GRAPHING NATURAL DISASTERS

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Barbara Somervill

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Disclaimer
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REAL WORLD DATA

WHAT ARE NATURAL DISASTERS?

Natural disasters happen on land, in water, and in the air. Some natural disasters happen because of the way the Earth is formed. These **geological** disasters include **volcanoes**, **earthquakes**, and **tsunamis**. Bad weather also causes natural disasters. **Hurricanes**, **cyclones**, and **tornadoes** bring lots of wind and rain. Too much rain and melting snow cause floods. A lack of rain is just as bad. It causes **drought**. Humans can also cause natural disasters. This is true in the cases of most **avalanches** and some wildfires.

What are graphs?

This book uses graphs to show information about natural disasters. Graphs show data (information) visually. There are many different types of graphs, but all graphs make it easier to see patterns at a glance. One small graph can give the same information as many pages of data.

Floods destroy homes, personal property, and crops.

After a natural disaster, people need help. Help can be food, water, shelter, or medicine. It can be rebuilding homes, opening schools, or burying the dead. As well as loss of life or injury, natural disasters cause damage to property and loss of property. Every year, natural disasters cost billions of pounds.

The current **trends** in natural disasters tell a sad story. The number of incidents is increasing. Most scientists believe that **global warming** is causing the increase. Because the storms are more frequent and more powerful, the amount of damage and property loss from natural disasters is also increasing. One bit of good news is that loss of life is decreasing. Early warning systems are saving lives.

US natural disasters, 2006

The table below shows the loss of property from natural disasters in the United States in 2006. The bar graph shows the same information. The graph makes it instantly clear that flooding causes the most property damage.

Event	Property damage in $ million	Event	Property damage in $ million
Lightning	63.8	Fire	192.4
Tornado	752.3	Blizzard	571.0
Flash flood	2,136.6	Drought	138.0
River flood	1,631.1		
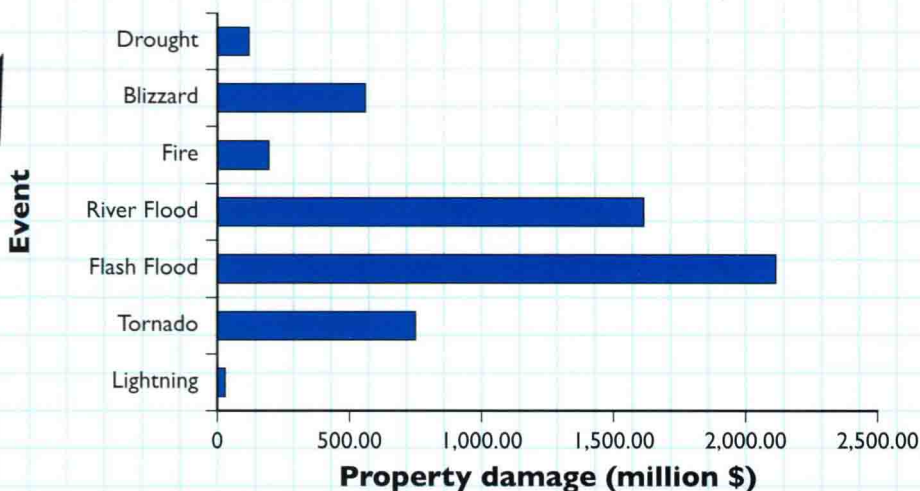
Source: Summary of Natural Hazard Statistics for 2006 in the United States, NOAA

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VOLCANOES

Volcanoes send sparks, clouds of ash and dust, smoke, and lava shooting into the sky. They are dramatic and dangerous. An **eruption** can quickly destroy everything in the surrounding area.

Volcanoes can be many shapes. Some are gentle domes, called shield volcanoes. Some are cone-shaped mountains. When an eruption occurs, **magma** escapes through a hole in the volcano. The magma may shoot out with great force or ooze from the opening. Magma that flows over Earth's surface is called lava. Some volcanoes may throw up clouds of super-heated ash, dust, and rock. These are called **pyroclastic** clouds. A pyroclastic explosion is as destructive and deadly as flowing lava.

The lava seen in this photo may be as hot as 1,200 °C (2,200 °F).

Volcanic eruptions destroy forests and crops. They fill the air with ash, **pollute** water, and kill livestock. Buildings and forests are burnt by lava or covered in ash and **debris**.

When Mount Vesuvius blew its top in 79 CE, ash buried the Roman cities of Pompeii and Herculaneum. The 1883 eruption of Krakatoa blew up two-thirds of the island it sat on. The Soufrière Hills volcano on the Caribbean island of Montserrat has been erupting since 1995, making a large part of the island **uninhabitable**.

