

# Secondary Disasters

When we call an earthquake the 'primary disaster', other disasters caused by the earthquake are called secondary disasters.

This can include tsunamis, landslides, surface rupture and soil liquefaction.

Compared with earthquake itself, these secondary disasters can be even more catastrophic.



*Damage from a tsunami in Alaska. Image Credit: NOAA*

For example, in the 2004 Indian Ocean earthquake and the 2011 Tōhoku earthquake in Japan, it was the tsunami induced by the earthquake that caused tremendous damage and fatalities.

In the 2008 Sichuan earthquake in China, at least one third of the death toll resulted from the geohazards triggered by the earthquake, and quake lakes forming in the mountain valleys became a big hazard for people living downstream.

Read below for more information about four of the main secondary disasters following an earthquake.

## Tsunami

Tsunami is a Japanese word meaning bay or harbour wave. It is caused by movement of ocean floor due to an earthquake beneath the sea. The wave height is relatively low in the open ocean, making it difficult to detect, and usually it does no harm to ships. However, when the wave reaches shallow water along the coastline, the wave height can increase significantly in a short time, reaching over 10 metres tall. The wave will ultimately flood a huge area inland, and the force of the wave will destroy everything in its path.



*Tsunami warning signs in Japan*



*Tsunami shelter in Thailand. Image credit: Roy Googin*

## Landslide

The shock of earthquake may trigger landslides, especially in the mountainous region, where the geological and topographical features and climate conditions are very complex.

During a landslide, earth materials ranging from soil to huge boulders move rapidly down a slope. It can sweep everything in its path or even bury whole towns.

Large landslides can block rivers, creating unstable dams and quake lakes upstream. The dam may eventually collapse and cause huge floods downstream.



*A landslide following an Earthquake near Cusco, Peru, 2018  
Image credit: Galeria del Ministerio de Defensa del Perú*



*Surface rupture in 1999 Jiji earthquake, Taiwan  
Image credit: Oregon State University*

## Surface rupture

Surface rupture is a breaking of the ground's surface when a fault rupture extends to the earth surface.

These ruptures or cracks can be caused by both horizontal and vertical movement in the ground from the earthquake. For buildings built across the fault, there is a high risk to be torn apart. It's very important to avoid building across or even near these areas.

## Soil liquefaction

During an earthquake, the repeated strong shaking can change the features of soil, making it behave like a liquid. If there is a building built upon this type of ground, it can collapse or sink.

Soil liquefaction can also flood the area with sand and ground water that was shaken to the surface.



*Buildings fallen over due to soil liquefaction after the 1964 Niigata, Japan earthquake  
Image credit: Ungtss via wikipedia*