



A new GIS based methodology to assess coastal vulnerability by using a Modified Coastal Vulnerability Index (MCVI)

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Interdisciplinary researches of the last 20 years highlight the erosion risk that affects world-wide many coasts which are subject, in particular, to retreat and inundation risk by sea ingression due to natural and/or anthropic driving forces. Critical coast conditions, in relation to the prospected near-future climate change may generate heavy negative impact on coastal resource handling and connected risk assessment. Also the Italian coast, which extends for ca. 7500 km, is significantly affected by erosion (ca. 22% of the total coast) and other coastal risks such as subsidence (for example the Venice laguna). It hosts important urban and industrial centers, infrastructures and touristic activities, and numerous landscape beauties, and risk assessment appears crucial in order to guarantee its protection and sustainable development.

In this work we have analyzed in detail the sandy 32 km long coast which limits the Sele river coastal plain to the sea, located between the rocky Amalfi and Cilento coasts (Campania, Southern Italy). This coast is well populated and characterized by the presence of large urban areas, first the city of Salerno, important touristic places as the famous archeological site of Paestum and touristic structures all along the coast.

Aim of our study was to assess the coastal vulnerability by using a GIS based methodological approach. The coastal vulnerability, which is intended as the susceptibility of a determined coastal area to be affected either by inundation or erosion, is linked to several parameters that can be grouped into three main categories: erosion, permanent inundation and episodic inundation. There are several qualitative and/or quantitative models which allow to assess coastal vulnerability and to compare different coastal areas. One of the most applied models was proposed by Gornitz et al. (1997) and consists in the determination of a Coastal Vulnerability Index (CVI). This method, however, has the limit that it can be used only for large areas. In order to improve this model for smaller coastal sectors and, therefore, for the study area, we have made some important changes to the method. These changes allowed to define a new index of vulnerability (MCVI) which is based on the evaluation of the Potential Erosion (PE), the Potential Inundation (PI) and two more indexes of coastal vulnerability, MCVI25 and MCVI50, which consider the Sea Level Rise (SLR) at 25 and 50 years, respectively. The final correlation of the described indexes is obtained through a multiple linear regression, and the final index value is derived by the expression $MCVI=0.45 \cdot PE + 0.55 \cdot PI$, already used by Gornitz et al. (1994).

The proposed methodology has allowed us to identify an area in the northern sector of the Sele coast (between Salerno and the Sele River) with a moderate to very high degree of vulnerability which becomes maximum at the Picentino river mouth, and an area in the southern sector which is characterized by a low to very low degree of coastal vulnerability.

In conclusion the study showed that 44%, 33% and 25% of the beaches present along the Sele coast are characterized by a high to very high, a moderate and a low to very low degree of vulnerability, respectively.

Finally, the calculated vulnerability referring to the effect of sea level rise due to climatic change (MCVI25, MCVI50) is very low except for the Picentino mouth sector.

Gornitz V.M., Daniels R.C., White, T.W. & Birdwell, K.R. (1994) The development of a coastal risk assessment database: vulnerability to sea-level rise in the U.S. Southeast. *Journal of Coastal Research*, SI 12, 327-338.

Gornitz, V.M., Beaty, T.W., Daniels, R.C. (1997) A coastal hazards data base for the U.S. West Coast. ORNL/CDIAC-81, NDP-043C.