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Coastal Risk Assessment Framework tool for the identification of hotspots along the Emilia-Romagna coastline (northern Italy)

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The Emilia-Romagna coastline is located in northern Italy, facing the Adriatic sea. The area is especially exposed to the flooding hazard because of its low lying nature, high urbanisation and the large exploitation of beach resources for tourism. The identification of hotspots where marine flooding can cause significant damages is, therefore, a key issue.
The methodology implemented to identify hotspots is based on the Coastal Risk Assessment Framework tool that was developed in the RISC-KIT project (www.riskit.eu). The tool combines the hazard component with different exposure indicators and is applied along predefined coastal sectors of almost 1 Km alongshore length. The coastline was divided into 106 sectors in which each component was analysed. The hazard part was evaluated through the computation of maximum water levels, obtained as the sum of wave set-up, storm surge and tide, calculated along representative beach profiles, one per sector, and for two return periods (10 and 100 years). The data for the computation of the maximum water level were extracted from the literature. The landward extension of flood-prone areas in each sector was the extension of the flood maps produced by the regional authorities for the EU Flood Directive and for the same return periods. The exposure indicators were evaluated taking into account the location and type of different assets in each sector and in flood-prone areas. Specifically, the assets that were taken into account are: the transport network, the utilities (water, gas and electricity) networks, the land use typologies, the social vulnerability status of the population and the business sector. Each component was then ranked from 1 to 5, considering a scale based on their computed value (hazard), importance and location (exposure indicators). A final coastal index (CI) was computed as the root mean square of the geometrical mean of the exposure indicators multiplied by the hazard indicator. Land use typologies were valued taking into account a classification produced by the regional authorities for the Flood Directive. The social vulnerability status of the population was derived from data produced by the National Statistic Institute. The regional managers provided the location of transport and utilities networks. The business indicator was built considering the tourist arrivals in each coastal municipality compared to the total number of arrivals.
The results showed that the coast is very exposed to flooding and that the 100 year return period event leads to the identification of a large number of hotspots (65 over 106) defined as sectors with CI > 2.5. The main drivers for the hotspot identification were the hazard indicator and the land use typologies, because important transport/utilities network are not located in flood-prone areas. The most critical sectors are situated in the central-southern part of the coastline, where the most attractive tourist facilities are located and where the coastal corridor is occupied by a continuous urbanisation.