

# continuum

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**Earthquakes**



exclusively for **MARS** associates

## Welcome to the first issue of Continuum!

The Mars family encompasses a great many people, cultures, languages, and products. But there are some things that we all share, and one of them is the need to be prepared in the event of an emergency or crisis—both on the job and in the home.

With this newsletter, we hope to bring you helpful information on natural, accidental, and intentional disasters and other issues that could impact your home, family, and work. We'll be publishing regularly on different topics, and welcome your feedback.

## Earthquakes in Mythology

Myths and legends have helped people explain the unexplainable since the beginning of time. Here are some of the ways cultures around the world have described the phenomenon of earthquakes.

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Interview: Hiroyuki Ikegawa  
Location: Mars Japan  
Position at Mars: Supply manager

Hiroyuki Ikegawa learned the importance of catastrophe planning when he woke up one morning in the middle of one of the biggest earthquakes in Japan's history.

At 5:47am on January 17, 1995, Ikegawa should have still been sleeping. It wasn't yet time to get up to go to his job as manager of transportation and warehouse at Proctor & Gamble in Kobe. But as soon as he realized what was happening, he was up and out of bed, rushing his family to the bathroom and taking cover in the tub.

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## Earthquake Risk Report: Executive Summary Background

### What is an earthquake?

An earthquake is a shaking of the earth that is volcanic or tectonic in origin. Though earthquakes do not happen frequently, their sudden occurrence and large areas of effect can be extremely disruptive.

### When do earthquakes occur?

Earthquakes occur without warning. All preparations for earthquakes must be made in advance.

### Where do earthquakes occur?

Knowing the earthquake potential of the area you are located in is critical for proper planning. Dangerous areas include:

- ▶ Areas around fault lines
- ▶ Certain sands that liquefy and amplify vibrations
- ▶ Areas prone to settling or landslides
- ▶ Soft, water-soils, such as artificial fill or mud

### How long does an earthquake last?

Earthquakes vary in duration. The shaking can be a single event lasting only a few seconds, or it may consist of a series of events with varying duration. The series can last over several hours, days, weeks or months.

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After 20 very long seconds, it was over. He was very lucky—his refrigerator had moved across the kitchen floor and things had fallen off shelves, but that was the extent of the damage in his home. Outside, however, it was a much different story.

Ikegawa walked out of his house and found violent evidence of the quake all around him. The shaking ground had moved his car so forcefully that it crashed into a nearby wall. Many houses in his neighborhood were destroyed or on fire, and he could hear cries for help coming from under crumpled buildings. Further outside his neighborhood, highways fell apart, bridge spans buckled, and the train station had suffered a “[pancake collapse](#)”—the building cracked and its parts caved in, causing the entire second floor to break through to the one beneath it.

He was amazed—and relieved—to later learn that no one he knew was among the over 6,500 dead. It took one week for electricity to come back online, the area was without water and gas for one full month, and the railway system was out of commission for almost four months. At \$200 billion in damages, the Great Hanshin Earthquake of January 17, 1995 has the dubious honor

of a place in the Guinness Book of World Records as the costliest in history.

Ikegawa and his coworkers gathered the next day in the office at the production site, located on the west side of Kobe in a free-standing 30-story building that had escaped any structural damage. Things were, he says, “very messy” inside, but fine. He was again lucky—after a head count, they realized that everyone was OK. And because some precautionary measures had been taken, they were able to restore normal business operations far ahead of some of the public utilities and transportation systems of the area.

How were they able to do this? They kept the various elements of production separated over a large area. Orders were fulfilled from the plant site, but the orders were taken in the U.S. Products were shipped out of 19 distribution centers with manual operations (fax), so they were able to re-route orders to a different distribution center within 10 days—a key factor in minimizing the disruption to business-as-usual.

