



## **An approach on the hydrogeological vulnerability of fluvial-karst systems (Lecce province, southern Italy)**

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Surface and subsurface karst morphologies characterize the Lecce province (southern Italy), with particular diffusion of landforms as dolines and water sinks. Since the first settlements of this territory, landforms have been used and partly modified to some aims such as draining the surface waters, discharging floods and reclaiming marsh lands. This contribution shows the geological data collected of the about 200 km<sup>2</sup> wide fluvial-karst Asso basin, in the Lecce province, which is part of a complex hydrological system belonging to a regional graben tectonic structure. As a whole, the system is highly vulnerable both flooding and groundwater pollution. Subordinate, but real, is the hazard due to the development of sinkholes. The Asso streams is a network of natural and artificial channels joined, as results by a performed archive research, to six water sinks, about 75 years ago, to solve flooding and epidemiological problems. To start from the 1991, this fluvial-karst system have been used to discharge municipal and industrial wastewater from treatment plants. As a consequence the runoff, which has a variable regime from summer dried conditions to some tens of cubic meters rate of flow during the strongest winter rainfalls, have been modified. Within the Asso catchment basin, calcarenites and clayey Quaternary deposits, overlies a Tertiary and Cretaceous mainly carbonate substratum. Against this apparently simple arrangement, the geological literature of this portion of Lecce province shows an high number of lithostratigraphic setting reconstructions, sometimes each one in conflict with another interpretation. As a consequence, a number of applied geological problems arise, such as the making of vulnerability hydrogeological maps. The investigated area contains discontinuous shallow aquifers, locally used for irrigation, and a huge deep coastal karst aquifer intensively exploited for human purposes that is recharged by means of infiltration and the water flowing through the sink conduits. However, the speleogene-

sis and, as a consequence, the hydraulic properties of the sinks as well as the relationships between streamflow and groundwater, are missing in the current water resource management. The carried out researches allow us to distinguish natural, partially modified and human bored water sinks. Some of the natural water sinks can be described as collapse dolines, but a number of them present different origin and development, as karst wells and karst shaft. Actually, the terminal sinks of the Asso fluvial-karst system absolved the functions of: storm water drainage wells, aquifer remediation-related wells and underground injection regulated wastewater disposal systems. So, the water management of the system is an hard task, being the mitigation of the amplitude of flooding events, achieved by means of the increasing of water sinks discharge, in contrast with the safeguard aquifers by pollutant displacements and the need to protect the public health. In order to make tools useful to the catchment basin management, and especially to evaluate the hydrogeological vulnerability of the Asso fluvial-karst system, existing and collected geological data (archive files, literature studies and interpretations, stratigraphic sections, structural observations, channels features, water sinks characteristics) have been implemented in a Geographical Information System database. This operative support will be used also to the hydrogeological modelling of possible calamitous scenarios.