



Allianz Risk Pulse

Focus: Natural Catastrophes

Natural catastrophes on the rise?

Analysis of the potentially increasing threat from natural catastrophes worldwide

→ Recently the world has witnessed a string of natural catastrophes, from earthquakes in Haiti, Chile, New Zealand and Japan, to floods throughout Europe, Pakistan and Australia. It would seem as though the number and severity of natural catastrophes has increased. But is that really true? An analysis from Allianz experts from reinsurance, corporate insurance and economic research gives a more nuanced picture.

The Pakistan floods in August 2010 were the worst in living memory, affecting millions of people and leading to over 1,500 deaths. Floods in the Czech Republic, Poland, Hungary, Slovakia and Germany later that year, led to only a handful of fatalities but caused losses of tens of millions of euros.

Meanwhile, the Icelandic volcano that erupted on March 21, 2010 sent an ash cloud over western Europe for nearly a month. It caused little physical damage or losses for property insurers, but its disruption to air traffic led to significant losses to the travel industry and travel insurers as well as supply chains.



“Terrible events like major natural catastrophes illustrate the value and importance of insurance to society. Now is the time to help people,” says Clement B. Booth, Board member of Allianz SE

The earthquake in Japan on March 11, 2011, with a magnitude of 9.0 was the fourth-largest worldwide on record and triggered a series of further events. It has claimed thousands of lives and will be very expensive for Japan, global markets and the insurance industry – not only from claims arising directly from the disaster but also from so-called contingent business interruption losses. These kind of losses arise for example where production is interrupted at a manufacturer due to non-delivery of parts from a supplier which has been directly affected by the events in Japan. Contingent business interruption claims may end up much higher than the original physical losses.

The largest versus most fatal earthquakes in 2000–2011

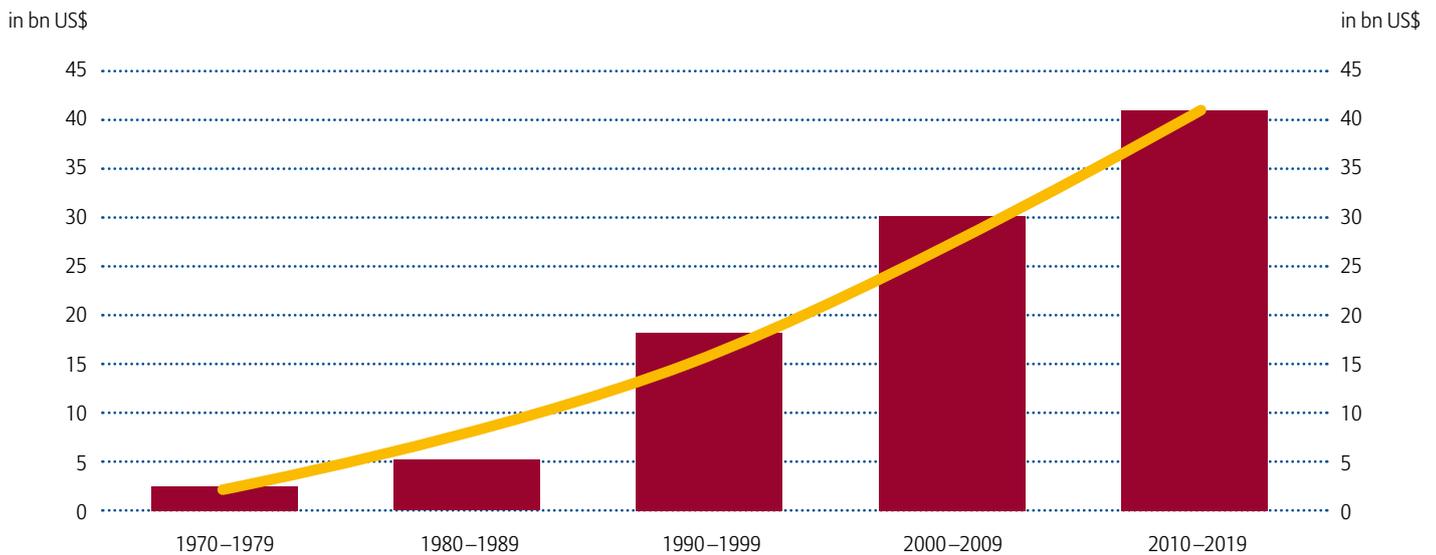
Year	Region	Magnitude	Energy factor	Fatalities
2011	Japan (March 11)	9.0	n.a.	n.a.
2010	Chile (Feb 27)	8.8	501	507
	Haiti (Dec 1)	7.0		222,570
2009	Samoa Islands (Sep 29)	8.1	8	192
	Southern Sumatra (Sep 30)	7.5		1,117
2008	Sichuan, China (May 12)	7.9	n.a.	84,000
2007	Indonesia (Sept 12)	8.5	5.5	25
	Peru (Aug 15)	8.0		514
2006	Kuril Islands (Nov 15)	8.3	1000	0
	Java, Indonesia (May 26)	6.3		5,749
2005	Northern Sumatra (March 28)	8.6	32	1,313
	Pakistan (Oct 8)	7.6		80,361
2004	Northern Sumatra (Dec 26)	9.1	n.a.	227,898
2003	Hokkaido, Japan (Sep 25)	8.3	355	0
	Iran (Dec 26)	6.6		31,000
2002	Alaska (Nov 3)	7.9	501	0
	Afghanistan (Mar 25)	6.1		1,000
2001	Coast of Peru (June 23)	8.4	11	138
	India (Jan 26)	7.7		20,023
2000	Papua New Guinea (Nov 16)	8.0	1.5	2
	Indonesia (Jun 4)	7.9		103

