslides caused by heavy rain	42 dead 8 injured INR 3bn (USD 64m) total damage
17.11.–23.11.	United Kingdom, Ireland North Wales, north-western England, Cumbria, south-western Scotland, Cork	Floods caused by heavy rain; 6 bridges collapsed, 1 300 houses flooded	2 dead, 1 missing GBP 206m (USD 333m) insured loss GBP 300m (USD 484m) total damage
25.11.–26.11.	Saudi Arabia Jeddah	Floods caused by heavy rain; damage to 7 000 cars and 8 000 buildings	122 dead, 39 missing 10 000 homeless USD 900m total damage
26.11.–5.12.	Brazil, Uruguay São Paulo, Espirito Santo, Artigas	Floods and landslides caused by heavy rain; Tiete River bursts its banks	17 dead, 1 missing 3 000 homeless USD 9m total damage

Storms (51)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
21.1.–22.1	Madagascar, Indian Ocean Morondava	Cyclone Fanele with winds up to 210 km/h, heavy rain, flood	9 dead 27 injured 3 000 homeless
24.1.–25.1.	France, Spain Dordogne, Pyrenees, Galicia, Catalonia, Basque area, Aragón	Winter storm Klaus, winds up to 170 km/h, heavy rain, floods; severe damage to pine forest, property and infrastructure, power outages	25 dead 6 injured EUR 2.35bn (USD 3.37bn) insured loss EUR 4bn (USD 5.74bn) total damage
9.2.–10.2.	France, United Kingdom, Germany, Belgium, Luxembourg, Austria, Switzerland, Spain, Portugal	Winter storm Quinten with winds up to 150 km/h, heavy rain	4 injured EUR 250m (USD 359m) insured loss EUR 500m (USD 717m) total damage
10.2.–13.2.	United States OH, OK (Lone Grove), KY, TX, TN, PA, WV, MD, VA	Thunderstorms, winds up to 145 km/h, hail, heavy rain; gymnasium collapses	15 dead 50 injured USD 1–3bn insured loss* USD 2.5bn total damage
18.2.–19.2.	United States GA	Thunderstorms with winds up to 193 km/h	1 dead 22 injured USD 100–300m insured loss* USD 200m total damage
7.3.–9.3.	United States IL, MO, IN, OH, KY	Tornadoes with winds up to 146 km/h; hail	USD 25–100m insured loss* USD 100m total damage
28.3.–30.3.	Mozambique Zambezia	Tropical storm Izilda, winds up to 130 km/h; 3 000 homes, 2 500 hectares of crops destroyed	6 500 homeless USD 3m total damage
31.3.	India Orissa, Kendrapara	Thunderstorms, hail	15 dead 50 injured

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
9.4.–11.4.	United States GA, AL, TN, AR, SC, KY, MO	Tornadoes, storms with winds up to 105 km/h, hail	2 dead 48 injured USD 1–3bn insured loss* USD 1.7bn total damage
12.4.–14.4.	United States GA, AL, FL, MS	Storms with winds up to 112 km/h, hail	USD 100–300m insured loss* USD 250m total damage
16.4.–18.4.	United States TX	Storms, hail, heavy rain, floods	USD 100–300m insured loss* USD 240m total damage
17.4.–19.4.	Bangladesh, Bay of Bengal Cox's Bazar, Chittagong, Noakhali, Bhola	Cyclone Bijli, winds up to 90 km/h; 200 houses destroyed	6 dead 50 injured 1 000 homeless
24.4.–28.4.	United States TX, KS, MI, OK, IA, WI	Storms with winds up to 128 km/h, thunderstorms, hail, heavy rain; floods	USD 300–600m insured loss* USD 400m total damage
2.5.–7.5.	Philippines, Philippine Sea, South China Sea Luzon, Bicol, Catanduanes	Typhoon Kujira/No 1 with winds up to 148 km/h, floods and landslides	27 dead 5 injured 54 000 homeless USD 26m total damage
2.5.–6.5.	United States TX, AL, AR, NC, LA	Storms with winds up to 112 km/h, hail, heavy rain; floods	USD 100–300m insured loss*
3.5.	Nepal	Storm, heavy rain; floods	8 dead 100 injured
7.5.–10.5.	Philippines, Philippine Sea Ilocos, Cagayan Valley, Cordillera, Central Luzon	Typhoon Chan-Hom/No 2 with winds up to 139 km/h, heavy rain; floods and landslides, 2 811 houses destroyed	60 dead, 13 missing 40 injured PHP 1.28bn (USD 28m) total damage
7.5.–9.5.	United States IL, MO, KS, TX, KY, TN	Storms, thunderstorms with winds up to 145 km/h, floods	USD 300–600m insured loss* USD 800m total damage
11.5.	India Uttar Pradesh	Storm with winds up to 110 km/h, hail	32 dead 23 injured
13.5.–14.5.	United States OK, Anadarko, MO, Kirksville, IN, Indianapolis, IL, Gillespie	Thunderstorms, tornadoes with winds up to 180 km/h; hail	3 dead USD 100–300m insured loss* USD 200m total damage
25.5.–29.5.	Bangladesh, India, Bhutan, Bay of Bengal Sundarban islands, West Bengal, Kolkata, Bhola	Cyclone Aila with winds up to 120 km/h, heavy rain; mudslides, over 1 million houses, 450 000 hectares of crops destroyed	265 dead 7 103 injured 760 000 homeless INR 34bn (USD 731m) total damage
2.6.–6.6.	United States IN, Fishers, MO, FL	Thunderstorms, hail, rain, floods	USD 100–300m insured loss* USD 170m total damage
3.6.–6.6.	China Henan, Anhui, Shangqiu	Thunderstorms, hail, floods	52 dead 215 injured CNY 4.27bn (USD 625m) total damage
5.6.–8.6.	United States CO, NE, IA, MO, KS, IL	Storms with winds up to 110 km/h, hail, heavy rain, floods	USD 300–600m insured loss* USD 750m total damage
7.6.	India Uttar Pradesh	Thunderstorms, heavy rain, floods	20 dead
10.6.–18.6.	United States TX, NE, OK, KS, NC, AL, MO, AR, PA, TN, MS, SC, KY	Thunderstorms with wind up to 128 km/h; hail floods	1 dead 2 injured USD 1–3bn insured loss* USD 2bn total damage
14.6.–15.6.	China Anhui	Thunderstorm with winds up to 97 km/h, hail, floods; 9 690 houses, 24 300 hectares of crops destroyed	15 dead 181 injured CNY 450m (USD 66m) total damage
23.6.–26.6.	Philippines, Philippine Sea Luzon, Visayas	Typhoon Nangka/No 4, heavy rain, floods, landslides, 7 500 houses destroyed	8 dead, 12 missing 5 injured 15 000 homeless PHP 200m (USD 4m) total damage
25.6.	United States OH, Ohio Valley, Great Lakes, MI, CT	Thunderstorms with winds up to 128 km/h; hail, floods	USD 25–100m insured loss* USD 120m total damage

