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COASTAL EROSION AND FLOOD VULNERABILITY INDICATORS: A NORTHERN PORTUGUESE CASE STUDY

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ABSTRACT

About a quarter of the world's sandy beaches are estimated to be eroding, threatening coastal populations and ecosystems and causing economic as well as land losses. Coastal erosion and flood risk is a growing concern, particularly in the light of potential climate change effects, with expected sea-level rise and increases in storm frequency and intensity. Climate change impacts associated with increasing coastal population and weakened dune systems, and thus vulnerability, are likely to increase coastal risks (i.e. potential losses and damages) in the coming decades. Insight into coastal vulnerability and dynamics is essential for an informed decision making and planning process, in order to apply the most adequate risk management strategies including, preparedness, protection and/or mitigation measures.

The MarRisk project aims to ensure an intelligent and sustainable growth of the Galician and Portuguese coastal zones, increasing their resilience to climate change impacts, and improving their response to potential disasters. Therefore, coastal vulnerability (e.g. in terms of geology, morphology and exposure) and coastal erosion and flood risks were assessed. We present the morphometric, morphodynamic, sediment and vegetation indicators that were selected to provide information about vulnerability (e.g. beach type) and possible climate change effects (e.g. beach erosion in recent years), and subsequently used for erosion and flood risk assessment and modelling for the Northern-Portuguese Atlantic coast.

Aerial (plane and drone-based) photography was used for regional lower-resolution and local higher-resolution topographic surveys. Indicators related to land use and land cover, including dune vegetation cover, were also extracted from orthophotos. Morphological indicators, such as beach width and dune height were extracted from the derived Digital Elevation Models (DEM). Coastal short-term dynamics indicators, such as coast line evolution and volumetric changes, were assessed comparing the project topographic surveys with previous observations and DEM. Additional in-situ observations were carried out to obtain indicators related to coast types and sandy beach sediments. Information was compiled and analysed in a GIS, allowing quantification of indicators and of their changes over time. The coastal erosion and flood vulnerability indicators obtained were used to classify beach stretches and to support erosion and flood risk modelling, providing valuable information for stakeholders, particularly local and national authorities that have to decide which measures to

apply and prioritize the investments to adapt and defend the coast.

Keywords: coastal vulnerability, erosion risk, coastal flood risk, morphodynamics, climate change