



## **The pollution risk map of the southern part of the Volturno River plain (Southern Italy)**

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This study deals with the aquifer risk map of an alluvial plain, located in Southern Italy, highly urbanized and with an high level of groundwater contamination.

The main aquifer of the Volturno River Plain ( $\sim 1000 \text{ km}^2$ ) is located in the alluvial-pyroclastic and pyroclastic porous units underlying the "Campanian Ignimbrite" tuffs. The hydrogeological setting is strongly related to the thickness and to the physical characteristics (lithification, granulometry, amount of scoria, etc.) of the Campanian Ignimbrite, which plays the role of semi-confining or confining bed. The aquifer is recharged by rainwater infiltration and by underflow from the adjacent reliefs: the limestone Mesozoic mountains (NE), the Somma-Vesuvius volcano (S) and the Phlegrean Fields pyroclastic hills (SW).

Although on the basis of these characteristics it is possible to zone areas with different hydrogeological features, the aquifer can be considered a single continuous body. The piezometric surface (constructed on the basis of a monitoring network of almost 700 wells) stresses the groundwater inflows to the Piana Campana aquifer and shows a groundwater divide, which separate the flow in two parts: the first directed towards W and the second towards S, in the eastern part of Naples. Moreover, The piezometric surface shows the same pattern of the year 1988 but a generalized lowering, due to the intensive pumping for agricultural, industrial, and domestic use.

The contamination vulnerability map shows that the prevalent vulnerability degree is moderate and, consequently, the diffuse contamination of the area is due to the high hazard of this area for the widespread presence of pollutant activities in a densely

inhabited area.

Therefore, it is important the knowledge of the human impact on the area and, consequently, of the contamination risk of the aquifer. The adopted groundwater contamination risk assessment method follows the approach of previous studies, optimised by developing new analytical procedures using a GIS, to construct and overlay thematic maps. The vulnerability map, the hazard map and the value map have been used to assess the groundwater contamination.

The final map shows interesting results, especially regarding the contamination due to the nitrate contents; the high levels in nitrate indicate a severe contamination and are related to human activities (application of nitrogen fertilisers and wastewater disposal).