# Earthquakes and tsunamis in Europe?

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Since the tsunami that devastated coasts around the Indian Ocean in December 2004 and the Fukushima disaster in March 2011, people worldwide are aware that geological processes in the ocean can cause significant damage. From a European perspective, such events are seen to occur mostly in distant regions. "It is often forgotten that the

European coasts are also located in areas that are tectonically very active—and that many catastrophes have occurred here in the past", says Prof. Dr. Heidrun Kopp, a geophysicist from GEOMAR Helmholtz Centre for Ocean Research Kiel and co-chair of the European Marine Board working group on this topic. The European Marine Board is an association of major national marine or oceanographic institutes, research funding agencies, and national consortia of universities with a strong marine research focus from across Europe. Under Prof. Kopp's leadership, a position paper on marine geohazards has now been published.

The position paper "Marine geohazards: Safeguarding society and the Blue Economy from a hidden threat" provides information about dormant risks and makes recommendations for future research and policy. The position paper was launched at the 8th European Marine Board Forum focused on Supporting the Ocean Decade in Europe, held in Brussels, Belgium. "This Position Paper is highly relevant for European countries", emphasizes Heidrun Kopp. "If a natural disaster were to occur on Europe's coasts, all European Union states would be involved—both in disaster relief and in financing reconstruction."

## Multiple threats

For the position paper, scientists from a number of European Marine Board member institutions identified multiple threats. These include earthquakes and volcanic eruptions, which can subsequently result in tsunamis. Tsunamis can also be triggered when landslides occur on the seafloor. In addition, there are smaller events that may not cause major devastation but can incur significant economic damage. For example, large sandbars can shift along the ocean floor, similar to shifting sand dunes in deserts. These sandbars can cover and damage pipelines or deep-sea cables for communications and internet traffic, and cause costs of many millions of euros to business and governments. Heidrun Kopp:

"Our aim is not to build up a major disaster scenario, but to draw attention to threats so that policymakers and authorities can prepare and respond accordingly." One key aspect would be to better assess risks in maritime spatial planning and construction projects. "The probabilities with which geological events such as earthquakes or volcanic eruptions occur have not changed over millions of years. But the magnitude of damage is increasing because coasts are becoming more densely populated, we have built ports and industrial facilities on the coasts and on the seafloor, and we've generally accumulated large values there."

## A detailed map of the seabed

The authors of the position paper also emphasize that there is still a considerable need for research to better assess geological hazards in Europe's seas. For example, there is still no high-resolution map of the seafloor that accurately shows the geological fracture zones and margins of the continental plates where earthquakes often occur. They also say that there has been no detailed knowledge on the position and movement of large sandbanks until now. The researchers therefore propose large-scale measurement programs that map the seafloor with centimeter precision. "We want to identify those structures that are particularly problematic", says Heidrun Kopp. "In many cases, we still do not know exactly where these sites are. We do not even know the exact location of the 1908 Messina earthquake which struck Italy and caused the highest number of casualties ever recorded by a European earthquake. More than 80,000 people died at that time."

Large-scale measurement programs would be a first step towards greater safety. The next step would be to cover the particularly critical points with a measuring network—as is already the case on Mount Etna, for example. For a long time now, the flank of the volcano has been sinking into the sea by two to three centimeters per year. This movement is common and not a cause for concern. However, if the land mass were to

move faster at some point, the monitoring network would sound the alarm—to warn of a major submarine landslide. "The most important goal of our paper is to make these threats visible," says Heidrun Kopp. "We want to help make citizens and decision-makers more aware of the dangers in the future."

**More information:** Position paper: marineboard.eu/sites/marineboa … o_Hazards_v5_web.pdf

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