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
29.6.	India Bihar, Jharkhand	Storm, lightning, heavy rain	35 dead 12 injured
8.7.–10.7.	United States KS, Wichita, IA, SD, ND	Tornado, thunderstorms with winds up to 160 km/h, hail and heavy rain	USD 300–600m insured loss* USD 570m total damage
18.7.	Croatia Trencin	Tent collapses at Pohoda open-air music festival due to storm	1 dead 52 injured
20.7.–21.7.	United States CO, Denver, Wheat Ridge, Lakewood, Arvada	Storms, heavy rain, hail	USD 600m–1bn insured loss* USD 1.2bn total damage
24.7.–26.7.	Canada Ontario, Ottawa, Hamilton	Storms, tornadoes, heavy rain; damage to over 600 homes	1 dead CAD 232m (USD 221m) insured loss CAD 290m (USD 277m) total damage
24.7.–25.7.	United States MN, WI, IL, IA	Storms with winds up to 113 km/h, thunderstorms, hail	USD 100–300m insured loss* USD 310m total damage
29.7.	United States CO	Thunderstorms, heavy rain, hail	USD 100–300m insured loss* USD 300m total damage
2.8.–6.8.	China Chongqing	Storm, heavy rain, floods, landslides; 10 000 homes destroyed	10 dead, 1 missing CNY 738m (USD 108m) total damage
4.8.–9.8.	Philippines, China Negros Island, Mindanao, Hainan	Tropical storm Goni with winds up to 83 km/h, heavy rain, floods; over 575 houses, 68 000 hectares of crops destroyed	17 dead, 3 missing 10 injured USD 7m total damage
4.8.	United States KY, IN, Ohio Valley	Storms with winds up to 113 km/h, heavy rain; 20 buildings at University of Louisville flooded	USD 100–300m insured loss* USD 175m total damage
7.8.–17.8.	Taiwan, Philippines, China, South China Sea Kaohsiung, Taitung, Hsiaolin, Fujian, Zhejiang	Typhoon Morakot/No 8 with winds up to 148 km/h; freighter Chang Ying sinks; over 75 000 hectares of farmland flooded	738 dead, 192 missing 45 injured 6 000 homeless USD 130m insured loss USD 1.5bn total damage
7.8.–10.8.	United States IA, MI, CO, MN	Thunderstorms, hail	USD 100–300m insured loss*
20.8.	Canada Ontario, Toronto	Tornadoes, wind, hail, heavy rain, floods	CAD 107m (USD 102m) insured loss CAD 160m (USD 153m) total damage
2.9.–4.9.	Mexico Comondu, Loreto, Mulege	Hurricane Jimena with winds up to 205 km/h, heavy rain, floods; 4 000 houses destroyed	2 000 homeless USD 37m total damage
8.9.	Argentina, Brazil Misiones	Storm with winds up to 120 km/h, heavy rain, floods	17 dead 60 injured
13.9.–17.9.	China, Philippines, South China Sea Luzon Strait, Guangdong, Hong Kong, Yangchun, Xinyi, Luoding	Typhoon Koppu/No 15 with winds up to 138 km/h, heavy rain; floods, land- and mudslides	10 dead, at least 4 missing 74 injured CNY 1.75bn (USD 256m) total damage
26.9.–30.9.	Philippines, Vietnam, Cambodia, Lao People's Democratic Republic Luzon, Manila, Pampanga, Rizal, Kon Tum, Quang Nam, Quang Ngai, Tue	Typhoon Ketsana/No 16 with winds up to 160 km/h, heavy rain, landslides: industrial and commercial area flooded, 49 500 houses, 103 800 hectares of farmland destroyed	662 dead, 192 missing 1 547 injured 316 900 homeless USD 400m insured loss USD 1.03bn total damage
3.10.–14.10.	Philippines, China, Taiwan, Vietnam, South China Sea Bashi Channel, Luzon, Cagayan, Tuguegarao, Isabela, Quirino, Nueva Vizcaya	Typhoon Parma/No 17, winds up to 195 km/h, floods, land- and mudslides caused by heavy rain; 6 200 houses, 430 000 hectares of crops destroyed	492 dead, 47 missing 207 injured USD 540m total damage
8.10.–9.10.	Japan Aichi, Gifu, Mie, Shiga, Wakayama, Miyagi, Saitama	Typhoon Melor/No 18 with winds up to 204 km/h; damage to residential, commercial, industrial property	5 dead 135 injured USD 615m insured loss USD 1bn total damage

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
27.10.–6.11.	Vietnam, Philippines, Cambodia, South China Sea Phu Yen, Binh Dinh, Laguna, Santa Cruz, Manila	Typhoon Mirinae/No 21 with winds up to 148 km/h, heavy rain, floods; 10 000 houses, 19 000 hectares of rice destroyed	143 dead, 29 missing 100 injured USD 10m insured loss USD 280m total damage
5.11.–10.11.	United States, Nicaragua, Honduras, Mexico, Gulf of Mexico SC, NC, VA, MD, DE, NJ, Yucatan, Cancun	Hurricane Ida, winds up to 165 km/h, heavy rain; floods, 930 houses destroyed, beach erosion	5 300 homeless USD 200m insured loss
11.11.–14.11.	United States VA, NC, MD, DE	Storm with winds up to 113 km/h; heavy rain; floods	USD 100–300m insured loss* USD 260m total damage

Earthquakes (12)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
4.1.	Indonesia West Papua, Manokwari	Earthquake (M_W 7.6), aftershocks; damage to buildings, rice warehouse, roads, infrastructure	2 dead 50 injured USD 10m total damage
8.1.	Costa Rica San José, Alajuela	Earthquake (M_W 6.1), aftershocks, landslides; 5 highways, 9 bridges destroyed	18 dead, 47 missing 91 injured CRC 9.02bn (USD 16m) insured loss USD 100m total damage
12.2.	Indonesia, Philippine Sea Sulawesi, Kepulauan	Earthquake (M_W 7.2), aftershocks	64 injured USD 9m total damage
6.4.	Italy Abbruzo, L'Aquila, Onna, Castelnuovo, Fossa, Paganica, Tempera, Villa Sant'Angelo	Earthquake (M_W 6.3); aftershocks; 15 000 houses destroyed, 10 000 of L'Aquila's ancient buildings damaged	296 dead 1 500 injured 60 000 homeless EUR 350m (USD 502m) insured loss EUR 2bn (USD 2.87bn) total damage
17.4.	Afghanistan Nangarhar, Hindu Kush, Khogyani, Sherzad	Earthquake (M_W 5.5 and M_W 5.1); over 200 houses destroyed	22 dead 51 injured
28.5.	Honduras, Belize Cordero, El Progreso	Earthquake (M_W 7.1); Democracy Bridge collapses	7 dead 40 injured USD 125m total damage
10.7.	China Yunnan, Yao'an, Dali	Earthquake (M_W 5.7), aftershocks; over 18 000 houses destroyed	1 dead 31 injured 10 000 homeless CNY 400m (USD 59m) total damage
11.8.	Japan Honshu, Shizuoka	Earthquake (M_W 6.4); over 5 000 houses damaged	1 dead 319 injured JPY 3.8bn (USD 41m) insured loss
2.9.	Indonesia West Java, Bandung, Jakarta, Cikangkareng, Rawa	Earthquake (M_W 7), landslides	74 dead, 34 missing 925 injured 88 000 homeless IDR 1.5tr (USD 160m) total damage
30.9.	Indonesia, Indian Ocean West Sumatra, Padang, Kota Padang	Earthquake (M_W 7.6); damage to infrastructure, schools, hospitals, hotels, 100 000 houses	1 195 dead 2 000 injured 500 000 homeless USD 50m insured loss IDR 21.6tr (USD 2.3bn) total damage
4.11.	Iran Hormozgan, Bandar-e Abbas	Earthquake (M_W 4.8); damage to property and power lines	100 injured
9.11.	Indonesia Sumbawa, Raba	Earthquake (M_W 6.6)	2 dead 65 injured USD 2m total damage