Source: Allianz

The Energy factor shows the ratio between the seismic energy released by the two earthquakes. For example, the quake in Chile released 500 times more energy than the quake in Haiti. This table shows that those regions where tectonic plates clash are at highest risk. Six tremendous earthquakes happened in Indonesia in the last decade. All other earthquakes in this table – except Haiti – are also in high-risk zones. The amount of energy released does not necessarily mean more damage or casualties. Instead, weak buildings or secondary effects of earthquakes such as tsunamis or fires are the most common reason for high fatality rates. This was the case in Haiti in 2010, in Northern Sumatra in 2004 and will probably be the case for Japan.

Markus Tremel, seismology expert at Allianz SE Reinsurance

Insured losses increasing dramatically



This graph shows the dramatic increase of average insured claims per decade.

Source: Allianz

Within a week of its occurrence various experts have put out their estimates of the losses. Catastrophe modeller EQECAT estimated that total insured losses would range between US\$12bn and US\$25bn, while risk modelling agency AIR Worldwide has put the insured bill at between US\$15bn and US\$35bn. Some analysts have suggested that the cost of the earthquake to the global insurance industry could be over US\$60bn. While these estimates are informed speculation, Allianz and the insurance industry feel that it is too early to confirm total insured losses, they do indicate the huge scale of potential financial damages associated with this event.

Japan is situated in a seismically very active region, so earthquakes there have been a common major catastrophe, says Markus Tremel, a seismology expert at Allianz SE Reinsurance. Tremors are frequently accompanied by tsunamis and large-scale fires. As a result, “insurers use earthquake risk models regularly to calculate the probability of the damages that they insure against. The tsunami and fires must be examined relative to their actual occurrence,” says Tremel.

Millions of earthquakes

The US Geological Survey (USGS) estimates that “several million” earthquakes occur worldwide each year, about 20,000 of which are located by its National Earthquake Information Center. “However, the number of large quakes – those with a magnitude 6.0 or greater – has stayed relatively constant,” adds Markus Tremel. In his view, the ubiquitous media cover also supports the impression that there is an increase of natural catastrophes worldwide. “We see images and videos of the event within seconds on YouTube, Twitter or Facebook. This makes catastrophes more real for us, no matter where we are.” adds Markus Tremel.

While the USGS recorded twenty-two earthquakes with a magnitude above 7 in 2010, all but a few thousand of the recorded 227,000 fatalities from that year came from the major quake that hit Haiti on January 12, 2010. The largest earthquake recorded that year was the magnitude-8.8 earthquake that hit offshore Bio-Bio, Chile, on February 27. It killed more than 500 people, with about half of those deaths

This picture was taken by Ray Hogendoorn, Head of AGCS claims general adjusters, when he was regulating claims in Chile in March 2010



caused by a tsunami it triggered. While the energy released by this earthquake was more than 500 times the one that struck Haiti, fatalities were far fewer due to strict building codes in Chile dating back to 1935 (and most recently revised in 2003) and lower maximum shaking intensities.

