



Protection of coastal monuments against climatic change induced sea level rise and storm waves reckoning designing limitations

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Sea Level Rise and increased storm events can have severe negative effects on structures that were not designed to withstand the current state of the environment. Risks affecting coastal cultural heritage may stem from exposure to wave energy and overtopping of coastal structures, these representing as well potential hazard for the safety of people. In the case where the coastal structure is a monument or landmark of an area, protection measures should apply. Depending on the level of exposure, coastal engineers rely on predictions from semi-empirical methods and numerical models for solutions. The anticipated increase in extreme events, due to climatic change, makes protection and prevention measures all the more compulsory. Additionally, restrictions in funds availability and the need of landscape preservation increase the level of difficulty in designing such interventions. In this work, a model to quantify the effectiveness of a protection measure, combining a numerical wave model accounting also for the trend of increase of sea level rise and storm frequency, with design requirements, fund availability and economic sustainability, is presented. As a case study, the Venetian Coastal Fortress of the city of Heraklion is considered. Climatic forecasting results indicate that for the coastal area of Heraklion the wind speed and directions are expected to have increase in wind speeds but also an increase in the frequency of the wind directions that effect the monuments the most. Based on the results of the measurements and numerical modelling, mitigation actions were proposed that include, increasing the submerged armouring with the use of natural based solutions in order to the effect of wave energy and overtopping.

Keywords: Wave overtopping, storms, climatic change, cultural heritage, design limitations.

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