

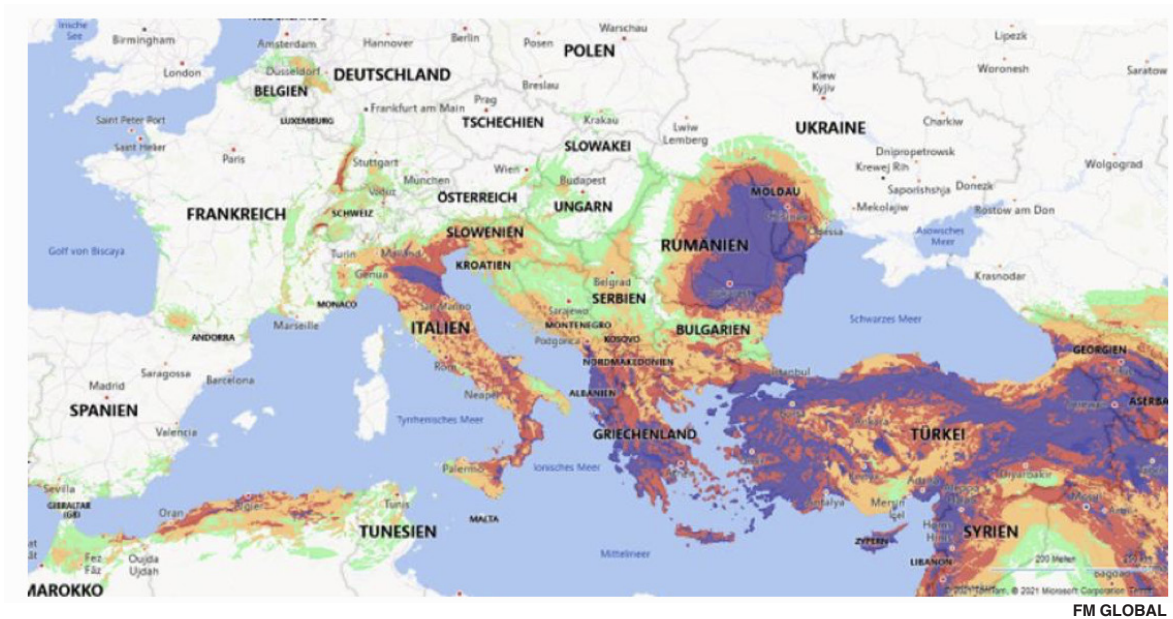
Forbes

SCIENCE

World's Most Comprehensive Global Earthquake Risk Map Online

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I deal with the rocky road to our modern understanding of earth



The FM Global Worldwide Earthquake Map is an interactive tool for visualizing earthquake risk.

One out of three people in the world is exposed to earthquakes, a number which almost doubled in the past 40 years. On average earthquakes cause nearly US\$40 billion in direct economic loss every year, by destroying production sites and disrupting transport lines. Knowing an area's seismic hazard is

now a bigger priority than ever.

This week *FM Global*, one of the largest commercial property insurers based in the U.S., released the world's most comprehensive global earthquake risk map to date.

FM Global Worldwide Earthquake Map is an online tool providing a zoomable map with a resolution of one square mile or less around the

world. The map employs data and seismic hazard models by the public-private Global Earthquake Model Foundation, China Earthquake Administration and the U.S. Geological Survey.

The map shows color-coded zones based on the return periods of damaging ground motion: every 50 years (with a higher than 2% annual probability of a damaging earthquake hap-

pening), 100 years, 250 years, 500 years and >500 years (with a lower than 0.2% annual probability of a damaging earthquake happening).

Unlike standard earthquake maps that show only the expected ground shaking during a seismic event, the new map incorporates soil data and building structural performance to map the probability that the earthquake will damage buildings.

Soil properties play an important role in the outcome of an earthquake. As seismic waves travel through the ground, they move faster through hard rock than soft soil. When waves transition from hard to soft earth, they increase in amplitude (or size), and a bigger wave causes stronger ground shaking. Fine-grained and water-saturated sediment layers in the underground can also lead to soil liquefaction during a quake, in which the ground that is ordinarily a solid behaves like a liquid, causing buildings to sink and topple.

The map also considers the vulnerability of structures, especially buildings, to define risk zones. Seismologists often say that it is not the earthquake that kills people, it is their home. If buildings are designed according to the modern seismic codes, with reinforced structures, the risk is low even if a strong earthquake happens. On the contrary, even a minor magnitude earthquake can cause

many victims if structures with weak points, like brick walls in old buildings, collapse.

Every year about 1,000 strong earthquakes, defined as quakes with a magnitude of 5.5 or greater, shake Earth. The great majority of all earthquakes occur at plate boundaries, where Earth's tectonic plates collide or where segments of Earth's crust move sideways in relation to each other. Relatively few intraplate earthquakes occur along faults in the normally stable interior of plates. A volcano-tectonic earthquake is an earthquake caused by the movement of magma beneath the surface of the Earth.

Based on the new map, some regions of the world are higher risk zones, including:

- The states of California, Idaho, Nevada, New Mexico and Utah. Seismicity here is associated with the San Andreas Fault, a roughly 800-mile (over 1,200 km) system of fractures that runs much of the length of the west coast of the U.S. and is capable of producing magnitude 7+ earthquakes, powerful enough to cause widespread destruction.

- Regions like New Zealand, China, Mexico and Latin America. Seismicity here is associated with a 25,000-mile (40,000 km) long system of faults and plate boundaries surrounding the Pacific Ocean,

dubbed sometimes "Ring of Fire" as most active volcanoes are located on or near the plate boundaries.

- Europe and Middle East. As the African plate moves north, it collides with the European and Asian plate, forming a complex pattern of faults and shifting microplates around the Mediterranean and Red Sea.

- Indian subcontinent. As the Indian plate moves north, it collides with the Asian plate, thrusting up fragments of continental crust and forming the Himalayas. The mountain-building process generates a lot of earthquakes along the thrust faults.

Lower risk zones include:

- The states of Oregon and Washington, and the New Madrid Seismic Zone region, a famous example of an area with intraplate earthquakes.

- Thailand, Malaysia, Singapore and Australia, bordering the Ring of Fire.

- Europe and Middle East, with countries like Spain, Germany, Austria, Hungary and the United Arab Emirates.

- Canada with the Ottawa-Montreal region. Seismicity here is associated with an old suture zone of a continent-continent collisions forming modern North America. In rare cases, tectonic stress can reactivate the fossil faults found here.