Over the past 40 years, climate or weather-related insurance claims have increased dramatically. According to Allianz, average insured claims per decade have risen from less than US\$5bn during the 1970s and 1980s, to over US\$40bn by 2010.



“Clients all over the world, catastrophes all over the world: Allianz Global Corporate & Specialty is used to managing large losses wherever they happen. Still any disaster poses new challenges to the claims organization and of course the client always comes first.” Axel Theis, CEO of Allianz Global Corporate & Specialty

Most insured catastrophe losses are concentrated in the US and Europe (60% and 28% respectively). This is because natural catastrophes have an enormous effect on areas where there are dense populations and large structures, and some of the world’s most populous areas are located in areas of high seismic activity or on coastal areas that are prone to flood and hurricane risks. As insurance cover has grown for the rapidly expanding number of residential and business properties based in these locations, so too has the number of claims and payouts. Accordingly, the most expensive insurance claims have come from developed countries where insurance market penetration is very high for both residential and business property.

Katrina and her siblings

The highest financial losses in recent years have occurred in the United States. Hurricane Katrina in 2005 was the third-strongest hurricane to have ever reached the US and the most expensive natural catastrophe ever, with an insured loss of some US\$60bn. Nearly 2,000 people are believed to have died in the storm, and more than one million Gulf Coast residents were forced to relocate. Up to 80% of the city of New Orleans was flooded. The US also saw the insurance industry’s biggest-ever earthquake loss following the 1994 Northridge, California earthquake which cost insurers US\$15.3bn.

According to a joint World Wide Fund for Nature (WWF) and Allianz survey released in November 2009 called Major Tipping Points, the US is at risk of even worse natural disasters as a result of rising sea levels through climate change and increased urbanisation.

According to the survey, a rise in the sea level of 15cm on the north-east coast of the US would in effect mean a rise in sea level of 65cm in cities such as Baltimore, Boston, New York, Philadelphia and Providence. Such a rise in sea level would potentially increase asset exposure from a current estimate of US\$1,359bn to US\$7,425bn. The critical issue is the impact that a hurricane could have in the New York region – potentially, the cost could be US\$1 trillion at present, rising to over US\$5 trillion by the mid-century.

Handling the claims process

→ Andreas Shell, head of short-tail claims at Allianz Global Corporate & Specialty, says that while there is a “standard” claims process, each crisis has its own special features, which claims adjusters need to adapt to. For example, in the case of the Japanese earthquake, insurers need to take into account the effect of the tsunami, as well as the danger of radioactive leaks from Fukushima Daiichi nuclear plant. Presently, claims adjusters are unable to visit the hardest hit areas.

Shell says that a key part of the process involves teams working with the client to develop or enact contingency plans and locate alternate suppliers or alternate transport routes to ensure that the financial loss remains low. Ray Hogendoorn, the head of AGCS claims general adjusters, says that “the basic concern is maintaining cash flow. If a client needs an advance payment to maintain that for their local company, we make those funds available. But money as such is not the primary thing they are turning to us for – staying in business is.”

Shell says that in terms of marine transport, claims for hull losses will come more quickly than cargo losses due to the complications around cargo not being delivered to or shipped from Japan.

“Aviation claims are likely to be limited to hull damage to aircraft on the ground and damages to spare parts located in destroyed warehouses.” adds Alexander Mack, head of long-tail claims at Allianz Global Corporate & Specialty.

Alexander Mack does not expect many liability claims as the event will be classed as a force majeure. “Third-party claims based on losses caused by such an Act of God are generally excluded from legal liability or not insured,” says Mack. “But as we have seen after Katrina, in the aftermath of such a catastrophe all kind of liability claims will be raised by individuals, companies and subrogating insurers,” he adds.



On March 11, 2011, at 5.46 UTC an earthquake of 9.0 magnitude occurred near the East Coast of Honshu, Japan. A devastating tsunami and many aftershocks followed.

Increased exposure to natural catastrophes in regions like the US and Europe are forcing insurers and reinsurers to look at new risk models, issue cat bonds, review pricing structures and consider possible deductibles and exclusions in their policies. However, the industry also faces difficult challenges when assessing natural catastrophe risks and liabilities in developing regions such as South America and Asia, particularly as the population in both regions is set to grow rapidly. The United Nations, for example, says that there will be nearly 3.5 billion people living in Asia’s cities by 2050, compared to 230 million in 1950.