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Droughts, bush fires, heat waves (8)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
1.1.–14.2.	China Anhui, Henan, Shandong, Shanxi, Gansu, Shaanxi, Hebei, Jiangsu	Drought; 10.3 million hectares of crops destroyed	CNY 1.6bn (USD 234m) total damage
27.1.–31.1.	Australia VIC, SA	Heat wave with temperatures of over 43 degrees Celsius	304 dead
7.2.–14.2.	Australia VIC, Marysville, Kinglake, Taggerty, Strathewen, St Andrews, Whittlesea, Wandong	Victorian bush fires with winds up to 100 km/h; 303 000 hectares of land, 2 029 houses destroyed	173 dead 500 injured 7 000 homeless AUD 1.2bn (USD 1.08bn) insured loss USD 1.3bn total damage
1.4.–31.5.	Canada Alberta	Losses to crops due to drought and earlier cool temperature	CAD 596m (USD 569m) insured loss
14.4.–26.6.	India Orissa, Bihar, Uttar Pradesh	Heat wave with temperatures of over 42 degrees Celsius	124 dead
5.5.–11.5.	United States CA, Santa Barbara	Jesusita urban forest fire; over 3 500 hectares of land, 78 homes destroyed	29 injured USD 100m insured loss
18.7.–5.8.	Canada British Columbia, Okanagan, West Kelowna	Wildfires after dry, hot weather	USD 110m total damage
20.7.–27.7.	Italy Sardinia	Forest fires; 25 000 hectares of land burnt	2 dead EUR 80m (USD 115m) total damage

Cold, frost (6)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
3.1.–14.1.	India Himachal Pradesh, Kashmir, Uttar Pradesh, Punjab, Haryana	Cold wave with temperatures close to freezing	100 dead
26.1.–28.1.	United States KY, AR, MO, IN, OH, OK	Winter storm, snow, ice; power outages	23 dead USD 300–600m insured loss* USD 700m total damage
2.2.–10.2.	United Kingdom London	Heavy snow, cold temperature; disruption of public transport system	GBP 3bn (USD 4.84bn) total damage
1.5.–4.8.	Peru Puno, Huãnuco, Cusco, Loreto, Junín, Huancavelica, Lima	Low temperatures, hail and snow	274 dead
11.11.–14.11.	China Hebei, Shijiazhuang, Shaanxi, Henan, Shanxi, Hubei, Shandong	Winter storm with heavy snow fall; 9 000 houses collapsed, damage to 200 000 hectares of crops	41 dead 96 injured CNY 142m (USD 21m) insured loss CNY 7bn (USD 1.03bn) total damage
19.12.–20.12.	Poland, Ukraine, Romania, Czech Republic, Germany Warsaw	Snow storms, temperatures of –20° Celsius	100 dead

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Hail (8)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
25.3.–26.3.	United States TX, MS, LA	Thunderstorms with hail; damage to vehicles and homes	6 dead 25 injured USD 600m–1bn insured loss* USD 1.5bn total damage
30.3.–31.3.	United States TX	Hail, storm with winds up to 80 km/h, heavy rain; floods	USD 165m insured loss USD 200m total damage
26.5.	France, Germany, Belgium South and East Bavaria	Hail storm Felix with winds up to 90 km/h, heavy rain	2 dead EUR 530m (USD 760m) insured loss EUR 700m (USD 1bn) total damage
15.6.–17.6.	Canada Ontario	Hail, storms, heavy rain	CAD 117m (USD 111m) insured loss
16.7.–20.7.	United States OK, TX	Hail, storms with winds up to 113 km/h	USD 100–300m insured loss* USD 240m total damage
23.7.–24.7.	Switzerland, Austria, Poland, Czech Republic, Slovakia, Germany Cantons of Bern, Freiburg, Vaud, Lucerne, Nidwalden	Hail storm Wolfgang with winds up to 130 km/h; damage to buildings, cars and some crops	11 dead 100 injured USD 1.19bn insured loss USD 1.8bn total damage
1.8.	Canada South Alberta, Edmonton	Hail, storm with winds up to 100 km/h; damage to agriculture, collapse of stage at Country Music Festival	1 dead 75 injured CAD 442m (USD 422m) insured loss CAD 660m (USD 630m) total damage
16.9.	United States TX, El Paso	Hailstorm; damage to vehicles and homes	USD 300–600m insured loss*

Tsunami (1)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
29.9.	Samoa, American Samoa, Tonga Pago Pago, Niuatoputapu, Apia	Earthquake (M_W 8) triggers series of tsunami in the Pacific Ocean	184 dead, 6 missing 335 injured 15 000 homeless USD 147m total damage

Other natural catastrophes (1)

Date	Country Place	Event	No. of victims/amount of damage in original currency and (USD)
4.1.	Guatemala Alta Verapaz	Landslide on mountainside buries road	at least 34 dead, at least 9 missing 21 injured

Source: Swiss Re, sigma catastrophe database

* Loss ranges for natural catastrophes in the US in Table 10: defined by Property Claim Services (PCS)

