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3D geological model developed to analyse the aquifer - sewer network interaction in Bucharest city

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Due to the fact that several important Bucharest city sewer segments drain the groundwater and provide high input flow-rates for the existing waste-water treatment plant, their rehabilitation is necessary. A hydrogeological model, currently under development, will permit to compute the groundwater-sewer network interaction allowing the simulation of distinct design solutions to prevent city disturbances.
For groundwater modelling the geological model represents the fundament of understanding the aquifers system behaviour. In this respect a 3D accurate and detailed geological model, covering a region of about 75 km2 has been developed to identify its contact with the major collecting sewer conduit. The shallow aquifer stratum of quaternary formations called Colentina is made of gravels and sands. This unconfined aquifer can be found mainly in the Bucharest city region at depths up to 20 m. A clayey-marl layer is located between Colentina and a lower confined aquifer called Mostistea. This second one is located at depths between 25 m and 70 m and is made of fine and medium sands with gravel intercalations. It overlays on a very thick sequence (40 m to 150 m) of marl and clay layers with slim sandy intercalations.

The geological model has been developed on the basis of a large number of geological and geotechnical boreholes. A set of 400 boreholes with depths between 5m to 200 m showing a detailed geological and lithological description stored in a geospatial database have been used. The geological analysis has been performed using a software platform that integrates the spatial database and a set of tools and methodologies developed in a GIS environment with the aim of facilitating the development of 3D geological models for sedimentary media.

Taking into account the first 50 m in depth, 25 geological profiles have been interpreted on the basis of chronostratigraphycal, lithological, and sedimentological criteria to delineate the geological formations and assess their thickness. Further structural maps have been generated to outline the spatial development of the existing aquifers. By connecting the 3D sewer network to the geology, a qualitative description of the interaction between the aquifer media and the sewer system is obtained as a 3D geometrical model.