The rise of Asian risk

Scott Ryrie, CEO of Allianz SE Reinsurance Branch Asia Pacific, points out that cities like Beijing, Delhi, Jakarta, Manila, Mumbai, Shanghai and Taipei are all situated in earthquake zones and are also at risk from flooding or typhoons. In the Philippines, for instance, 62 of the 79 provinces are regularly hit by tropical cyclones, with devastating consequences. China's seismic "danger zone" covers roughly half the country.

"In comparison to the US, due to the far higher population base, Asia is 590 times more vulnerable to earthquakes, 62 times more vulnerable to flooding, and 40 times more vulnerable to tropical cyclones," says Ryrie. Even those with low exposures to catastrophes can be hit unexpectedly and severely, he says, as proved by the tsunamis that devastated countries bordering the Indian Ocean on December 26, 2004. "Hence, Asia stands to lose much more from natural disasters as further urbanisation occurs" he adds.

"Insurers and reinsurers have a peculiar problem in developing markets," says Ryrie. "On the one hand, there is enormous potential for selling products and services in growth markets. The downside is that the industry could be providing cover for enormous risk, particularly as the growth of residential and commercial property is not linked to any improvement in building standards or ability to withstand seismic shocks or strong winds," he says.

For example, when Typhoon Nari hit Taipei in 2001 at a relatively low wind speed, it caused US\$500mn worth of damage. Heavy rainfall flooded the subway network after the pumping system failed. The main traffic arteries in and out of the capital were paralyzed for weeks. The Taiwanese government subsequently spent NT6bn (USD \$198mn) on a flood diversion project to mitigate the damage in the Keelung River basin. This project has been very successful and demonstrates how planning can help reduce the effect of floods.

Ryrie says that the insurance industry needs to further develop information standards and risk assessment tools. "There is very little historical data in Asia with regards to how buildings are constructed, whether they have the necessary planning permission, and if they comply with accepted building standards. As a result, there is a danger that insurers are pricing risk without full knowledge and are therefore taking more catastrophe risk onto their books. Added to that, risk modelling firms have much work to do in this area, since exposure data is underdeveloped."

Addressing all risk factors

The main factor behind increasing insured losses is, very simply, economic growth. Property values rise and areas of population density expand, often in highly at-risk areas. At the same time, the insurance density in these areas is increasing. There is also a link between human activity and climate change, which will have an impact on storm volatility, flood activity and on water levels and coastal regions. "Allianz is following all the factors that lead to increased claims from natural catastrophes very closely," says Armin Sandhövel, CEO of Allianz Climate Solutions. "In addition to risk analysis data, we commission scientific studies and closely work with our clients to better

The economic impact of the Japanese disaster

→ Even months after the Japanese earthquakes and tsunami, it will remain difficult to precisely estimate the economic impact of the catastrophe. There is little doubt, however, that the longer that radiation leaks from the Fukushima Daiichi nuclear plant, the worse the prospects are for a quick economy recovery.

Thomas Hofmann, an economist at Allianz SE Economic Research and Corporate Development, stresses that any assessment needs to look at two scenarios. "If the radiation leak can be contained and kept away from the large urban centers, and power outages do not last for several months, nationwide economic activity in Japan will likely be able to pick up soon and there will be limited overall business interruption."

"On the other hand, if radioactivity were to spread further across the country, this would create major economic difficulties. Large areas of national production would come to a standstill. Such a scenario would be characterized by ongoing support measures from the central bank and financial assistance from the state. Government debt would soar."

Such a scenario could lead to a slowdown in manufacturing, particularly in the automotive and electronics industries, which depend on components supplied by Japanese firms, says Hofmann. Foreign buyers would, however, try quickly to source materials from other suppliers and locations.



"Major catastrophes like earthquakes always wreak havoc on the economy. Factories and businesses are closed down, normal consumption patterns grind to a halt. However, eventually a major disaster can have a positive or catalytic effect, too. Once disaster relief gets under way and funds flow in, the reconstruction effort generates new growth and provides business opportunities for industry sectors like engineering, building or transportation." Michael Heise, Chief Economist at Allianz SE

understand all implications. Climate change is the factor that needs to be most closely studied, since its implications on the future situation are the most difficult to assess."

