



# **1 Assessment of the geotechnical conditions of unstable terrain for urban planning of the Umka settlement, Yugoslavia**

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Belgrade's rolling area and its surroundings are known for the occurrences of instability. Until recently only a 1000 landslides have been recorded, mainly in low boundary terrains oriented towards the rivers Sava and Danube. Their slopes are prevalingly made of Miocene-Pleistocene complexes of soft rocks: clays, marls and sands.

The cause for these numerous landslides is due to the complex geological and morphological evolution of the terrain. However, often the result of human building and economic activity is the cause. As a consequence numerous new landslides have taken place with the recovery of the old ones.

The Umka settlement is located near the Sava river in a suburb of Belgrade. In the course of four decades there has been extensive urbanization that has also extended itself onto the unstable parts of the terrains. The extension of the settlements was not followed-up in synchrony with the construction of communal infrastructure, thus causing the reactivation of old landslides that spread over 500 apartment houses and cottages. In addition to pronounced erosion of Sava river, large-scale landslide processes became intense particularly after the developement of a water-supply network that was not accompanied by sewerage works. Within several decades the problems were ensuing and have the features of natural disasters.

In order to prepare the urban plan of Umka settlement (700 hectares in size) our estab-

lishment prepared the geotechnical documentation that have helped to determine the land use for the terrains. The geotechnical documentation has been made in accordance with the detailed engineering geological investigations of terrain and by relying on the results of geotechnical monitoring of the Belgrade-South Adriatic motorway on the banks of the Sava river.

Five large unstable slopes have been recorded in the area under study, with very spacious and mainly deep landslides of different level of activity. Overall the area that contains landslides amounts to 310 hectares, or 44% of area under study, with 170 hectares of active landslides and 140 hectares of calmed landslides. Total volume of landslides is approximately 20 000 000 cubic meters.