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Natural Disasters: Earth, Water, and Space



What is a natural disaster?

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Kinds of natural disasters

Geological or **geophysical**¹ natural disasters are caused by the Earth itself. Examples are earthquakes, volcanoes, avalanches/landslides, and sinkholes.

Hydrological² natural disasters are caused by water. They include tsunamis, floods, and limnic eruptions.

Finally, **extraterrestrial**³ natural disasters are caused by forces and objects from outside our atmosphere. Such disasters could be caused by meteorites/asteroids or solar storms.

Earth natural disasters

Earth's surface is always moving. It is made of many pieces, called **tectonic plates**⁴. Plates slide around on top of the almost liquid rock



Earth's surface is made of plates.

¹ **Geological/geophysical natural disasters:** events caused by the Earth itself.

² **Hydrological:** having to do with water.

³ **Extraterrestrial:** coming from outer space.

⁴ **Tectonic plates:** pieces that make up Earth's surface.

(**magma**⁵) of the **mantle**⁶. The mantle is the layer under the crust. These plates interact at **plate boundaries**⁷. They can push into each other, move away from one another, or slide past each other. These interactions cause events on the surface, such as earthquakes, volcanoes, and landslides/avalanches. Sinkholes are not caused by tectonic activity, but they are caused by things happening just under the surface.

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Earthquakes can destroy buildings.

Earthquakes can't be predicted. The best scientists can do is know where faults are and make sure the public also knows. Earthquakes will happen at faults at some point in the future, but when is a mystery. Even though earthquakes can't be predicted, they can be measured. The two major measurements for an earthquake are **magnitude**⁸, or how much energy is released, and **intensity**⁹, the strength of the shaking. In strong earthquakes, buildings can be damaged or destroyed, and the ground can split.

People and animals can be killed by falling debris. Even small earthquakes can knock things over in homes and businesses.

Volcanoes¹⁰ are holes in Earth's crust that hot, liquid magma flows out of as lava. They are dangerous to humans and wildlife. Eruptions throw out burning drops of lava, hot cinders, ash, and chunks of rock. These pieces of debris can cause injury and property damage. Lava that flows down the sides of a mountain can damage natural environments as well as towns and cities and injure or kill humans and other animals.



Volcanoes are holes in Earth's crust.

⁵ **Magma**: almost liquid rock.

⁶ **Mantle**: Earth layer under the crust.

⁷ **Plate boundaries**: edges of tectonic plates.

⁸ **Magnitude**: how much energy is released in an earthquake.

⁹ **Intensity**: strength of the shaking in an earthquake.

¹⁰ **Volcanoes**: holes in Earth's crust.



Lava flows are dangerous to anything in their path.

Similar, but even more dangerous, are **pyroclastic flows**¹¹. These are hot (100-700°C, 212-1300°F), moving mixtures of ash, gas, and other things from inside the volcano. They flow at up to 160 km (100 mi) per hour, scorching anything they touch. Clouds of gas from a volcano can poison the air, causing lung damage and even killing animals and plants. Ash that falls out of the air after an eruption can damage crops or even buildings. Like earthquakes, volcanoes at sea can cause tsunamis. However, unlike earthquakes, volcanic eruptions can be predicted.

Warnings include earthquakes and bulges on a volcanic mountain. These bulges mean that magma is just under the surface.

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Sinkholes can open near or even under homes.

Sinkholes¹² are pockets of sunken ground that can be less than 1 foot (0.3 m) to more than 100 feet (30 m) deep. They happen when rock below the surface gets hollowed out, usually by groundwater. They are most common in areas with soft rock that dissolves easily, like limestone or carbonate. They are also common where there are salt beds underground. Sinkholes form slowly, but once the rock gets too hollow, the ground can fall suddenly. Sinkholes swallow trees, roads, buildings, people, and other animals. Some sinkholes cause

widespread damage, while others simply become wetland.

Water natural disasters

The **hydrosphere**¹³ includes all the water on Earth. This means bodies of water as well as clouds and groundwater. Natural disasters that have to do with water are called hydrological. Such disasters include tsunamis, floods, and limnic eruptions.

¹¹ **Pyroclastic flows:** hot, moving mixtures of ash, gas, and other things from inside the volcano.

¹² **Sinkholes:** pockets of sunken ground.

¹³ **Hydrosphere:** all water on Earth.

Tsunamis¹⁴ are giant, fast waves. They are caused when something happens in the ocean to move lots of water. That something is usually an earthquake. However, volcanic eruptions, landslides, or meteorite strikes can also cause tsunamis. Tsunami waves can move hundreds of kilometers per hour (up to 900 km/hr in the open ocean). They can be taller than 100 ft (30 m) when they reach shore, and travel several kilometers inland.



Tsunamis are giant waves.