In order to support the growth of prosperity worldwide, insurers will continue to consider new forms of cover and expanding their presence in emerging markets. Allianz will also continue to partner with policy makers and industry to further develop safety codes and tackle climate change worldwide.

Clement B. Booth is a board member of Allianz SE.

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Scott Ryrie is CEO of Allianz SE Reinsurance Branch Asia Pacific.

Armin Sandhövel is CEO of Allianz Climate Solutions.

Markus Tremel is a natural catastrophe risk expert at Allianz SE Reinsurance.

Interesting Facts and Common Myths about Earthquakes

Markus Trembl, seismology expert at Allianz SE Reinsurance, knows almost everything about earthquakes. Apparently, there are many misconceptions and common myths about this fascinating and sometimes horrible natural phenomenon.

→ The **epicenter** is not necessarily the point where the intensity of an earthquake is highest. Damage can be much greater some distance away from the epicentre – depending on a multitude of factors including seismic vulnerability of buildings or the soil they are built on.

→ Although it may seem otherwise: **earthquakes are not on the increase**. In fact, earthquakes of magnitude 7.0 or greater have remained fairly constant. However, during the last 20 years there has been an increase in the number of earthquakes “located” by the increasing number of seismograph stations and improving global communications. In the past, many more earthquakes were barely noticed or reported only in small local newspapers. Today, pictures or videos are on the internet minutes after a quake. In addition, in most earthquake prone areas the population and the exposed values have increased, sometimes significantly.

→ **Earthquakes do not only occur at major seismic fault lines**, which is where tectonic plates meet each other. There are also faults within plates, some of which are buried and not known until an earthquake occurs on them and reveals their location. Moreover, these earthquakes tend to occur infrequently with long periods of quiescence. All this makes seismic hazard assessment for intra-plate regions such as central Europe and the eastern USA very difficult.

→ **Earthquakes as geological phenomena are not affected by climate change**. Only in very special cases can weather (and thus climate) related events like torrential rains cause or increase the occur-

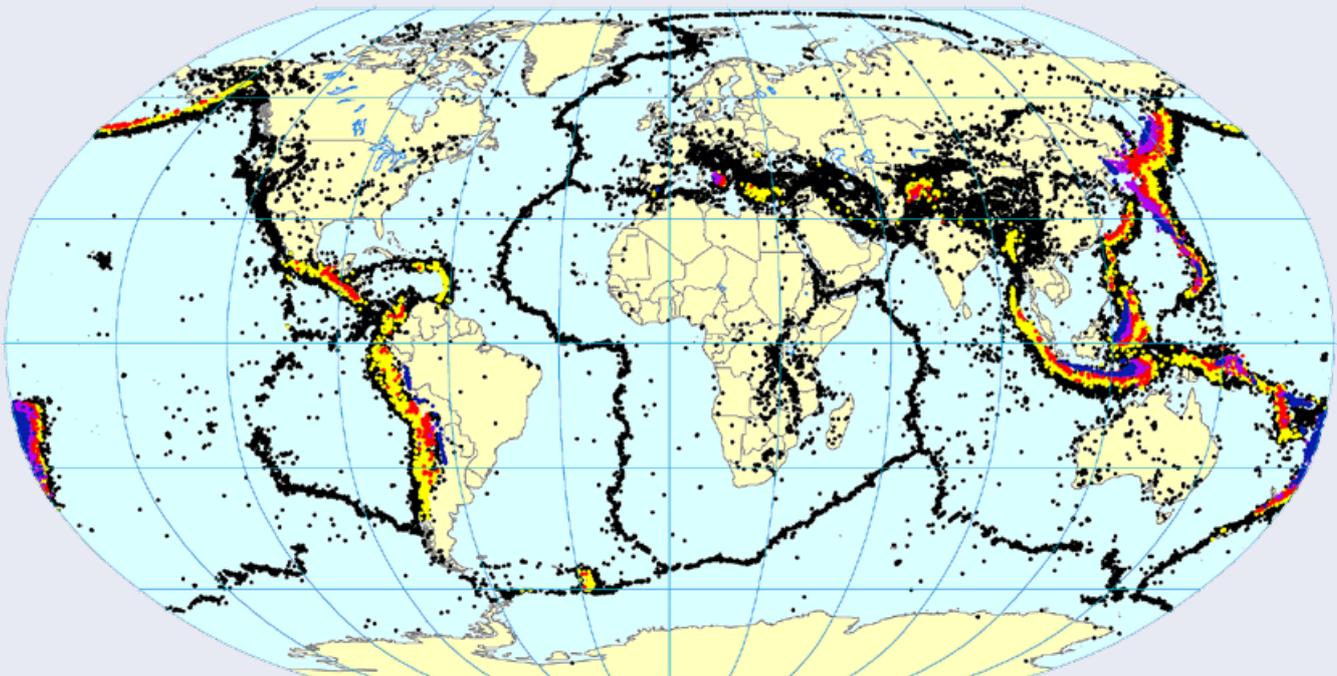
rence of earthquakes. In general, the long-term geological processes that lead to earthquakes happen independently from processes in the earth’s atmosphere.