This is an area of particular concern to him in his new position at Mars: Everything from order to fulfillment





## The Kobe Earthquake

*When: Tuesday January 17, 1995*

*Magnitude: 7.2*

*Duration: 20 seconds*

Also called "Great Hanshin Earthquake," this event left more than 6,500 dead, and almost 37,000 injured. It has the dubious honor of a place in the Guinness Book of World Records for "costliest disaster to befall any one country"—it caused around ten trillion yen in damages. It was also the biggest earthquake in Japan since the Great Kanto earthquake of 1923, which claimed 140,000 lives.

[Learn more about the Kobe Earthquake from the USGS.](#)



is currently located in one building. "It's very risky," he warns, "especially to have order-taking in an area prone to disasters like earthquakes," as they are in Kobe. If orders are taken at HQ and something happens to HQ... no more orders.

Ikegawa and his team are only in the planning stages, but he knows that they must be proactive and preemptive in their disaster planning. "People are the first priority," Ikegawa stressed. Second, "the safety of the product—and so also the safety of the customer." He'll use his experience in Kobe to support and maintain business continuity planning, and his coworkers are all on board. It takes a lot of time and commitment, he says, but "so far, everyone gets together and works effectively."

And what if an earthquake happened today? "Very good question! There's no choice but to wait and see," he admits. Until the plan is complete, some stop-gap measures could be taken, like using the fax system for orders instead of computer, shifting orders to a different distribution center... Business could still continue, but Ikegawa says there is a serious risk of compromised quality—especially since best-by dates are linked to the computer system. But regardless of what happens, he says, "I think everyone will get together and go the distance."

“ He walked out of his house and found violent evidence of the quake all around him. They were able to re-route orders to a different distribution center within 10 days. **'People are the first priority,'** Ikegawa stressed. ”

“

**'You don't see an earthquake coming.'** Entire villages were swept away under the rampaging mud, ice, and resulting floods. **'It's hard to get things done when people don't come to work!'**

”

Interview: Philippe Bellande

Location: Cali, Colombia

Position at Mars: Corporate Brand Manager, Corporate Affairs

He was having lunch at the Cali Viejo Restaurant and the shops began to sway.

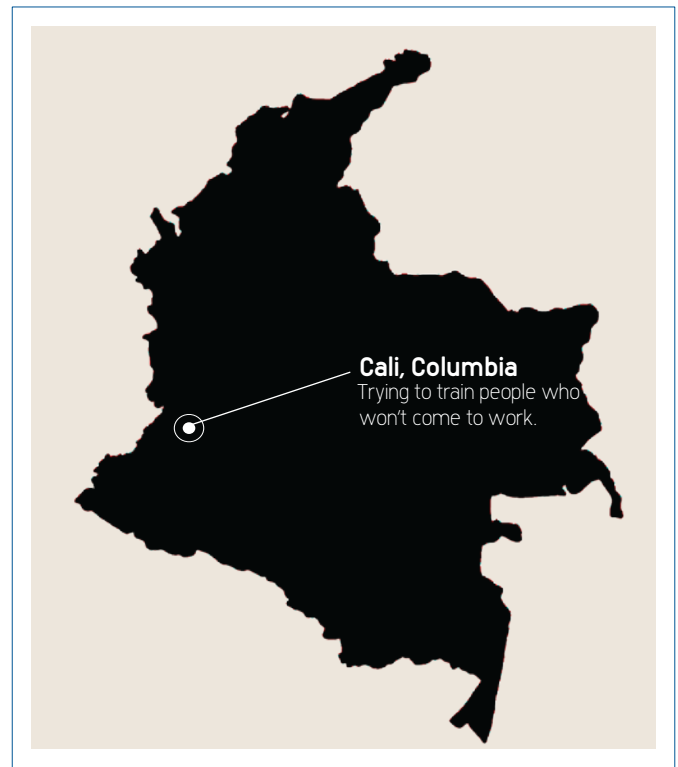
For nearly a full minute, Philippe Bellande paused over his plate of...

...well, he can't remember what it was he was eating that day, Monday, June 6, 1994. He was more concerned with the fact that the buildings of Cali, Colombia were moving. He was experiencing his very first earthquake, a seismic event that he would later learn registered 6.4 on the Richter Scale.

