



## **Coastal vulnerability assessment with the use of environmental and socio-economic indicators**

George Alexandrakis (1), Stelios Petrakis (1,2), Mixalis Voutsdoukas (3), George Ghionis (1,2), Eleni Hatziyanni (4), and Nikolaos Kampanis (1)

(1) Foundation for Research and Technology, Hellas, Institute of Applied and Computational Mathematics, Heraklion, Greece (alexandrakis@iacm.forth.gr), (2) Department of Geography & Climatology, Faculty of Geology & Geoenvironment, University of Athens, Panepistimioupolis, Zografou, 15784, Greece, (3) Institute of Environment and Sustainability, Joint European Research Center, Via Enrico Fermi 2749, I-21027-Ispra, Italy. , (4) Region of Crete, Directorate of Environment and Spatial Planning, M Mousourou 15, GR71201, Heraklion, Crete, Greece

Climate change has significant repercussions on the natural environment, triggering obvious changes in the natural processes that have a severe socio-economic impact on the coastal zone; where a great number of human activities are concentrated. So far, the estimation of coastal vulnerability was based primarily on the natural processes and less on socio-economic variables, which would assist in the identification of vulnerable areas. The present investigation proposes a methodology to examine the vulnerability of a highly touristic area in the Island of Crete to an expected sea level rise of up to ~40 cm by the year 2100, according to the A1B scenario of IPCC 2007. The methodology includes the combination of socio-economic indicators into a GIS-based coastal vulnerability index for wave-induced erosion. This approach includes three sub-indices that contribute equally to the overall index. The sub-indices refer to coastal forcing, socio-economic and coastal characteristics. All variables are ranked on a 1-5 scale with 5 indicating higher vulnerability. The socio-economic sub-index includes, as indicators, the population of the study area, cultural heritage sites, transport networks, land use and protection measures. The coastal forcing sub-index includes the frequency of extreme events, while the Coastal Vulnerability Index includes the geological variables (coastal geomorphology, historical coastline changes, and regional coastal slope) and the variables representing the marine processes (relative sea level rise, mean significant wave height, and tidal range). The main difficulty for the estimation of the index lies in assessing and ranking the socio-economic indicators. The whole approach was tested and validated through field and desktop studies, using as a case study the Elouda bay, Crete Isl., an area of high cultural and economic value, which combines monuments from ancient and medieval times, with a very high touristic development since the 1970s.