Table 11
Chronological list of all man-made disasters 2009

Major fires, explosions (30)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
1.1.	Thailand Bangkok	Fire at two-storey nightclub	66 dead 200 injured
8.1.	Pakistan Karachi	Fire at shanty town	40 dead 20 injured 200 homeless
11.1.	Israel Ashdod	Fire at chemical plant	8 injured
17.1.	Portugal Sines	Fire at oil refinery	
28.1.	Kenya Nairobi	Fire at supermarket	29 dead
31.1.	Kenya Molo	Explosion of petrol tanker	133 dead 200 injured
31.1.	Russia Komi, Podjelsk	Fire at nursing home	23 dead 3 injured
7.2.	South Africa Milnerton	Fire at printing press	
9.2.	China Beijing	Fire at luxury hotel	1 dead 7 injured USD 588m total damage
21.3.	Brazil Goias, Rio Verde	Fire at meatpacking plant	
23.3.	United Kingdom Scotland	Fire at power plant	
12.4.	Poland	Fire at homeless hostel	22 dead 20 injured
17.4.	South Africa Paarl	Fire at printing factory	9 dead 15 injured
4.5.	United States OH, West Carrollton	Explosion and fire at chemical plant; damage to nearby homes and businesses	4 injured
5.6.	Mexico Sonora	Fire at day-care centre	48 dead 23 injured
9.6.	United States NC, Garner	Fire at food processing plant	3 dead 38 injured
27.6.	Belgium Yara Tertre	Explosion at ammonia production plant	2 injured
22.7.	Germany Iserlohn, Stümmern	Explosion and fire at chemical plant	1 dead 8 injured
2.8.	Saudi Arabia Al Khobar	Fire at makeshift residential camp located close to gas plant	6 dead, 40 missing
16.8.	Kuwait Al-Jahra	Fire in wedding tent	44 dead 76 injured
17.8.	Russia Siberia, Khakassia	Explosion at Sayano-Shushenskaya hydroelectric power station; collapse of ceiling causes floods in turbine hall, engine room	71 dead, 4 missing 14 injured RUB 40bn (USD 1.32bn) total damage
4.9.	Canada Ontario	Fire at ice cream factory	
12.9.	Kazakhstan Taldykorgan	Fire at narcological dispensary	39 dead 12 injured
17.10.	Taiwan Taichung	Fire at glass plant	

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
23.10.	Puerto Rico San Juan	Explosion and fire at oil storage depot	2 injured USD 160m total damage
29.10.–1.11.	India Rajasthan, Jaipur	Explosions and fire at oil storage depot; damage to adjoining factories	11 dead 135 injured USD 200m total damage
10.11.	United Kingdom Scotland, Clackmannanshire	Fire at printing works	
16.11.	Philippines Manila	Fire in Mandaluyong slum area; over 400 houses destroyed	5 000 homeless PHP 8m total damage
4.12.	Indonesia North Sumatra, Medan	Fire at karaoke bar	20 dead 13 injured
5.12.	Russia Ural, Perm	Fire at night club	146 dead 86 injured

Aviation disasters (15)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
22.1.	Space	Power anomaly of Eutelsat W2M satellite	
1.2.–28.2.	Space	Power anomaly, pointing anomaly of Orbcomm CDS&QL 1–5 satellite	USD 60m total damage
7.2.	Brazil Santo António	Manaus Aerotáxi Embraer EMB-110P1 Bandeirante crashes in the Manacapuru River	24 dead
12.2.	United States NY, Buffalo	Colgan Air DHC-8 crashes in residential area	50 dead
25.2.	Netherlands Amsterdam-Schiphol International Airport	Turkish Airlines Boeing 737-8F2 lands 1.5 km short of runway	9 dead 50 injured
23.3.	Japan Tokyo-Narita Airport	Federal Express cargo plane MD-11 crashes on landing, catches fire	2 dead
6.4.	Indonesia Bandung-Husein Sastranegara International Airport	Indonesian Air Force Fokker F-27 crashes into airport hangar on landing; catches fire	24 dead
11.4.	Space	Antenna anomaly of Eutelsat W2A Solaris	
20.5.	Indonesia Java, Geplak	Indonesian Air Force C-130 Hercules crashes on landing; catches fire	100 dead 15 injured
1.6.	Atlantic Ocean	Air France Airbus A330 crashes into the ocean	50 dead, 178 missing
30.6.	Indian Ocean, Comoros	Yemenia Airways Airbus A310 crashes into sea while on approach	3 dead, 149 missing 1 injured
3.7.	Pakistan Peshawar, Chapri, Ferozkhel	Military transport helicopter crashes	26 dead
15.7.	Iran Qazvin	Caspian Airlines Tupolev 154M crashes shortly after take-off	168 dead
31.8.	Space	Failure of upper stage of Palapa-D satellite's launch vehicle	
22.12.	Jamaica Kingston-Norman Manley International Airport	American Airlines Boeing 737-823 overruns runway during storm with heavy rain	91 injured

Maritime disasters (39)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
4.1.	Nepal Sunsari	Overloaded boat capsizes on Koshi River	2 dead, 21 missing
11.1.	South China Sea, Indonesia Makassar Strait, Sulawesi	Ferry Teratai Prima sinks in rough weather	311 dead 35 injured
18.1.	Arabian Sea, Gulf of Aden, Yemen	Boat carrying illegal immigrants capsizes	9 dead, 12 missing
19.1.	Bangladesh	MV Sabbir-1 capsizes after collision with cargo vessel on Meghna River	22 dead
16.2.	Atlantic Ocean Canary Islands, Lanzarote	Overloaded boat carrying illegal immigrants capsizes	21 dead 6 injured
19.2.	Bangladesh Barisal	Collision between ferry and freighter on Kirtankhola River	38 dead, 11 missing
27.2.	Arabian Sea, Gulf of Aden, Yemen	Boat carrying illegal immigrants capsizes	45 dead
28.3.–30.3.	Mediterranean Sea, Libyan Arab Jamahiriya	Overloaded boat carrying illegal immigrants sinks	21 dead, 213 missing
4.4.	Arabian Sea, Gulf of Aden, Yemen	Boat carrying illegal immigrants capsizes	20 dead
20.4.–22.4.	Arabian Sea, Gulf of Aden, Yemen	Overloaded boat carrying illegal immigrants capsizes	35 dead
24.4.	East China Sea, China Shandong, Weihai	Car-carrier Dyvi Pacific strikes rocks and capsizes	
25.4.	South China Sea, Indonesia Strait of Malacca, Sumatra Island	Overloaded boat capsizes in bad weather	8 dead, 30 missing 22 injured
10.5.	Bangladesh Chandpur	Boat capsizes on Meghna River	5 dead, 25 missing
28.5.	South China Sea, Indonesia Strait of Malacca	Overloaded boat carrying illegal immigrants sinks	19 dead, 1 missing
8.6.	Atlantic Ocean, North Sea	Collision between vessel and platform	
14.6.	Arabian Sea, Gulf of Aden, Yemen	Boat carrying illegal immigrants capsizes in rough seas	18 dead, 29 missing
30.6.	Arabian Sea, Persian Gulf, Qatar Doha	Tug Demas Victory capsizes during storm	30 dead
26.7.	Atlantic Ocean, Turks and Caicos Islands Cockburn Town	Boat carrying illegal immigrants capsizes	16 dead, 66 missing 4 injured
31.7.–3.8.	North Atlantic, Norwegian Sea, Norway	Freighter Full City runs aground in rough weather; 200 tons of oil spilled at Sastein and Langesund beaches	
5.8.	South Pacific Ocean, Tonga Nomuka Islands	Ferry Princess Ashika sinks	2 dead, 73 missing NZD 25m (USD 18m) total damage
21.8.–3.11.	Indian Ocean, Timor Sea, Australia East Nusa Tenggara	Leakage of gas and oil at oil field: over 1 500 tons of oil spilled; explosion on drilling platform	
8.9.	China Anhui, Tongling	Boat capsizes on Yangtze River	20 dead
8.9.	Sierra Leone	Boat capsizes on Sierra Leone River in rough weather	70 dead
8.9.	North Atlantic, Sierra Leone Freetown	Overloaded ferry Tay Chay sinks during bad weather	120 dead, 111 missing
13.9.	Congo, Democratic Republic of (DRC) Katanga, Ankoro	Overloaded boat capsizes on Lualaba River	at least 14 dead, at least 34 missing
28.9.	India Bihar, Patna	Two overloaded boats capsize on Koshi River	64 dead