"Bad timing," he admits, but he's chuckling. Philippe had traveled to Colombia from Caracas to introduce Mars snack foods and pet foods to a new market, and he only had a short time to get products on the shelves. He had been developing marketing plans with distribution partners and training the extensive sales staff when the quake hit.

"You don't see an earthquake coming," Philippe explains. Like a tornado, it comes out of nowhere and disappears almost as quickly, leaving behind a chaotic signature of destruction. And Philippe knows this for sure: "One minute of earthquake... It feels like forever!"

When the tremors subsided, however, there seemed to be miraculously little damage. "It was an easy one," Philippe jokes. The story about 70km southeast of Cali, however, was much different. The pounding of 14 aftershocks caused an avalanche near Nevado del Huila, a volcano 170 miles southwest of Bogota. Entire villages were swept away under the rampaging mud, ice, and



resulting floods. In the end, over 1,000 people died, and rescue workers toiled for days to rescue villagers from Paez, Irlanda, and other small settlements, who were stranded on chilly mountainsides accessible only by helicopter.

Back in Cali, the quake wasn't particularly disruptive to the economy, and there were only minor damages to structures. The usual casualties of an earthquake in an urban center—water, power, and transportation systems—were back online after just a few days.

But while the damage to the economy and public utilities in Cali had been minimal, in Philippe's world it was definitely not business-as-usual—it would soon be evident that the greatest effect of the earthquake would be psychological. The devastation in Nevado del Huila and the numerous aftershocks made people afraid to leave their homes. "It's hard to get things done when people don't come to work!" he cries. How could he train the thousands of salespeople it would take to get products in front of shoppers? They needed a solid knowledge base before they could go out into the field and properly represent Mars products to local storeowners. It was frustrating. "If they failed, I failed," Philippe recounts.

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A lot of the delay could have been avoided with a little preparation, according to Philippe. He insists that catastrophe plans are really for the people, not the company. Having a solid plan in place gives workers confidence in the event of an emergency—important because “the first thing to do is make sure everyone’s OK.” And once all the heads have been counted, damage can be assessed and communications can get back online—the first steps to getting the business back on its feet.

“When one part of the business is disrupted, everyone is disrupted,” he says, and so it’s important to be able to act quickly. Had a business continuity plan been in place in Cali, Philippe is sure that things would have been back to usual much sooner, and a lot of the stress could have been avoided. He describes the catastrophe planning process as an insurance premium. “You spend time and resources, and you might not even need it in the end,” he says, “but it’s worth it for that one time when you *do* need it.”

## The Paez Earthquake

*When: Monday, June 6, 1994*

*Magnitude: 6.4*

*Duration: 40 seconds*

Known mostly for the catastrophic avalanche and landslide caused in the volcanic region of Nevado del Huila, this event left more than 1,100 dead. Entire villages were destroyed in the landslide, and while 14 aftershocks shook the areas around Bogota and Cali, villagers near the volcano reported feeling hundreds of tremors after the main event.

Learn more about The Paez Earthquake:  
[ReliefWeb](#), [USGS](#), [New York Times](#)

## It’s an earthquake. Time to take a bath?

The Federal Emergency Management Agency (FEMA) recommends getting under a sturdy piece of furniture, like a table, if you’re inside when an earthquake starts. Other authorities recommend heading to the bathroom—the bathtub is one of the most durable items you’ll find in most houses.

[Learn more about FEMA’s recommendations for what to do before, during, and after an earthquake.](#)



### How is an earthquake measured?

Today, seismologists use the Moment Magnitude Scale, which measures the size of the earthquake's fault, and how much of the earth slips at the time of the quake. A number of readings are taken, averaged and then adjusted to generate numbers similar to the Richter Scale. According to the Moment Magnitude Scale, the severity of an earthquake is categorized as the following:

- <5.0 Small
- 5.0 – 6.0 Moderate
- 6.0 – 7.0 Large
- 7.0 – 7.8 Major
- >7.8 Great

(Source: Insurance Information Institute, [www.iii.org](http://www.iii.org), Feb 1, 2008)

### Risk

It is estimated that by the year 2025 over 5.5 billion people will either live or work in cities—cities that may be close to regions of known seismic risk and hazard. Because people and businesses will continue to aggregate towards these cities, the annual fatality rate from earthquakes is expected to increase over the next 30 years. Experts speculate that the rise in deaths will be attributed to a few catastrophic quakes hitting near cities with future populations of several million people.