→ **Earthquakes cannot be predicted**. A real prediction, which would give the (exact) time, location and magnitude of an earthquake is not possible. What seismologists can do is a systematic seismic hazard assessment to determine the strength of seismic shaking for a given probability. This is the basis for establishing appropriate seismic building codes that can – if properly enforced – prevent building collapse and loss of life. Authorities can also use these studies to develop emergency plans for an effective disaster response based on realistic earthquake scenarios.

→ Popular belief says, that **the higher the magnitude** (often referred to as “Richter scale”), **the higher the damage**. **This is not necessarily true**: again, damage depends on vulnerability of buildings, the soil they are built on, on earthquake depth, and on whether the earthquake occurs in a place where much damage can be done. Many strong earthquakes create little damage, because they occur under the oceans or at great depths within the earth.

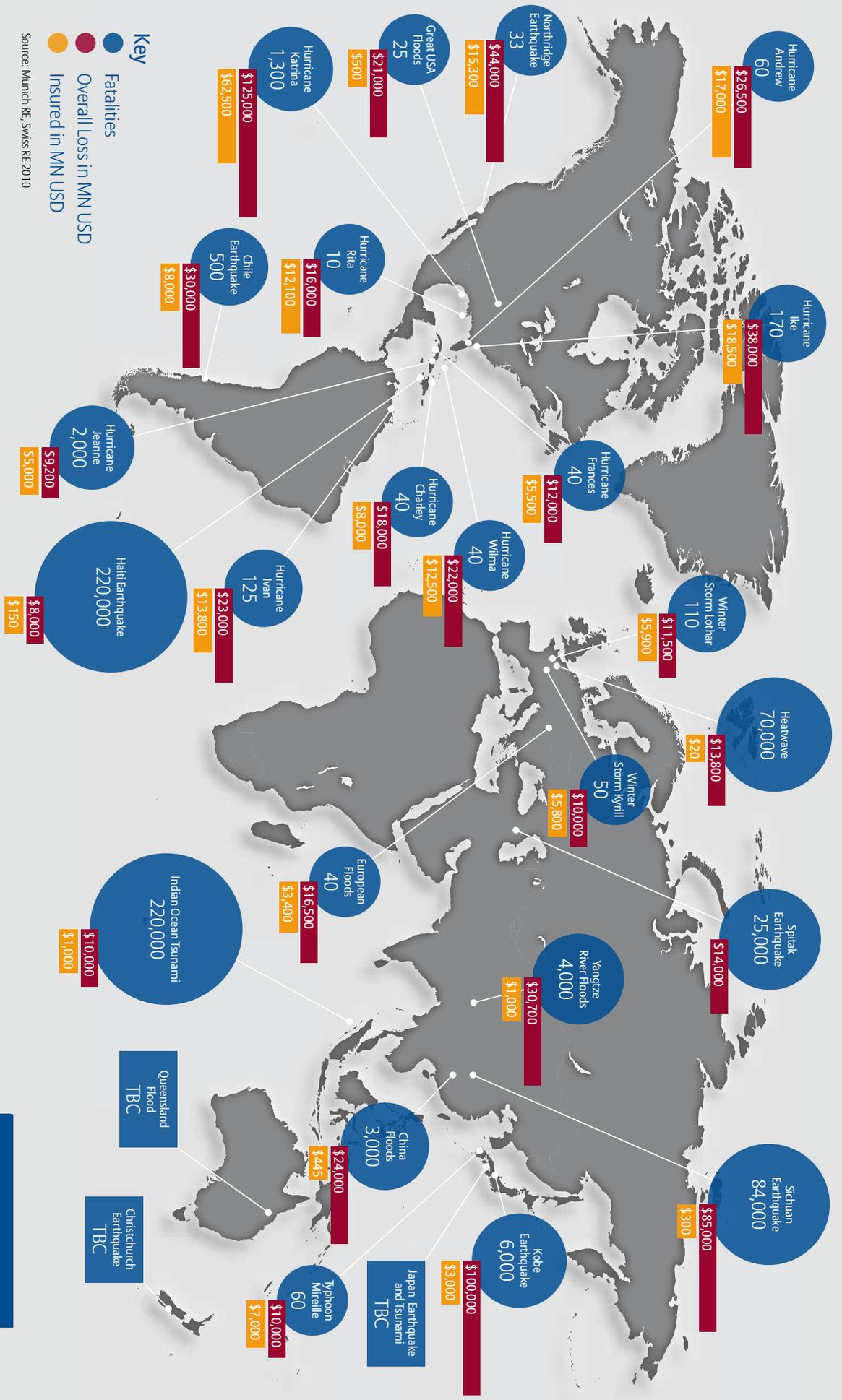
→ Sometimes people say that there is such a thing as **“earthquake weather”** or **“earthquake season”**. However, the occurrence of earthquakes is randomly distributed over the year and throughout a day. The tectonic processes have a much longer timescale than a day or a year and are not influenced by atmospheric processes. What does change, based on the season or time of day, is the number of fatalities and the amount of damage. At night most people are asleep, during rush-hour they are on the streets and during the day they are at their workplaces – and their exposure to earthquake effects changes considerably.

