

Comparison of empirical and numerical methods for the assessment of coastal vulnerability to erosion

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Assessing the vulnerability to erosion is an important step in order to identify the prone areas and propose an adaptation policy to climate change in coastal areas.

In this paper two coastal areas at the Northern part of the Aegean Sea are selected to examine their vulnerability to erosion. The first case is Lesbos Island where the most common feature is pocket beaches and the second one is the coast of Thrace composed by long sandy beaches. In both case studies, the same simplified methodology proposed by Mendoza and Jimenez (2009) is used, which links the vulnerability to erosion with morphodynamic parameters such as beach retreat and beach width. The key parameter for the vulnerability assessment is the beach retreat. For its calculation two different approaches are used and compared. The first approach divides the eroded volume with the eroded depth and it is based on an empirical formula, derived for the Greek seas from the CCSEAWAVS project (Kokkinos et al, 2014), which links the eroded volume with JA parameter, a beach erosion predictor proposed by Jimenez (1993). The sediment fall velocity, the beach slope and the wave characteristics are the only necessary parameters to calculate JA. The second approach is based on the results derived from the numerical model Xbeach (Roelvink et al., 2009), which is an open source, state-of-the-art, two-dimensional model including the hydrodynamic processes of short and long wave transformation, wave-induced setup, overwash, inundation, as well as the morphodynamic processes of bed load and suspended sediment transport, dune face avalanching, bed update and breaching. The results indicate that the area of Thrace is very prone to erosion at the eastern and western part of the study area, while the Island of Lesbos appears to have very low vulnerability.

The application of this methodology with the two different approaches aims to generate useful information about the vulnerability to erosion, to examine the reliability of the empirical approach and to support studies for an adaptation policy to climate change.

References:

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