



## **Coastal erosion risk assessment using natural and human factors in different scales.**

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Climate change, including sea-level rise and increasing storms, raise the threats of coastal erosion. Mitigating and adapting to coastal erosion risks in areas of human interest, like urban areas, culture heritage sites, and areas of economic interest, present a major challenge for society. In this context, decision making needs to be based in reliable risk assessment that includes environmental, social and economic factors. By integrating coastal hazard and risk assessments maps into coastal management plans, risks in areas of interest can be reduced. To address this, the vulnerability of the coast to sea level rise and associated erosion, in terms of expected land loss and socioeconomic importance need to be identified. A holistic risk assessment based in environmental, socioeconomic and economics approach can provide managers information how to mitigate the impact of coastal erosion and plan protection measures. Such an approach needs to consider social, economic and environmental factors, which interactions can be better assessed when distributed and analysed along the geographical space. In this work, estimations of climate change impact to coastline are based on a combination of environmental and economic data analysed in a GIS database. The risk assessment is implemented through the estimation of the vulnerability and exposure variables of the coast in two scales. The larger scale estimates the vulnerability in a regional level, with the use environmental factors with the use of CVI. The exposure variable is estimated by the use of socioeconomic factors. Subsequently, a smaller scale focuses on highly vulnerable beaches with high social and economic value. The vulnerability assessment of the natural processes to the environmental characteristics of the beach is estimated with the use of the Beach Vulnerability Index. As exposure variable, the value of beach width that is capitalized in revenues is implemented through a hedonic pricing model. In this econometric modelling, Beach Value is related with economic and environmental attributes of the beach. All calculations are implemented in a GIS database, organised in five levels. In the first level the gathering of raw data is been made. In the second level data are organized in different scales. Third level, concerns the generating of new thematic data for further use. Risk assessment analysis and cost benefit analysis for protection measures is been made in level four. In the fifth level the results are transformed in user friendly form to be used by coastal managers. As case study area for the application of the method is selected Crete Island, while for the small scale the city of Rethymnon, which at the regional vulnerability analysis was found as high vulnerable. In the small scale vulnerability analysis, the sectors of the beach which are most vulnerable were identified, and risk analysis was made based on the revenue losses.

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