



## **Possible multihazard events (tsunamis, earthquakes, landslides) expected on the North Bulgarian Black sea coast**

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**Earthquakes** The area is famous with its seismic regime. The region usually shows non regular behavior of the strong events occurrence. There are episodes of activation and between them long periods of seismic quiescence. The most important one is at the I-st century BC when according to the chronicler Strabo, the ancient Greek colony "Bisone sank in the waters of the sea". The seismic source is known as Shabla-Kaliakra zone with the best documented seismic event of 31st March 1901. This event had a magnitude of 7.2 (estimated by the macroseismic transformation formula) with a source depth of about 10-20 km. The epicenter was located in the aquatory of the sea. The observed macroseismic intensity on the land reached the maximum value of X degree MSK. This event produced a number of secondary effects – landslides, rockfalls, subsidence, extensive destruction of the houses located around and tsunami (up to 3 meters height observed at Balchik port. This event is selected as referent one.

**Tsunamis** Such earthquakes (magnitude greater then 7.0) almost always trigger tsunamis. They could be generated by the earthquake rupture process, or more frequently by the secondary triggered phenomena – landslides (submarine or surface) and/or other geodynamic phenomena – rock falls, degradation of gas hydrates, etc. the most famous water level change is described by Strabo – related to the great catastrophe. The area shows also some other expressions about tsunamis – the last one – a non seismic tsunami at 7th May, 2007 with maximum observed amplitudes of about 3 meters water level changes.

**Landslides** The area on the north Bulgarian Black Sea coast is covered by many active landslides. They have different size, depth and activation time. Most of them are located near the coast line thus presenting huge danger about the beaches, tourist infrastructure, population and historical heritage. The most famous landslide (subsidence) is related with the I-st century BC seismic event, when a huge mass slide in the waters, buried Bisone and created the peak Chirakman. The event of 1901 also created landslides, subsidence of a huge land block with dimensions of about 1x1 km. and rock falls with large boulders. The landslide could be also submarine; creating in such way turbidities and/or mud flows from the bottom deposits like sapropel breccia and mud volcano depositions.

**The time dependent scenario** The initial data about the time development of the hazards phenomena is based on their main physical properties – size, location, velocity of the process, intensity (magnitude), etc. The table about the main parameters, possible consequences and general threaten objects is created. The main time development of the disasters in case of the referent event (magnitude 7.2) is presented at the time chart diagram. The time chart development of the selected hazardous processes is presented as follows:

**Conclusions** The time dependent scenario in case of a referent M7.2 seismic event is developed. The investigations about the consecutive and simultaneous action of all expected hazards and their multirisk effects are performed. The results obtained show the complex possible consequences and interrelated dependencies. Acknowledgments: This study is supported by the SCHEMA and TRANSFER EU Projects.