One-third of central Catalan coast is very vulnerable to storm impact

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Researchers from the Polytechnic University of Catalonia (UPC) have developed a method for evaluating the vulnerability of coastal regions to the impact of storms. The method, which has been applied on the Catalan coastline, shows that one-third of the region's coasts have a high rate of vulnerability to flooding, while 20% are at risk of erosion.

"Until now there was no tool for evaluating coastal storm vulnerability that could quantify the processes and the probabilities of these events occurring. This is why we have developed a method to allow coastal managers – the government – to predict the scale of the damage caused by these kinds of phenomena, which are becoming increasingly frequent", Eva Bosom, lead author of the study and a researcher at the Maritime Engineering Laboratory of the Polytechnic University of Catalonia (UC), tells SINC.

Some 34% of the central Catalan coast exhibits a level of vulnerability to flooding ranging from high to very high, while this vulnerability is medium in almost 50% of cases, indicating the existence of "fairly frequent coastal inundation problems", the study points out. With regard to the risk of erosion, 20% of the areas are at medium to high risk, especially in the south, where the beaches are narrower and the sand fine.

A coast's capacity to cope with the impact of a storm depends on the intensity of the storm and the geomorphology of each beach. The most common "damaging" processes are flooding and erosion.

The UPC based their study on these processes in measuring the fragility of a 50-kilometer stretch of the Catalan coast. "Flooding and erosion were evaluated separately because, although they are caused by the same agent – storms – their intensity is not equally dependent on the characteristics of the storm, and the damage caused by them is not the same", explains Bosom. Wave data from the past 50 years, from 1958 through to 2008, was used for the study.

The results, published in the journal *Natural Hazards and Earth System Sciences*, show that different kinds of coastlines suffer differently from the effects of storms, showing that "coastal geomorphology controls the capacity of the system to recover from the impact", the author adds.

Evaluating risks to offset damage

The aim of the methodology developed is to help coastal managers take decisions about where to invest in order to mitigate coastal disasters, depending on the characteristics of the storm and the stretch of coastline being assessed.

A storm's magnitude can vary along the coastline, and this affects the intensity of flooding and erosion processes. For this reason "it is important to measure the vulnerability of the coast and the probabilities of an event happening, which can be selected according to the socioeconomic or environmental importance of each place", says Bosom. This means "managers can classify the region according to the danger level and decide where to invest resources or where to put in place protection and adaptation measures", the researcher goes on.

The vulnerability of a beach may also vary due to changes in its morphology. To measure this variation "coastal data must be updated periodically or following an important event, in order to give the most accurate picture possible of the current morphology of the beach", the

researcher says.

More information: E. Bosom; J. A. Jiménez. "Probabilistic coastal vulnerability assessment to storms at regional scale – application to Catalan beaches (NW Mediterranean)". *Natural Hazards and Earth System Sciences*, 2011. DOI: 10.5194/nhess-11-475-2011

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