

## MULTI-SOURCE FLOOD RISK ANALYSIS FOR SAFE COASTAL COMMUNITIES AND SUSTAINABLE DEVELOPMENT

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### Abstract

To increase the response capability to coastal flooding events in an accelerating sea level rise context, the ability to predict floods has to improve and be integrated with other components of risk, such as vulnerability and exposure. The MOSAIC.pt project aims at developing an advanced flood risk management framework for coastal zones, integrating robust predictive tools and multi-source data with the different dimensions of the risk, to adequately contribute to emergency planning and response.

*Key words:* Risk assessment; Real-time prediction and monitoring; Territorial vulnerability; Safe communities

### 1. Introduction

About 60% of the Portuguese population inhabits the coastal zone, increasing up to 80% during the summer months (European Commission, 2009). The Portuguese coast presents a high risk of flooding, as shown by the impact of recent events (e.g. the Hercules storm in 2014, Santos et al., 2015), that is increasing with the sea level rise. More exposed to extreme events, the Portuguese West coast stretches through about 640 km showing a variety of coastal typologies, such as sand beaches, rocky, cliffed and artificialized coasts. To improve the response capability to flooding events, the understanding of hazard, vulnerability and exposure of people and assets should be integrated in efficient methodologies that adequately support the planning and emergency response. This paper presents the project MOSAIC.pt - *Multi-source flood risk analysis for safe coastal communities and sustainable development*.

### 2. Objectives and methodological approach

MOSAIC.pt aims to develop an innovative flood risk management framework for coastal zones based on the integration of predictive models and real-time monitoring data, and accounting for the different dimensions of the vulnerability. The project is anchored on a relevant scientific challenge: how to predict the flooding process in an efficient way to support the emergency management needs considering the singularities of a diverse exposed territory. To answer this question, the project addresses the following specific objectives: 1) to improve flood prediction in different coastal typologies, through the integration of data from multiple *in-situ* and remote

sources; 2) to identify the coastal typologies affected by flooding aiming to support the development of an integrated risk analysis methodology; 3) to contribute to the emergency response capacity of the coastal management institutions and the affected communities. A preliminary evaluation of past flood events in the Portuguese West coast allows the selection of critical coastal typologies used as testbeds in an observatory context for a) innovative methodology development, combining model predictions and multi-source monitoring data; b) assessment of the different vulnerability dimensions. The observatory context provides guidelines for the development of an integrated, generic risk framework to be applied for other areas, upon multi-scenario criteria of hazard. To contribute to the capacity improvement of the emergency management decisions-makers, a real-time flood emergency component will be conceptualized taking advantage of LNEC's forecast framework (Fortunato *et al.*, 2017). The evaluation of the current emergency response capability of the communities will support the design of the participative methodologies to increase their involvement and preparedness.

### 3. Results

The project main outcomes will be: 1) a database representing the historical conditions of past flood events at the West Portuguese coast; 2) the identification of the coastal typologies, connecting flood hazard and impacts, that characterize the West Portuguese coast; 3) a multi-source methodology for flood hazard prediction; 4) the conceptualization and operation of a real-time flood emergency system; 5) proposals of thresholds and tools for community training actions, adjusted practices, and insurance streamlines and accountability references.

### 4. Final remarks

The main challenge and innovation of this project is to identify the coastal critical typologies affected by flooding in the Portuguese West coast and to improve for those predictive tools by integrating data from multiple sources. The project results will support more realistic and efficient flood risk assessments that will be able to inform and support public policy instruments (e.g. National Strategy for Coastal Zone Management or the National Strategy for Climate Change adaptation) promoting safer and more resilient communities in line with the Sendai Framework for Disaster Risk Reduction (2015-2030).

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