The most destructive volcano ever?

In 1815, Mount Tambora, Indonesia, erupted. About 92,000 people died because of the eruption. It disrupted weather around the world. Throughout the Northern hemisphere, snow fell in June, frost formed in July, and crops failed. Another 100,000 people died of hunger because Mt Tambora's eruption caused a "year without a summer".

Measuring volcanic power
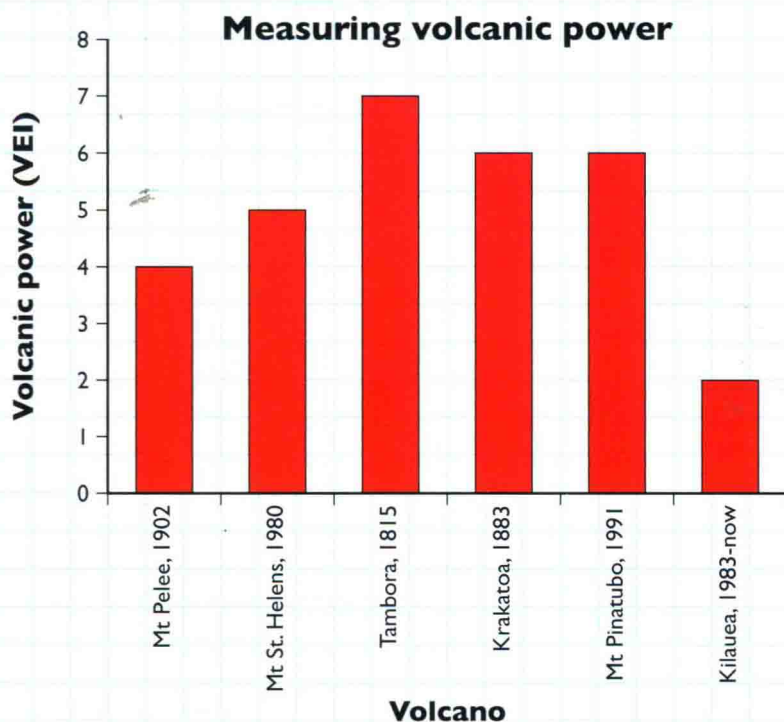
Volcanic power is measured by the Volcanic Explosivity Index (VEI). The index ranges from non-explosive (0) to the most powerful (8). The bar graph shows that the Tambora, Krakatoa, and Pinatubo eruptions were powerful eruptions.

EARTHQUAKES

Earthquakes shake, stretch, roll, and crack the Earth's crust. The Earth is not one solid block of land. It is many blocks, called **tectonic** plates. These plates move, although the movement happens over millions of years.

As plates push or pull on the Earth, they cause cracks, called **fault** lines. Pressure from the plates may cause the Earth to slip, slide, or shift along fault lines. As blocks of earth slip and slide, earthquakes occur. There are more than a million earthquakes every year. Humans do not feel most of them.

Earthquakes can crack roads and destroy bridges.

Measuring the power of an earthquake

The shaking of an earthquake is measured on a machine called a **seismograph**. The movement is shown as a zigzag line, called a seismogram. The stronger the quake, the closer and longer the zigzags appear on a seismogram. Scientists pinpoint the location where the earthquake starts. That point is called the **epicentre**. Scientists use the Richter scale to explain the **magnitude** (power) of an earthquake. Those earthquakes that rate a 2 on the Richter scale usually can't be felt. A 7 is a serious, destructive earthquake.

No one knows when an earthquake will strike. The ground shakes. Water and electricity lines break. Buildings crumble. Often people become trapped under rubble from falling buildings. In May 2008, Sichuan, China, experienced a 7.9 magnitude earthquake. Nearly 90,000 people were killed. More than 5 million buildings collapsed. Millions of people were left homeless.

The Richter scale: magnitude of earthquakes	Average number of events yearly
8 and higher	1
7–7.9	17
6–6.9	134
5–5.9	1,319
4–4.9	13,000 (estimated)
3–3.9	130,000 (estimated)
2–2.9	1,300,000 (estimated)

Seismograph

This diagram shows the seismic wave generated by an earthquake in Alabama, USA. The nearly straight line indicates a normal seismic pattern – nothing is happening. As the line becomes more jagged, the earthquake is beginning. The section that shows sharp peaks and valleys shows earthquake activity.