Given the forecasts for increased seismic activity in the future, responsible planning is now essential. Businesses, urban planners, and city governments must take steps today to prepare for the earthquakes of tomorrow.

(Sources: Insurance Information Institute, [www.iii.org](http://www.iii.org), Feb 26, 2008, Roger Billham, University of Colorado <http://cires.colorado.edu/~bilham/>, Mar 20, 2008)

### Stats/Metrics

- ▶ The National Earthquake Information Center (NEIC) estimates that there are over 500,000 detectable earthquakes in the world each year. 100,000 of those can be felt and over 100 of them will cause damage.
- ▶ From 2000–2008, the Earth has averaged 134 quakes per year with a magnitude of 6–6.9
- ▶ From 2000–2008, the Earth has averaged 17 quakes per year with a magnitude of 7–7.9
- ▶ In a 2000 study, FEMA estimated that earthquake losses in the USA would average almost \$4.4 billion dollars per year.

(Source: United States Geological Survey, <http://neic.usgs.gov>, Feb 2, 2008)

### Preparedness

While earthquakes cannot be prevented, new science and engineering breakthroughs provide innovative tools that can be employed to mitigate their damage. With a high degree of confidence, scientists can now identify where earthquakes are likely to occur and what level of force they will generate. Engineering can help provide design and construction techniques so that buildings and other structures can survive the tremendous forces of earthquakes.

### Conclusion

The potential cost of earthquakes worldwide has been growing because of increasing urban development in seismically active areas and the vulnerability of older structures, many of which were not built to current building code and have not yet been upgraded. The unpredictability of earthquakes makes it that much more important that individuals and organizations take the proper steps to prepare and protect their assets with the proper insurance coverage and disaster preparedness.

Read the full report [here](#).

## Bulletin Board

### Visit the Risk Café

Join the Mars business continuity community at the [Risk Cafe!](#) Find helpful links, articles, and other materials.

### Wanted: Submissions

Have news you'd like to share? Want to feature your team? Send submissions to [newsroom@seanmurphyrisk.com](mailto:newsroom@seanmurphyrisk.com)

### Talking Earthquakes

#### Aftershock

Any number of a series of smaller tremors that follow an earthquake

#### Core

The center of the Earth

- ▶ Inner – The very middle, believed to be made up of solid iron
- ▶ Outer – The molten iron that surrounds the inner core

#### Crust

The outermost and thinnest layer of the Earth

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## **Epicenter**

The point on the Earth's surface directly above the focus, or hypocenter of an earthquake; usually the area that experiences the greatest damage

## **Fault**

A fracture in the Earth's crust

- ▶ Normal faults – Cracks in the Earth's crust that push plates downward toward the mantle
- ▶ Thrust, or reverse faults – Cracks in the Earth's crust that push plates upward
- ▶ Strike-slip faults – Horizontal movement in the crust

## **Focal depth**

The distance between the focus and epicenter of an earthquake

## **Focus, or Hypercenter**

The spot in the Earth's crust where the actual earthquake took place

## **Mantle**

Approximately 70% of the Earth's make-up, a layer of solid, hot rock (and where we find diamonds!)

## **Seismic waves**

Vibrations caused by disruption to the Earth's layers, such as an earthquake, explosion, or other release of energy

## **Richter Scale v. Moment Scale v. Mercalli Scale**

Earthquakes are measured by three different methods:

### ***Richter Scale***

Also known as the Richter-Gutenberg scale. Compares sizes of different earthquakes with a logarithm based on seismographic readings.