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
30.9.	India Kerala, Periyar Wildlife Sanctuary	Overloaded boat capsizes on Lake Thekkady	41 dead, 5 missing
10.10.	Cambodia Kratie	Overloaded boat capsizes on Mekong River	17 dead, 10 missing
19.10.	Ghana Kpando, Wusuta	Overloaded boat capsizes on Lake Volta	20 dead
11.11.–13.11.	Arabian Sea, India Maharashtra	Fishing vessels disappeared during Cyclone Phyan	28 dead, 34 missing
15.11.	Myanmar (Burma) Irrawaddy Delta	Collision of barge and ferry on Ngawun River	34 dead, 16 missing
22.11.	Indian Ocean, Indonesia Malacca Strait, Sumatra, Karimun	Overloaded ferry Dumai Express 10 sinks in stormy weather	32 dead, 16 missing
25.11.	Congo, Democratic Republic of (DRC) Bandundu	Two overloaded ferries sink on Lake Mai-Ndombe	73 dead
27.11.	Bangladesh Bhola, Lalmohon, Nazirpur	Overloaded ferry MV Koko-4 capsizes on Tentulia River	at least 87 dead, 4 missing
4.12.	Bangladesh Kishoreganj	Overloaded boat capsizes after collision with small ferry on Daira River	at least 47 dead, 6 missing
4.12.	Egypt Beheira, Rosetta	Collision of two ferries on the Nile; one boat splits apart and sinks	20 missing 12 injured
17.12.	Mediterranean Sea, Lebanon Lattakia, Jabli, Banyas	Freighter MV Danny Two loaded with 10 000 sheep and 18 000 cattle capsizes in stormy weather	17 dead, 26 missing 2 injured
24.12.	South China Sea, Philippines Manila Bay, Limbones Island	Two boats collide; wooden vessel Catalyn-B sinks	16 dead, 11 missing
26.12.	Philippine Sea, Philippines Verde Island, Batangas	Ferry MV Baleno 9 sinks	6 dead, 44 missing

Rail disasters including cableways (10)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
1.2.	South Africa Johannesburg, Lenasia	Collision between two commuter trains	160 injured
1.2.	South Africa Johannesburg, Gauteng, Ekurhuleni	Head-on collision of two trains at Springs West train station	100 injured
18.4.	Mexico Mexico City	Collision of two commuter trains at San Rafael station	80 injured
22.6.	United States Washington, DC	Metro train hits a stationary train	9 dead 51 injured
29.6.	China Hunan, Chenzhou	Collision of two passenger trains; seven coaches derail	3 dead 60 injured
29.6.	Italy Tuscany, Viareggio	One coach transporting liquefied petroleum gas derails and explodes; damage to nearby homes	29 dead 17 injured 100 homeless
24.7.	Croatia Rudine	Passenger train derails	6 dead 55 injured
13.9.	Germany Sachsen	Collision between two narrow gauge steam trains	52 injured
7.10.	India Bihar, Naugachia	7 coaches of a passenger train derail	1 dead 50 injured
21.10.	India Uttar Pradesh, Mathura	Goa Samparkranti Express crashes into stationary Mewar Express	22 dead 23 injured

Mining accidents (11)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
22.2.	China Shanxi, Gujiao	Gas explosion at coal mine	77 dead, 1 missing 114 injured
29.3.	Tanzania Mwanza, Geita	Flooding and collapse of gold mine due to heavy rain	20 dead
18.5.–19.5.	Philippines Compostela Valley, Pantukan	Landslides at gold mine due to heavy rain	26 dead, 6 missing 50 injured
18.5.–31.5.	South Africa Free State, Welkom	Fire at gold mine	76 dead
22.5.	South Africa Savuka	Damage to underground infrastructure at Savuka gold mine	
5.6.	China Chongqing, Wulong	Rockslide at Jiwei Mountain buries iron ore mining plant; 12 houses destroyed	8 dead, 64 missing 8 injured
16.6.	Indonesia Sumatra, Sawahlunto	Gas explosion at coal mine	32 dead, 1 missing 6 injured
10.8.	Slovakia Handlova	Gas explosion at coal mine	20 dead
8.9.	China Henan, Pingdingshan	Explosion at coal mine	44 dead, 35 missing 14 injured
8.10.	China Hunan	Two mine cages fall 240 metres at antimony mine	26 dead 5 injured
21.11.	China Heilongjiang, Hegang	Gas explosion at Xinxing coal mine	108 dead 60 injured

Collapse of buildings/bridges (10)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
18.1.–19.1.	Brazil São Paulo, Cambuci	Collapse of church roof	9 dead 93 injured
3.3.	Germany Cologne	Collapse of historical city archive; damage to neighbouring buildings	2 dead EUR 102m (USD 146m) total damage
27.3.	Indonesia Jakarta, Cireundeu	Situ Gintung dam bursts after heavy rain; flood and mudslides, 500 houses destroyed	98 dead, 115 missing 113 injured 1 600 homeless
31.3.	India Kashmir, Baramulla	Roof of school building collapses	52 injured
30.5.	Myanmar (Burma) Dala	Collapse of ancient Pagoda	5 dead 50 injured
31.7.	Pakistan Karachi	Collapse of five-storey building	23 dead
23.9.	India Chhattisgarh, Korba	Collapse of large chimney at power plant	45 dead, 20 missing 7 injured
30.9.	Nepal Dharan	Collapse of three-storey bamboo structure attached to a church	23 dead 63 injured
19.10.	Kenya Kiambu	Five-storey building – under construction – collapses	16 dead, 9 missing 11 injured
24.12.	India Rajasthan, Kota	Bridge – under construction – over Chambal River collapses	30 dead, 15 missing 5 injured

Miscellaneous (40)

