



Earthquake scenarios based on lessons from the past

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Earthquakes are the most deadly of the natural disasters affecting the human environment; indeed catastrophic earthquakes have marked the whole human history. Global seismic hazard and vulnerability to earthquakes are increasing steadily as urbanization and development occupy more areas that are prone to effects of strong earthquakes. Additionally, the uncontrolled growth of mega cities in highly seismic areas around the world is often associated with the construction of seismically unsafe buildings and infrastructures, and undertaken with an insufficient knowledge of the regional seismicity peculiarities and seismic hazard. The assessment of seismic hazard and generation of earthquake scenarios is the first link in the prevention chain and the first step in the evaluation of the seismic risk. The implementation of the earthquake scenarios into the policies for seismic risk reduction will allow focusing on the prevention of earthquake effects rather than on intervention following the disasters.

The territory of Bulgaria (situated in the eastern part of the Balkan Peninsula) represents a typical example of high seismic risk area. Over the centuries, Bulgaria has experienced strong earthquakes. At the beginning of the 20th century (from 1901 to 1928) five earthquakes with magnitude larger than or equal to $MS=7.0$ occurred in Bulgaria. However, no such large earthquakes occurred in Bulgaria since 1928, which may induce non-professionals to underestimate the earthquake risk. The 1986 earthquake of magnitude $MS=5.7$ occurred in the central northern Bulgaria (near the town of Strazhitsa) is the strongest quake after 1928. Moreover, the seismicity of the neighboring countries, like Greece, Turkey, former Yugoslavia and Romania (especially Vrancea-Romania intermediate earthquakes), influences the seismic hazard in Bulgaria.

In the present study deterministic scenarios (expressed in seismic intensity) for two Bulgarian cities (Rouse and Plovdiv) are presented. The work on scenarios was guided by the perception that usable and realistic (also in the sense of being compatible with seismic histories of cities that are several centuries long) ground motion maps had to be produced for urban areas. By deterministic scenario it is meant a representation of the severity of ground shaking over an urban area, using one or more hazard descriptors. Such representation can be obtained: - either from the assumption of a "reference earthquake" specified by a magnitude or an epicentral intensity, associated to a particular earthquake source - or, directly, showing values of local macroseismic intensity generated by a damaging, real earthquakes of the past. In the study we chose for the second method using the values of macroseismic intensity caused by damaging historical earthquakes (the 1928 quakes in southern Bulgaria; the 1940 and the 1977 Vrancea intermediate earthquakes) – lessons from the past. Such scenarios are intended as a basic input for developing detailed earthquake damage scenarios for the cities and can be used in earthquake-safe town and infrastructure planning.