Measuring the power of an earthquake

Seismic activity vs Time (s)

Key
— Normal activity
— Earthquake beginning and tailing off
— Earthquake activity
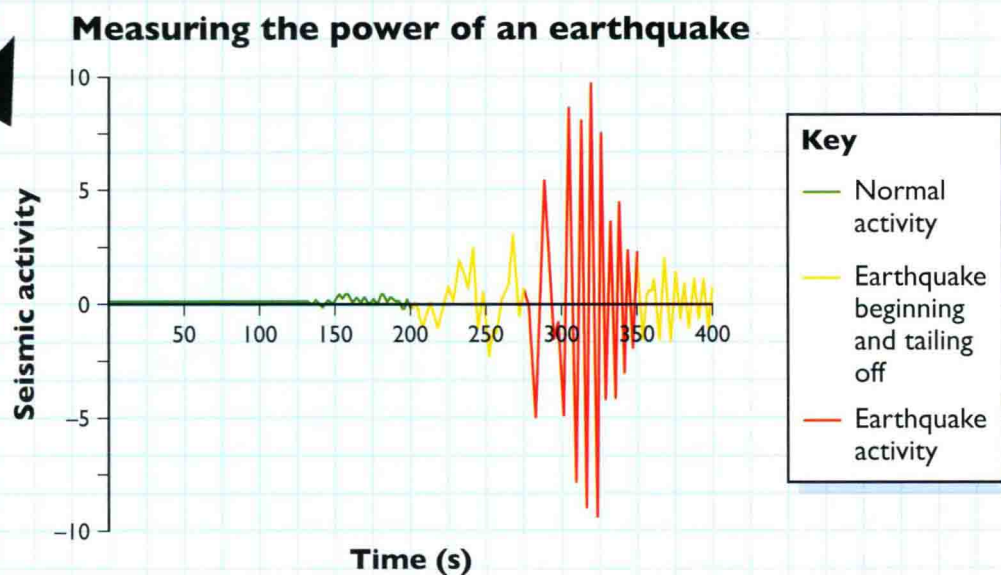
TSUNAMIS

Earthquakes and volcanic eruptions may cause tsunamis. Tsunamis are giant waves. They begin on the ocean floor and roll to shore. Waves can travel as fast as 720 kilometres (450 miles) per hour in the open ocean. They can measure as high as 30 metres (100 feet) tall. Or, they can be barely 1 metre (3 feet) high.

Like earthquakes, tsunamis have an epicentre. This is the point where a tsunami starts. A tsunami may be just one wave, but it is usually a series of waves. The waves travel in all directions from the epicentre towards the shore.

Disastrous damage

When a tsunami strikes, powerful waves crush buildings and trees along the shore. People caught by the wave may die or be seriously injured. Bridges are washed away. The salt water affects the fresh water supply and destroys crops. People who survive the waves are usually in desperate need of fresh water, food, and shelter.

The tsunami that hit Asia in 2004 caused massive damage. Below is a photo of Phuket, Thailand, in the aftermath of the wave.

On 26 December 2004, the worst tsunami in recent years struck. An earthquake off the coast of Indonesia sent a shockwave through the Indian Ocean. A massive tsunami crashed into the shores of nearby Thailand, India, Sri Lanka, and Indonesia. Those shores are flat and heavily populated. People in the area had little warning before the tsunami hit.

Hundreds of thousands of people died or were injured. Whole towns disappeared under a sea of water and mud. The people living there lost everything. Affected areas needed water, food, clothing, medical help, temporary housing, and transport.

The 2004 tsunami

This map shows the movement of the tsunami that struck Thailand in 2004. The line along the bottom is a line graph. It shows the change in the height of water level during a tsunami. The crest of the wave was the highest peak. The line graph shows several tall peaks. The wave drew so much water that the water level in front of it, the trough, was far below sea level.

