



## **Evaluating the loss of karst landscape due to anthropogenic activities**

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The Apulia region of southern Italy is extensively characterized by the presence of carbonate rocks, and karst landforms and caves represent therefore its most typical features. Unfortunately, a strong contrast exist between the existing laws for protection and safeguard of the karst environment, and their real enforcement. Heavy degradation, destruction of many caves, and loss of the karst landscape are, as a matter of fact, very frequent in the region. This paper deals with description of the land use changes that have occurred in the last decades in the Murge Plateau, a wide and tabular karst highplain that reach the maximum elevation at 686 m a.s.l. and extend from the Bradanic Foredeep to the Adriatic Sea. Within this plateau, a sample area was selected for this study in the surroundings of the town of Minervino Murge; besides presenting interesting karst features, this area is comprised within the boundaries of a recently established natural park (Parco dell'Alta Murgia). The Murge Plateau was originally devoted to pasture, and characterized by bare karst landscape with limestone rocks protruding from the ground surface. The few areas where residual soils and terre rosse concentrated were slightly incised valleys, locally called "lame", that constituted a sort of oasis where the farmers reached to perform agricultural practices. In the last decades, two main anthropogenic activities spread out in the Murge, which resulted in heavy changes in the natural landscapes: quarrying, and stone clearing. Quarrying is very diffuse due to the wide use in Apulia of carbonate rocks as building and ornamental materials. Advance of quarrying is carried out without any concern for the natural caves, many of which have been damaged or destroyed by quarrying. The quarrying activity coupled in the last 30 years with intensive stone clearing practices, even favoured by public subsidy from the European Community. These subsidies, addressed to changes in the land use for introducing new crops, resulted in the Murge

in transforming the original bare karst in a landscape which is unnatural for this area, with wide development of cornfields. At present, thousands of hectares of the original pastures have been transformed, and this has often resulted in later abandonment of the fields, due to intense erosion. In fact, stone clearing is carried out through the use of modern technologies and machinery, able to crush the carbonate rocks destroying the epikarst, and eliminating the soil. When it rains, even on gentle slopes surface runoff develops and intense erosion starts. Repeated surveys performed in the last years, integrated with interpretation of multi-year aerial photos allowed to quantitatively evaluate the advance of quarrying activities, and the areas involved in land use change. This was then integrated by field surveys and speleological explorations, that further highlighted the destruction of a high number of caves in the area. The data so collected clearly show that the area around Minervino Murge is one of the most degraded in Apulia as regards disturbance of the karst environment, with loss of the original landscape and destruction of the natural caves.