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Floods¹⁵ occur when water flows onto land that is usually dry. Any area that gets rain could flood. Floods can be anywhere from a few inches to tens of feet high, covering entire houses. Floods, like tsunamis, can knock over buildings, wash away soil and roadways, and carry dangerous debris. They can also poison drinking water and soil. Litter gets left behind after a flood, including sharp pieces of debris and even sewage. Because everything is wet, mold can grow, and people who live in flooded areas could get very sick.



The eruption of Lake Nyos killed 3500 livestock.

Limnic eruptions¹⁶ are rare, but deadly, lake explosions. Only two have been known to occur. The first, in 1984, killed 37 people. Two years later, a second eruption about 100 km (62 mi) away killed 1,746 people and 3,500 livestock. Limnic eruptions happen in lakes in old volcanic craters where temperatures don't change much. Gases, mainly carbon dioxide (CO₂), leak from the magma under the crater into the bottom of the lake. The water above this bottom layer holds the CO₂ down, keeping it from making bubbles and rising to the surface. Over time, more and more CO₂ leaks into the lake.

Floodwaters can reach the tops of houses.

¹⁴ **Tsunamis:** giant, fast waves.

¹⁵ **Floods:** water flowing on land that is usually dry.

¹⁶ **Limnic eruptions:** rare, deadly lake explosions.

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surface. It released a giant cloud of CO₂ that spread at nearly 100 km (60 mi) an hour across 22 km (14 mi). There were few survivors. CO₂ replaces oxygen in the air. When animals breathe it in, it poisons the lungs. It causes people and animals to pass out, go into a coma, and die. To prevent a future eruption at Lake Nyos, a team of scientists have put pipes in the lake. The pipes connect the deepest part of the lake with the surface. Gas can escape through the pipes to the air at the same rate it leaks into the lake, keeping it from building up.



Gas build-up in the bottom of Lake Nyos caused a huge eruption and CO₂ cloud.

Outer space natural disasters

Not all natural disasters start on our planet. Some come from outer space. These are extraterrestrial natural disasters and include meteorite/asteroid impacts and solar storms.



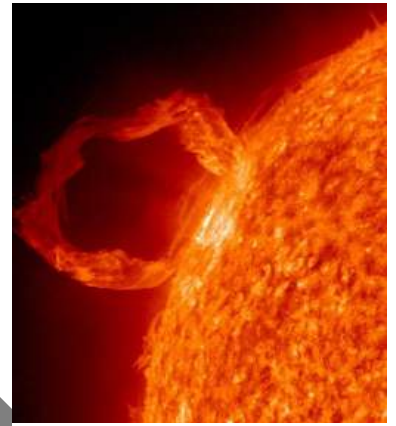
The asteroid impact theory is the most well-known K-T extinction theory.

We already know what kind of damage an **asteroid**¹⁷ can cause. After all, one is the most likely cause of one of the biggest mass extinction events in Earth's history. At the end of the Cretaceous Period, about 65 million years ago, a giant rock from space crashed into Earth. Over half of all species on the planet were wiped out, including the dinosaurs. Following the impact, clouds of dust and ash blocked the sun, leading to cold and low photosynthesis. Greenhouse gases built up in the atmosphere, so that when the ash

went away, the Earth warmed. Many animals that survived the blast and the cold were killed by the heat. If a meteorite were to hit in modern times, we could expect a similar result. Even one only about the size of a house could have as much energy as the bomb dropped on Hiroshima. Buildings in a 2-km (1.5-mile) radius would be flattened. A mile-wide meteorite would have about 10 million times more energy, with a flattening radius of about 300 km (200 mi).

¹⁷ **Asteroid:** rock from space.

Just as there are storms on Earth, there are storms on the Sun. They are very different from our storms. **Solar storms**¹⁸ are explosions that shoot energy and magnetic waves out of the Sun. Small storms give us auroras, the colorful light shows at the poles. Large storms could knock out satellite signals and electricity worldwide. Solar radiation from a storm could stretch to the space around Earth. This radiation can damage satellites and threaten humans on the International Space Station. This radiation could stay in the area for up to ten years. Scientists watch the Sun so that we can prepare for a future solar storm.



The effects of solar storms can reach Earth.

Summary

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¹⁸ **Solar storms:** explosions that shoot energy and magnetic waves out of the Sun.

Reading Comprehension Questions

1. What are natural disasters?
2. What
3. Name
4. What form does the energy from an earthquake take?
5. What
6. What triggers tsunamis?
7. Why
8. How much energy would a meteorite about the size of a house have?

Extension Questions

9. Which
10. Which
11. Create an infographic about one category of natural disaster, including where it is most likely to occur. Give examples of past events. Are these disasters likely to intensify with global climate change? Check out [canva.com](https://www.canva.com) for templates.

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