



## **Building a database on geological hazards in karst: some considerations about certainty, accuracy and reliability in the collection of data**

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Sinkholes are definitely the most typical geohazard affecting karst territories. Even though typically their formation is related to an underground cave, and the related subterranean drainage, sinkholes can also be observed on non-soluble deposits such as alluvial and/or colluvial materials. Further, the presence of cavities excavated by man (for different purposes, and in different ages) may be at the origin of other phenomena of sinkholes, the so-called anthropogenic sinkholes, that characterize many historical centres of built-up areas. In Italy, due to the long history of the country, these latter, too, are of great importance, being those that typically involve human buildings and infrastructures, and cause damage and losses to society.

As for any other geohazard, building a database through collection of information on the past events is a mandatory step to start the analyses aimed at the evaluation of susceptibility, hazard, and risk. The Institute of Research for the Hydrological Protection (IRPI) of the National Research Council of Italy (CNR) has been working in the last years at the construction of a specific chronological database on sinkholes in the whole country. In the database, the natural and anthropogenic sinkholes are treated in two different subsets, given the strong differences existing as regards both the causal and triggering factors, and the stabilization works as well.

A particular care was given in the database to the precise site and date of occurrence of the events, as crucial information for assessing, respectively, the susceptibility and the hazard related to the particular phenomenon under study. As a requirement to be included in the database, a temporal reference of the sinkhole occurrence must be therefore known.

Certainty in the geographical position of the event is a fundamental information to correctly locate the sinkhole, and to develop geological and morphological considerations aimed at performing a susceptibility analysis. This factor does not have to be disregarded since, especially for the most ancient events, the data from the sources may be not of high precision for a correct positioning of the sinkhole site. As a consequence, each sinkhole in the database was ranked according to the degree of certainty in the location, subdivided into three different levels.

Accuracy of the date of occurrence of the sinkhole was then evaluated, and the highest accuracy was assigned when all the information required (hour, day, month and year of occurrence) were available. The temporal reference is of crucial importance in the IRPI database, since the final goal of the research project is the definition of the sinkhole hazard in Italy. In order to reach such goal, given the definition of hazard, the time of occurrence, and the most likely return time of the events have to be assessed.

Overall, the aforementioned elements of the database allow to make some considerations about the reliability of the information presented, their precision, and to give the correct weight to the outcomes deriving from its analyses. Such issues are discussed in the present contribution, as crucial elements that need to be clearly defined in a scientifically-sound database. The database has reached so far about 900 events (31% natural sinkholes and 48% anthropogenic sinkholes, whilst 21% of sinkholes have an uncertain origin). It is continuously updated, and represents a good starting point for analysis of the sinkhole hazard at the national scale, aimed at increasing the level of attention by scientists, practitioners and authorities on this subtle hazard.