Where the ground shakes – Global Seismicity



The global earthquake activity from 1973 to 2003 shows a clear alignment along the boundaries of the tectonic plates. While black points represent earthquakes in the crust, the coloured points stand for deeper earthquakes that occur when one plate sinks into the earth’s mantle (it “subducts”). However, as can be seen in Europe and the Eastern USA, earthquakes can also occur within the plates. Markus Trembl, seismology expert at Allianz SE Reinsurance

Largest Natural Catastrophes 1970–2011



Please go to www.agcs.allianz.com for full details.



Natural Catastrophe Preparedness

Natural catastrophes do happen, and their effects can be great – potentially extreme. Numerous studies have shown that a remarkable number of companies or individuals don't have adequate – or any – disaster preparedness plans in place.

Tips for businesses

- ➔ **Step 1. Analyze your risks.**
Determine the natural catastrophe perils that could impact your site.
Determine your degree of exposure.
Build or retrofit accordingly.
- ➔ **Step 2. Prepare for the event.**
Write your plan.
Gather additional information.
Train your team.
Make periodic inspections.
- ➔ **Step 3. Post-event measures.**
When catastrophe hits, the object is to restore operations as quickly as possible. Depending on the exposure and the impact on business, this can be envisioned in a formal business continuity plan.



"A few precautions can help protect you from serious losses and disruptions in the event of a natural catastrophe," says Lyman Munson, vice president of risk services at Fireman's Fund Insurance Company. "Protecting your home is vital to keeping your family safe and comfortable."

Tips for homeowners in California

- ➔ **Anchor bookcases and filing cabinets to nearby walls.**
- ➔ **Anchor large appliances, such as water heaters, to walls using straps.**
- ➔ **Install ledge barriers on shelves; place heavy items on lower shelves.**
- ➔ **Use closed screw-eyes and wire to securely attach pictures or mirrors.**
- ➔ **Attach computers and small appliances to desks, tables or countertops.**
- ➔ **Install latches on drawers and cabinet doors to keep contents from spilling.**



Allianz was a major insurer of the San Francisco earthquake in 1906. Pictured here is the office building of Fireman's Fund, which today is part of Allianz Group.

Tips by: Allianz Global Corporate & Specialty and Fireman's Fund.

Publisher

Allianz SE, Allianz SE Reinsurance, Allianz Global Corporate & Specialty
Allianz SE, Königinstr. 28, 80802 Munich, Germany

Published in March 2011

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