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
1.1.	India Assam	Series of bomb explosions in the town of Guwahati	5 dead 62 injured
27.1.	Arabian Sea, Gulf of Aden, Yemen	Smugglers force illegal immigrants to jump overboard	35 dead
5.2.	Pakistan Punjab, Dera Ghazi Khan	Bomb explodes near mosque	33 dead 52 injured
7.2.	Madagascar Antananarivo	Clashes between demonstrators and police	28 dead
1.3.–2.3.	Bangladesh Dhaka	Revolt of border guards	63 dead, 72 missing
4.3.	Mexico Ciudad Juarez	Prison riots	20 dead 6 injured
27.3.	Pakistan North West Frontier, Jamrud	Suicide bombing on mosque	70 dead 30 injured
29.3.	Ivory Coast Abidjan	Stampede at a football stadium	19 dead 132 injured
30.3.	Pakistan Lahore	Attack on police academy, hostages taken	20 dead 100 injured
5.4.	Pakistan Punjab, Chakwal	Suicide bombing on mosque	22 dead 50 injured
12.4.–13.4.	Thailand Bangkok	Clashes between anti-government protesters and police	2 dead 135 injured
18.4.	Pakistan Hangue, Doaba	Suicide bomb attack on convoy passing a checkpoint	20 dead 15 injured
24.4.–14.5.	China Jilin	Poisonous gas leakage from chemical plant	161 injured
29.4.	Pakistan Karachi	Riots; 5 000 industrial units closed	21 dead 23 injured
4.5.	Turkey Bilge	Armed attack during wedding party	44 dead 6 injured
28.5.–4.6.	Indonesia Bali	Poisoning due to alcohol laced with methanol	25 dead 20 injured
4.6.–6.6.	Peru Bagua	Clashes between police and Amazon Indians	31 dead 197 injured
9.6.	Pakistan North West Frontier, Peshawar	Car bomb attack at luxury hotel	11 dead 50 injured
13.6.-27.6	Iran Tehran	Clashes over disputed election results	25 dead 100 injured
29.6.	Honduras Tegucigalpa	Clashes between police and demonstrators	1 dead 60 injured
5.7.	China Xinjiang	Riots in Urumqi City	197 dead 1 721 injured CNY 100m (USD 15m) total damage
17.7.	Indonesia Kuningan, Jakarta	Suicide bombings at five-star hotels Ritz Carlton and JW Marriott	9 dead 53 injured
21.7.	Poland Warsaw	Clashes between police and retailers at shopping centre	50 injured
28.7.	China Inner Mongolia, Chifeng	Poisoning due to contaminated tap water	59 injured
29.7.	Spain Burgos	Car bomb explodes near 14-story Civil Guard barracks building	60 injured
1.8.-21.8.	Mediterranean Sea, Italy Lampedusa	Illegal immigrants die during journey	73 missing

Date	Country Place	Event	No. of victims/amount of total damage in original currency and (USD)
6.8.	United Kingdom London	Robbery at jewellery boutique in Mayfair	
8.8.	United States CA, Los Angeles	Riots in prison	55 injured
15.8.	Bangladesh Sadar upazila, Kachichar	Clashes between opposition political parties	50 injured
17.8.	Russia Ingushetia, Nazran	Suicide bomb attack on police station	20 dead 100 injured
14.9.	Pakistan Karachi, Khori	Stampede during distribution of free rations at Jodia Bazaar	20 dead 30 injured
15.9.	Kenya Samburu, Laikipia	Clashes between two communities over land and water	24 dead
12.10.	Pakistan Shangla	Suicide bombing at bazaar	45 dead 40 injured
28.10.	Pakistan North West Frontier, Peshawar	Car bomb explodes in crowded Meena marketplace	118 dead 200 injured
2.11.	Pakistan Punjab, Rawalpindi	Suicide bomb attack in car park of National Bank of Pakistan	35 dead 63 injured
10.11.	Pakistan North West Frontier, Peshawar	Car bomb explodes in busy market place	30 dead 70 injured
25.11.–4.12.	Nepal Kailali, Dudejhari forest	Riots between landless squatters and police	5 dead 83 injured
27.11.	Russia Tver	Bomb attack on high-speed train; three coaches derail	26 dead, 4 missing 90 injured
7.12.	Pakistan Lahore, Allama Iqbal	Two suicide bombings at Moon market	49 dead 100 injured
27.12.	Iran Tehran	Clashes between anti-government protesters and police	8 dead 60 injured

Source: Swiss Re, sigma catastrophe database

Tables showing the major losses 1970–2009

Table 12
The 40 most costly insurance losses 1970–2009

Insured loss[10] (in USD m, indexed to 2009)	**Victims**[11]	**Date** (start)	**Event**	**Country**
71 163	1 836	25.08.2005	Hurricane Katrina; floods, dams burst, damage to oil rigs	US, Gulf of Mexico, Bahamas, North Atlantic
24 479	43	23.08.1992	Hurricane Andrew; floods	US, Bahamas
22 767	2 982	11.09.2001	Terror attack on WTC, Pentagon and other buildings	US
20 276	61	17.01.1994	Northridge earthquake (M 6.6)	US
19 940	136	06.09.2008	Hurricane Ike; floods, offshore damage	US, Caribbean: Gulf of Mexico et al
14 642	124	02.09.2004	Hurricane Ivan; damage to oil rigs	US, Caribbean; Barbados et al
13 807	35	19.10.2005	Hurricane Wilma; floods	US, Mexico, Jamaica, Haiti et al
11 089	34	20.09.2005	Hurricane Rita; floods, damage to oil rigs	US, Gulf of Mexico, Cuba
9 148	24	11.08.2004	Hurricane Charley; floods	US, Cuba, Jamaica et al
8 899	51	27.09.1991	Typhoon Mireille/No 19	Japan
7 916	71	15.09.1989	Hurricane Hugo	US, Puerto Rico et al
7 672	95	25.01.1990	Winter storm Daria	France, UK, Belgium, NL et al
7 475	110	25.12.1999	Winter storm Lothar	Switzerland, UK, France et al
6 309	54	18.01.2007	Winter storm Kyrill; floods	Germany, UK, NL, Belgium et al
5 857	22	15.10.1987	Storm and floods in Europe	France, UK, Netherlands et al
5 848	38	26.08.2004	Hurricane Frances	US, Bahamas
5 242	64	25.02.1990	Winter storm Vivian	Europe
5 206	26	22.09.1999	Typhoon Bart/No 18	Japan
4 649	600	20.09.1998	Hurricane Georges; floods	US, Caribbean
4 369	41	05.06.2001	Tropical storm Allison; floods	US
4 321	3 034	13.09.2004	Hurricane Jeanne; floods, landslides	US, Caribbean: Haiti et al
4 074	45	06.09.2004	Typhoon Songda/No 18	Japan, South Korea
3 988	135	26.08.2008	Hurricane Gustav; floods, offshore damage	US, Caribbean: Gulf of Mexico et al
3 740	45	02.05.2003	Thunderstorms, tornadoes, hail	US
3 637	70	10.09.1999	Hurricane Floyd; floods	US, Bahamas, Columbia
3 631	167	06.07.1988	Explosion on platform Piper Alpha	UK
3 530	59	01.10.1995	Hurricane Opal; floods	US, Mexico, Gulf of Mexico
3 482	6 425	17.01.1995	Great Hanshin earthquake (M 7.2) in Kobe	Japan
3 372	25	24.01.2009	Winter storm Klaus	France, Spain
3 093	45	27.12.1999	Winter storm Martin	Spain, France, Switzerland
2 917	246	10.03.1993	Blizzard, tornadoes, floods	US, Canada, Mexico, Cuba
2 755	38	06.08.2002	Severe floods	UK, Spain, Germany, Austria et al
2 680	26	20.10.1991	Forest fires which spread to urban areas, drought	US
2 667	–	06.04.2001	Hail, floods and tornadoes	US
2 575	4	25.06.2007	Heavy rainfall, floods	UK
2 540	30	18.09.2003	Hurricane Isabel	US, Canada
2 488	39	05.09.1996	Hurricane Fran	US
2 454	20	03.12.1999	Winter storm Anatol	Denmark, Sweden, UK et al
2 448	4	11.09.1992	Hurricane Iniki	US, North Pacific Ocean
2 361	–	29.08.1979	Hurricane Frederic	US