### ***Moment Magnitude Scale***

A more precise measurement of the energy released by an earthquake, developed in 1979.

### ***Modified Mercalli Scale***

Quantifies the physical effects of an earthquake on a scale of 1-12 (used to be up to 10, but was upgraded in 1902), with 12 being the most destructive.

# On the Record: The Most Destructive Earthquakes in History

## *1970 – Chimbote, Peru*

Magnitude: 7.9  
Casualties: 70,000

## *1693 – Italy, Sicily*

Magnitude: 7.5  
Casualties: 60,000

## *1268 – Asia Minor, Cilicia*

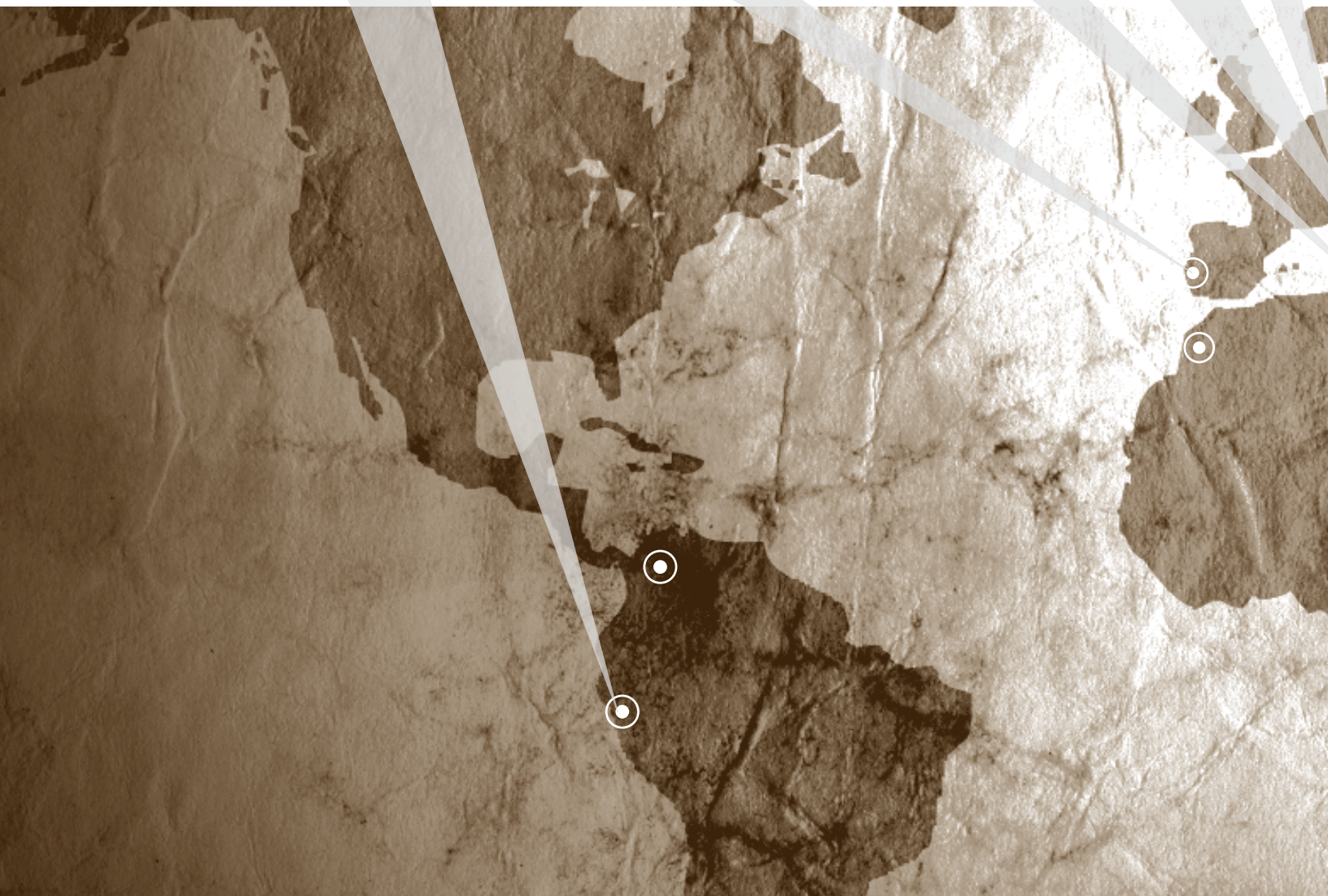
Magnitude: unknown  
Casualties: 60,000

## *1755 – Portugal, Lisbon*

Magnitude: 8.7  
Casualties: 70,000

## *1783 – Calabria, Italy*

Magnitude: unknown  
Casualties: 50,000





*1990 – Western Iran*

Magnitude: 7.4  
Casualties: 40,000-50,000

*2004 – Indian Ocean Earthquake*

Magnitude: 9.1  
Casualties: 227,898

*1923 – Kanto, Japan*

Magnitude: 7.9  
Casualties: 142,800

*1727 – Iran, Tabriz*

Magnitude: unknown  
Casualties: 77,000

*1290 – China, Chihli*

Magnitude: 7.6  
Casualties: 86,000

*1556 – Shaanxi, China*

Magnitude: 8  
Casualties: 830,000



## Earthquakes in Mythology

### Norse

Loki, god of fire and magic, was chained to three boulders as punishment for the death of Balder, the god of light (long story). A giant, venomous snake looms above his face, dripping poison into a bowl held by Loki's wife, Sygin. When the bowl is full and overflows onto him, he twists in pain, causing earthquakes.

### Greek

Poseidon, famous for being god of the sea, was also famous for his temper. His rages and stomping around on the sea floor would cause great tremors to reverberate onto land, felt by the ancient Greeks as earthquakes.

When the Greeks weren't blaming earthquakes on fits of Poseidon's pique, they lay the responsibility on Atlas. The Earth itself rested upon his shoulders, and when he'd shrug...

### Mongolian

Buddha threw golden sand on a frog to build the earth. When the frog moves or twitches, earthquakes result.