THAILAND

PHUKET

• Kamala
• Patong

• Kata   10 km

80 cm

0 cm

−60 cm

Normal ocean

Rising wave action

Crest of the tsunami

Trough of the tsunami

Sea level
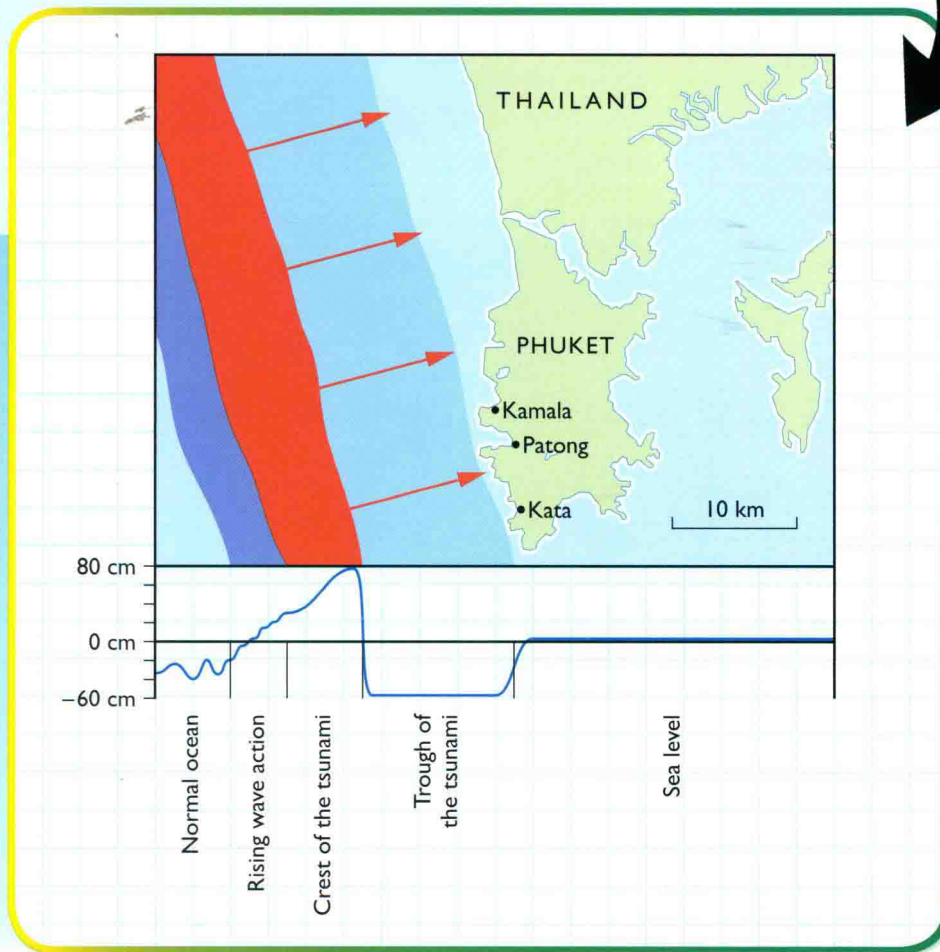
HURRICANES AND CYCLONES

A cyclone is a large mass of rotating air. The rotation is anti-clockwise in the Northern hemisphere and clockwise in the Southern hemisphere. When the surface winds exceed a certain value, they are called hurricanes or typhoons – hurricanes if they originated over the Atlantic or Pacific oceans and typhoons if they originated in Asia.

Hurricanes

Hurricanes are born in warm tropical waters. The storm gathers heat and energy over warm water. It builds in strength and destructive power as it moves along its path.

Hurricane Katrina

Hurricane Katrina struck New Orleans, Louisiana, USA, in 2005. Katrina was not the most powerful hurricane ever to strike land, but it did become a very serious natural disaster. New Orleans is a city built on low-lying land and is protected by **levees**. Katrina's storm surge pushed water over and through the levees and flooded the city. Officials had asked people to leave the city, but many did not go. After the hurricane, rescue efforts were disorganized. There was no way to help the people in need who had remained in the city.

Hurricane Katrina's storm surge flooded many streets in Louisiana, USA.

A hurricane spins around its centre point, called the eye. The area protecting the eye is the eye wall. That is where the strongest winds blow. The wind churns around, carrying heavy rain. As a hurricane moves, it pushes ocean water ahead of it. This water, called a **storm surge**, floods the land before the hurricane strikes.

Hurricanes are classified in categories. The wind speed in a hurricane determines in which category the hurricane falls. The weakest hurricane (category 1) has wind speeds from 119 to 153 kilometres (74 to 95 miles) per hour. The most powerful hurricane is a category 5, with wind speeds over 249 kilometres (155 miles) per hour. Today, hurricanes are more frequent and more powerful than they have ever been before. Most scientists believe that the number of storms is increasing because of global warming.

There are three basic reasons why hurricanes and cyclones cause fewer deaths than they did 100 years ago. First, weather **forecasters** warn people of coming storms days in advance. When officials have a good idea where the storm will strike, they order people to leave the danger zone. After the storm, rescue efforts are usually well organized.

The Saffir-Simpson Scale

This graph is a pictogram. It uses pictures to represent the wind speed for each category of hurricane. A hurricane's power is measured on the Saffir-Simpson scale. The most destructive hurricane is a category 5, with winds over 249 kilometres (155 miles) per hour.

The Saffir-Simpson scale