

## **Seismic Hazard and risk assessment for Romania -Bulgaria cross-border region**

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Among the many kinds of natural and man-made disasters, earthquakes dominate with regard to their social and economical impact on the urban environment. Global seismic hazard and vulnerability to earthquakes are steadily increasing as urbanization and development occupy more areas that are prone to effects of strong earthquakes. The assessment of the seismic hazard and risk is particularly important, because it provides valuable information for seismic safety and disaster mitigation, and it supports decision making for the benefit of society.

Romania and Bulgaria, situated in the Balkan Region as a part of the Alpine-Himalayan seismic belt, are characterized by high seismicity, and are exposed to a high seismic risk. Over the centuries, both countries have experienced strong earthquakes. The cross-border region encompassing the northern Bulgaria and southern Romania is a territory prone to effects of strong earthquakes. The area is significantly affected by earthquakes occurred in both countries, on the one hand the events generated by the Vrancea intermediate-depth seismic source in Romania, and on the other hand by the crustal seismicity originated in the seismic sources: Shabla (SHB), Dulovo, Gorna Orjahovitza (GO) in Bulgaria. The Vrancea seismogenic zone of Romania is a very peculiar seismic source, often described as unique in the world, and it represents a major concern for most of the northern part of Bulgaria as well.

In the present study the seismic hazard for Romania-Bulgaria cross-border region on the basis of integrated basic geo-datasets is assessed. The hazard results are obtained by applying two alternative approaches – probabilistic and deterministic. The MSK64 intensity (MSK64 scale is practically equal to the new EMS98) is used as output parameter for the hazard maps. We prefer to use here the macroseismic intensity instead of PGA, because it is directly related to the degree of damages and, moreover, the epicentral intensity is the original parameter in the historical earthquake catalogues. A particular advantage of using intensities is that the very irregular pattern of the attenuation field of the Vrancea intermediate depth earthquakes can be estimated from detailed macroseismic observations that are available (in both countries) for the study region. Additionally, de-aggregation of the seismic hazard for a recurrence period of 475 years (probability of exceedance of 10% in 50 years) for intensity was performed for 9 cities (administrative centers) situated in northern Bulgaria. Finally, applying SELENA software earthquake risk for Bulgarian part of the cross-boarder region is analyzed.

The results presented for the Romania-Bulgaria cross border region are part of the work carried out in the DACEA Project (2010-2013) that was implemented in the framework of the Romania - Bulgaria Cross Border Cooperation Programme (2007-2013).