Source: Swiss Re, sigma catastrophe database

[10] Property and business interruption, excluding liability and life insurance losses;
US natural catastrophe figures: with the permission of Property Claim Services (PCS)/incl. NFIP losses (see page 34 "Terms and selection criteria")
[11] Dead and missing

Table 13
The 40 worst catastrophes in terms of victims 1970–2009

Victims[12]	**Insured loss**[13] (in USD m, indexed to 2009)	**Date** (start)	**Event**	**Country**
300 000	–	14.11.1970	Storm and flood catastrophe	Bangladesh, Bay of Bengal
255 000	–	28.07.1976	Earthquake (M 7.5)	China
220 000	2 273	26.12.2004	Earthquake (M_W 9), tsunami in Indian Ocean	Indonesia, Thailand et al
138 373	–	02.05.2008	Tropical cyclone Nargis; Irrawaddy Delta flooded	Myanmar (Burma), Bay of Bengal
138 000	3	29.04.1991	Tropical cyclone Gorky	Bangladesh
87 449	365	12.05.2008	Earthquake (M_W 7.9) in Sichuan, aftershocks	China
73 300	–	08.10.2005	Earthquake (M_W 7.6); aftershocks, landslides	Pakistan, India, Afghanistan
66 000	–	31.05.1970	Earthquake (M 7.7); rock slides	Peru
40 000	189	21.06.1990	Earthquake (M 7.7); landslides	Iran
35 000	–	01.06.2003	Heat wave and drought in Europe	France, Italy, Germany et al
26 271	–	26.12.2003	Earthquake (M 6.5) destroys 85% of Bam	Iran
25 000	–	07.12.1988	Earthquake (M 6.9)	Armenia, ex-USSR
25 000	–	16.09.1978	Earthquake (M 7.7) in Tabas	Iran
23 000	–	13.11.1985	Volcanic eruption on Nevado del Ruiz	Colombia
22 084	283	04.02.1976	Earthquake (M 7.5)	Guatemala
19 737	121	26.01.2001	Earthquake (M_W 7.6) in Gujarat	India, Pakistan, Nepal et al
19 118	1 289	17.08.1999	Earthquake (M_L 7) in Izmit	Turkey
15 000	–	11.08.1979	Macchu dam burst in Morvi	India
15 000	–	01.09.1978	Floods following monsoon rains in the north	India, Bangladesh
15 000	129	29.10.1999	Cyclone 05B devastates Orissa state	India, Bangladesh
11 069	–	25.05.1985	Tropical cyclone in Bay of Bengal	Bangladesh
10 800	–	31.10.1971	Floods in Bay of Bengal and Orissa state	India
10 000	284	12.12.1999	Floods, mudflows and landslides	Venezuela, Colombia
10 000	–	20.11.1977	Tropical cyclone in Andrah Pradesh	India, Bay of Bengal
9 500	643	19.09.1985	Earthquake (M 8.1)	Mexico
9 475	–	30.09.1993	Earthquake (M 6.4) in Maharashtra	India
9 000	658	22.10.1998	Hurricane Mitch in Central America	Honduras, Nicaragua et al
6 425	3 482	17.01.1995	Great Hanshin earthquake (M 7.2) in Kobe	Japan
6 304	–	05.11.1991	Typhoons Thelma and Uring	Philippines
6 000	–	02.12.1984	Accident in chemical plant in Bhopal	India
6 000	–	01.06.1976	Heat wave, drought	France
5 778	43	27.05.2006	Earthquake (M_L 6.3); Bantul almost destroyed	Indonesia
5 422	–	26.06.1976	Earthquake (M 7.1)	Papua New Guinea, Indonesia et al
5 374	–	10.04.1972	Earthquake (M 6.9) in Fars	Iran
5 300	–	28.12.1974	Earthquake (M 6.3)	Pakistan
5 000	1 266	05.03.1987	Earthquake; oil pipeline damaged	Ecuador
5 000	667	23.12.1972	Earthquake (M 6.3) in Managua	Nicaragua
5 000	–	30.06.1976	Earthquake in West Irian	Indonesia
4 500	–	10.10.1980	Earthquake in El Asnam	Algeria
4 375	–	21.12.1987	Ferry Dona Paz collides with oil tanker Victor	Philippines

Source: Swiss Re, sigma catastrophe database

[12] Dead and missing
[13] Property and business interruption, excluding liability and life insurance losses;
US natural catastrophe figures: with the permission of Property Claim Services (PCS)/incl. NFIP losses (see page 34 "Terms and selection criteria")

Terms and selection criteria

A natural catastrophe is caused by natural forces.

Natural catastrophes

The term "natural catastrophe" refers to an event caused by natural forces. Such an event generally results in a large number of individual losses involving many insurance policies. The scale of the losses resulting from a catastrophe depends not only on the severity of the natural forces concerned, but also on man-made factors, such as building design or the efficiency of disaster control in the afflicted region. In this *sigma* study, natural catastrophes are subdivided into the following categories: floods, storms, earthquakes, droughts/forest fires/heat waves, cold waves/frost, hail, tsunami and other natural catastrophes.

A man-made or technical disaster is triggered by human activities.

Man-made disasters

This study categorises as "man-made" or "technical" disasters major events associated with human activities. Generally, a large object in a very limited space is affected, which is covered by a small number of insurance policies. War, civil war and war-like events are excluded. *sigma* subdivides man-made disasters into the following categories: major fires and explosions, aviation and space disasters, maritime disasters, rail disasters, mining accidents, collapse of buildings/bridges and miscellaneous (including terrorism). In Tables 10 and 11 (pages 17–31), all major natural catastrophes and man-made disasters and the associated losses are listed chronologically.

Losses due to property damage and business interruption that are directly attributable to major events are included in this study.

Total losses

For the purposes of the present *sigma* study, total losses are all the financial losses directly attributable to a major event, ie damage to buildings, infrastructure, vehicles etc. The term also includes losses due to business interruption as a direct consequence of the property damage. A figure identified as "total damage" or "economic loss" includes all damage, insured and uninsured. Total loss figures do not include indirect financial losses – ie loss of earnings by suppliers due to disabled businesses, estimated shortfalls in gross domestic product, and non-economic losses, such as loss of reputation or impaired quality of life.

The amount of the total losses is a general indication only.

