Coastal Dune Vulnerability To Overtourism: Ravenna Coast, Italy

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In the last 50 years, along the Ravenna coast, development has put tremendous stress on already delicate natural dune systems. This sensitive ecosystem is essentially exposed to natural hazards like climate change, sea level rise, storms, etc. Moreover, urbanization and fast growing tourism infrastructure such as active housing and restaurants followed by pollution and land perturbations are increasing coastal vulnerability. In this paper, vulnerability is directly related to tourism pressure, where beach users and tourism infrastructure sprawl are put into the main focus of the study. "Overtourism" is a term designed for this study meaning overly developed coastal zone associated with mass tourism. It was sorted into two categories: permanent activities such as present beach installations (housing, hotels, restaurants, parking, etc.) and temporary (visitors and vehicles tramping, seasonal outdoor facilities). Given that, vulnerability was assessed following a check-list developed for the study area. Variables were grouped into 4 partial vulnerability indices: geomorphology (GI), vegetation condition (VI) of the area, beach user influence (BUI) and coastal development density (CDI). PI - an index that referred to any evidence of recent management protection actions. All likely interactions between the pressures and the environmental components were highlighted by using Vulnerability Dependence Matrix. These variables were further weighted and combined into a composite index TVI (Total Vulnerability Index) where the resulting values were normalized and expressed graphically. A TVI/PM ratio was obtained to detect the site equilibrium relationship. Data for spatial patterns of beach goers and the evolution of beach development were obtained using digital photo images derived from web-cameras installed throughout the Ravenna coast. The main application of this tool was to perform preliminary assessment in order to envisage "hot spots" and allow stakeholders to interpret vulnerability aiding decision-making process and facilitating adaptation responses.