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Planning of geological investigations in areas affected by anthropogenic sinkholes: the case of densely urbanised area northeast of Naples (Italy)

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In the last years, many studies about sinkholes have been produced. These sudden phenomena can be generated from natural or artificial causes: the first ones are developed in soluble rocks like carbonate or sulphates, the second are linked to the presence of artificial caves or mines.
In Italy both the typologies are widely present, but more often the anthropogenic sinkholes are cause of most damages and fatalities, because many ancient city center were built using the local rock, giving rise to complex and widespread networks of underground cavities, whose collapse brings about the formation of sinkholes.
Examples are the Lazio, Toscana, Umbria, Campania, Puglia and Sicily regions, where important towns like Rome, Naples and Palermo are frequently affected by sinkholes.
Identifying and analyzing natural and anthropogenic predisposing and triggering factors are essential steps for evaluating susceptibility to sinkholes; nevertheless, the susceptibility zoning must be considered the starting point towards further detailed studies.
This study aims to provide a contribution to the definition of a more accurate planning of geological studies at the municipality scale, in order to mitigate the risk in densely urbanized areas affected by anthropogenic sinkholes.
The considered study area includes the metropolitan area northeast of Naples (Italy), where sinkholes are very frequent because of the widespread presence of artificial caves dug in pyroclastic rocks.
In a first phase, data and information relative to stratigraphic logs, presence and distribution of cavities and sinkholes phenomena were collected and organized in a GIS associated database. Thereafter, the processing of contour maps of tuff top surface and caves depth has been realized, as well as fully detailed cross sections, in order to recognize different characteristics and genesis of sinkholes.
At the end, with reference to high susceptibility areas, a list of possible geological surveys and monitoring systems as well early warning activities were reported in order to mitigate the risk.