Generally, total (or economic) losses are estimated and communicated in very different ways. As a result, they are not directly comparable and should be seen only as an indication of the general order of magnitude.

The term "losses" refers to insured losses, but do not include liability.

Insured losses

"Losses" refer to all insured losses except liability. Leaving aside the liability losses, on one hand, allows a relatively swift assessment of the insurance year; on the other hand, however, it tends to understate the cost of man-made disasters. Life insurance losses are also not included.

NFIP flood damage in the US is included.

NFIP flood damage in the US

The sigma catastrophe database also includes flood damage covered by the National Flood Insurance Program (NFIP) in the US, provided that it fulfils the *sigma* selection criteria.

Selection criteria
sigma has been publishing tables listing major losses since 1970. Thresholds with respect to casualties – the number of dead, missing, severely injured, and homeless – also make it possible to tabulate events in regions where the insurance penetration is below average.

Thresholds for insured losses and casualties in 2009

For the 2009 reporting year, the lower loss thresholds were set as follows:

Insured losses:
- Maritime disasters USD 17.1m
- Aviation USD 34.3m
- Other losses USD 42.6m

or Total economic losses: USD 85.2m

or Casualties:
- Dead or missing 20
- Injured 50
- Homeless 2 000

Losses are determined using year-end exchange rates and are then adjusted for inflation.

Adjustment for inflation, changes to published data, information
sigma converts all losses for the occurrence year not given in USD into USD using the end-of-year exchange rate. To adjust for inflation, these USD values are extrapolated using the US consumer price index to give current (2009) values.

This can be illustrated by examining the insured property losses arising from the floods which occurred in the UK between 29 October and 10 November 2000:

Insured loss at 2000 prices: USD 1 045.7m
Insured loss at 2009 prices: USD 1 303.6m

Alternatively, were one to adjust the losses in the original currency (GBP) for inflation and then convert them to USD using the current exchange rate, one would end up with an insured loss at 2009 prices of USD 1 346m, 3% more than with the standard *sigma* method. The reason for the difference is that the value of the GBP rose by 10% against the USD in the period 2000–2009, ie more than the difference in inflation between the US (24.7%) and the UK (19%) over the same period.

Figure 7
Alternative methods of adjusting for inflation, by comparison

Floods UK
29 October–10 November 2000

	GBPm	Exchange rate USD/GBP	USDm	US inflation USDm
Original loss	700.0	1.4939	1 045.7	1 045.7
Level of consumer price index 2000	93.1			172.2
Level of consumer price index 2009	110.8			214.7
Inflation factor	1.191			1.247
Adjusted for inflation to 2009	833.5	1.6148	1 346.2	1 303.6
Comparison			103%	100%

Source: Swiss Re, sigma catastrophe database

Changes to loss amounts of previously published events are updated in the sigma database.

If changes to the loss amounts of previously published events become known, *sigma* takes these into account in its database. However, these changes only become evident when an event appears in the table of the 40 most costly insured losses or the 40 disasters with the most fatalities since 1970 (See Tables 12 and 13 on pages 32–33).

Information on individual events is not available.

In the chronological lists of all man-made disasters, the insured losses are not shown for data protection reasons. However, the total of these insured losses is included in the list of major losses in 2009 according to loss category. *sigma* does not provide further information on individual insured losses or about updates made to published data.

Newspapers, direct insurance and reinsurance periodicals, specialist publications and other reports are used to compile this study.

Sources
Information is collected from newspapers, direct insurance and reinsurance periodicals, specialist publications (in printed or electronic form) and reports from insurers and reinsurers.[14] In no event shall Swiss Re be liable for any loss or damage arising in connection with the use of this information (see the copyright information in the impressum).

Table 14
Exchange rates used when converting total damage and/or insured losses

Exchange rate used,[15] national currency per USD

Country	Currency	Exchange rate, end 2009
Australia	AUD	1.1119
Bangladesh	BDT	69.2600
Brazil	BRL	1.7432
Canada	CAD	1.0484
China, PRC	CNY	6.8270
Costa Rica	CRC	554.5000
Europe	EUR	0.6970
India	INR	46.5350
Indonesia	IDR	9395.0000
Japan	JPY	93.0950
New Zealand	NZD	1.3743
Norway	NOK	5.7769
Philippines	PHP	46.2300
Russia	RUB	30.3136
South Africa	ZAR	7.3638
Taiwan, ROC	TWD	31.9850
United Kingdom	GPB	0.6193
USA	USD	1.00

Source: Swiss Re, sigma catastrophe database

[14] Natural catastrophes in the US: those sigma figures which are based exclusively on estimates of Property Claim Services (PCS), a unit of the Insurance Services Office, Inc (ISO), are given for each individual event in ranges defined by PCS. The estimates are the property of ISO and may not be printed or used for any purpose, including use as a component in any financial instruments, without the express consent of ISO.
[15] The losses for 2009 were converted to USD using these exchange rates. No losses in any other currencies were reported.

Recent *sigma* publications

2010	No 1	Natural catastrophes and man-made disasters in 2009: catastrophes claim fewer victims, insured losses fall
2009	No 1	Scenario analysis in insurance
	No 2	Natural catastrophes and man-made disasters in 2008: North America and Asia suffer heavy losses
	No 3	World insurance in 2008: life premiums fall in the industrialised countries – strong growth in the emerging economies
	No 4	The role of indices in transferring insurance risks to the capital markets
	No 5	Commercial liability: a challenge for businesses and their insurers
2008	No 1	Natural catastrophes and man-made disasters in 2007: high losses in Europe
	No 2	Non-life claims reserving: improving on a strategic challenge
	No 3	World insurance in 2007: emerging markets leading the way
	No 4	Innovative ways of financing retirement
	No 5	Insurance in the emerging markets: overview and prospects for Islamic insurance
2007	No 1	Insurance in emerging markets: sound development; greenfield for agricultural insurance
	No 2	Natural catastrophes and man-made disasters in 2006: low insured losses
	No 3	Annuities: a private solution to longevity risk
	No 4	World insurance in 2006: premiums came back to "life"
	No 5	Bancassurance: emerging trends, opportunities and challenges
	No 6	To your health: diagnosing the state of healthcare and the global private medical insurance industry
2006	No 1	Getting together: globals take the lead in life insurance M&A
	No 2	Natural catastrophes and man-made disasters 2005: high earthquake casualties, new dimension in windstorm losses
	No 3	Measuring underwriting profitability of the non-life insurance industry
	No 4	Solvency II: an integrated risk approach for European insurers
	No 5	World insurance in 2005: moderate premium growth, attractive profitability
	No 6	Credit and surety: solidifying commitments
	No 7	Securitization – new opportunities for insurers and investors
2005	No 1	Natural catastrophes and man-made disasters in 2004: more than 300 000 fatalities, record insured losses
	No 2	World insurance 2004: growing premiums and stronger balance sheets
	No 3	Insurers' cost of capital and economic value creation: principles and practical implications
	No 4	Innovating to insure the uninsurable
	No 5	Insurance in emerging markets: focus on liability developments

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