

Quantitative Analysis of the Effect of Rising Level of the Adriatic Sea on Croatian Coast: a GIS Approach

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Abstract

The increase in sea level is the consequence of gradual and extended increase in sea water volume associated with climate changes, as well as various geological processes. Global average sea level is estimated to increase from 0.18 m to more than 1 m by the end of the 21st century. In accordance with the prevailing global processes the level of the Adriatic Sea is also rising. Three models of varying sea level rise probability (1 m, 3 m and 6 m) were designed to analyze the potential vulnerability of Croatian coast to the rising sea level. Vulnerable zones were indicated based on these models and their spatial coverage was analyzed within various administrative units (counties, municipalities, settlements). The effect of rising sea level on population and traffic infrastructure of coastal region was also analyzed. The goal of the research was to define the most vulnerable parts of Croatian coast based on analyzed effects of rising sea level on the Croatian coastal region. The Coastal *Municipality Vulnerability Index* was produced so as to differentiate the most vulnerable parts of the Croatian coast and facilitate comparison of coastal municipalities according to the degree of vulnerability. In order to produce the Index, we used quantitative data on the spatial coverage of flood zones and vulnerability of population and traffic infrastructure of the coastal zone, obtained by analysis of effects. The Analytic Hierarchy Process (AHP) was employed to attribute different weights to mentioned variables, depending on importance of the variables. Data resulting from the analysis of different models indicate almost the entire Croatian coast is vulnerable and that various parts of Croatian coast are disproportionately vulnerable. Analyses of all three models showed that Zadar and its surroundings is the most vulnerable part of Croatian coast according to all three criteria (population vulnerability, flood zones and vulnerability of traffic infrastructure). Therefore, Zadar was analysed further in terms of the microlocation effect of the rising level of the Adriatic Sea, taking into consideration several social-economic segments of the coastal area. This research is important because it indicates the most vulnerable parts of the Croatian coast and is a basis for timely adaptation to negative effects of increasing level of the Adriatic Sea.

Note: The paper was produced within the project Promotion of Geography in High Schools, originally titled "Does the fate of Atlantis await Zadar?". The paper was subsequently expanded and a more comprehensive analysis was conducted.

Key words: GIS modelling, analytical hierarchical process, Adriatic Sea, analysis of effect, natural threats, rising sea level