### Hindu

The Earth is held by eight elephants. When one gets tired and lowers its head, the Earth shifts, causing a quake.

Source: [Earthquake Legends, Wikipedia](#).

## Head for higher ground.

Taller buildings are actually safer in an earthquake. As engineers learn more about the way earthquakes affect tall structures, they're able to [develop systems](#) that help skyscrapers weather the tremors with less damage.

Buildings in earthquake-prone areas are fitted with reinforced joints, and pads with rollers so they can withstand the movement of the earth. And as technology develops, soon they'll be able to outfit buildings with equipment that actually helps the structure adapt to the motion of the earth around it.

## Earthquakes don't actually kill people.

You may feel the earth move under your feet, but it's rarely the tremors themselves that cause fatalities during an earthquake. Earthquakes result in the collapse of buildings, bridges, and highways, and that's what causes accidents, fires, and, consequently, loss of life.

## Dude, where's my data?

Earthquakes cause fires, power loss, loss of communication systems, and sometimes water damage. Be sure you have a back-up copy of all files kept in a safe place.

## 2007: The Year in Earthquakes

- ▶ Total number of earthquakes around the world: 29,005
- ▶ Number of earthquakes that were probably too weak for us to feel (under 4 on the Richter Scale): 14,415

- ▶ Number of quakes that registered over 8.0: 4
- ▶ Estimated total deaths: 712

(Source: [USGS National Earthquake Information Center](#))

## Earthquake Emergency Preparedness Checklists

"Failure to prepare is preparing to fail," right? Make sure you're prepared for an earthquake both at home and at work with these checklists.

[At home.](#)  
[At work.](#)

## Learn more about earthquakes at these sites:

- ▶ [FEMA](#) – Earthquake preparedness information
- ▶ [US Geological Society](#) – Info on earthquakes around the world
- ▶ The online [Earthquake Museum](#) – Fun facts, trivia, and earthquake quizzes