



## **Data and prognostic assessment for natural and man-induced subsidence in Sofia City (Bulgaria)**

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Sofia City, the capital of Bulgaria, is situated on a Tertiary-Quaternary graben that takes place among mountains. The average altitude of the graben is 500-550 m and of the surrounding mountains - 1000-2000 m. The Iskar River, the longest river situated only in the Bulgarian territory, and its tributaries represent the draining arteries of Sofia City and its hinterland. Three overflood terraces with relative heights of 45-50 m, 18-32 m and 10-15 m and one flood terrace with relative height of 3-5 m take place in the studied territory. The sediments in the graben, including Sofia City are of continental origin. They include layers of gravel, sands and clays with variable thickness. The ground water in the graben and the city are shallow, very often in depths less than 10 m. The climatic conditions are characteristic with different extremity and several changes of dry and wet periods. During the dry periods the subsidence danger increase.

In a lot of cases the subsidence phenomena in Sofia City are related to the man-induced activities or to the combination of the natural and artificial factors. These activities are created by the remarkable increase of the population and of the industrial development. The main activities include: - the unsuccessful choice for a part of the constructions, - the creation of inefficient basement of the buildings, - the using of materials with lower quality, - the rapid and not well controlled creation of various constructions, - the exploration and the transformation of the constructions, - local manifestations of karst, - the bad functioning of drainage and the water supply systems, - the intensive exploration of the groundwater for the people and the industry.

Low and high buildings, old and relatively new buildings have subsidence problems. In a bigger part of cases they are provoked from the irregularity with the drainage and the water supply system.

The precise data from the classic geodetic measurements show the subsidence with values of 3-5 mm/y in SW periphery of the city. The previous predictions about the same area were for the subsidence of 15-17mm. Sofia City and its hinterland subside with a moderate or low degree. The local more intensive subsidence and damages take place in different locality of the city (in quarters Nadezhda, Mladost, Slatina etc.). The subsided constructions represent mainly private constructions of residential buildings and restaurants where the man-induced phenomena are not taken in account during continuous periods. The study was made for the UNESCO-BAS Project related to the expert assessment of the land subsidence in three Balkan capitals - Sofia, Skopje and Tirana.