Mapping the tsunami hazard

In just a few minutes, a tsunami can cause major human, economic and environmental damage. Greater understanding of these events is needed to establish early warning systems, effective evacuation plans and greater resilience in coastal communities.

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Satellite stations to monitor the coastline and calculate tsunami propagation, Ecuador.

Some events have a before and an after. This was the case for the 2004 Indian Ocean earthquake, which had a magnitude of over 9 and caused a devastating tsunami that killed 250,000 people. In the aftermath of this tragedy, more warning systems to alert coastal populations of incoming tsunamis were put in place, but these approaches alone are not enough. It is necessary to identify the areas likely to be impacted and those that are permanently protected beforehand.

To obtain this information and produce hazard maps, it is essential to build robust digital simulations capable of describing how a tsunami spreads and impacts the coast. These simulations require reliable physical models, solid knowledge of the nature of the source (e.g. an earthquake) and extensive data on the underwater and coastal topography. These models make it possible to assess the hazard at a lower cost, complementing the tsunami observation network.

Research carried out over the last 20 years has resulted in a number of maps, mainly around active fault zones, such as in Southeast Asia, the Caribbean, the Southwest Pacific and the Mediterranean.

These models, supplemented by hydrographic tsunami data or eyewitness accounts, can also sometimes be used retroactively, to acquire

"The Oceanographic Research Institute of the Ecuadorian Navy (INOCAR) is responsible for navigational safety and marine hazards. The North Andean seismic zone is a site of recurrent tsunamis, which means that Ecuador is the relay for the Pacific tsunami warning system. One of our key tasks is to establish tsunami risk maps and keep them up to date, which we share with civil protection authorities for risk prevention."

Andrés Pazmiño, Oceanographic Research Institute of the Ecuadorian Navy, Ecuador

••• New digital simulation and risk-mapping tools offer ways to adapt coastal development to the threat of tsunamis •••

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Tsunami damage in Indonesia in 2004.

information about the source of a tsunami and estimate, for example, the magnitude of historic earthquakes. The aim is to help create a better description of the seismic hazard. Examples include the Indian Ocean earthquake and certain famous 19th-century earthquakes in Liguria and the Loyalty Islands in the South Pacific.

Studies are continuing on the North Andean subduction zone. Tools and methodologies are currently being implemented within the Ecuadoran Oceanographic Research Institute. The objective is to be able to create flood and intensity maps for all communities in the country. The work is time-consuming and will have to be constantly updated, but once done, it can be replicated in other places.

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