



Hydrogeophysical investigations of alluvial deep aquifer system: results from a test area in northern Italy

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Fresh groundwater is a strategic resource which is increasingly threatened by human activities. Saving this precious resource demands detailed knowledge of the subsurface, of the potential sources of pollution, of the equilibrium between exploitation and recharge processes. Similarly, information about the whole sequence of aquifer bodies at the greatest depths becomes a strategic priority. A proper approach of integrated hydrogeological, geochemical and geophysical data and models is required both for their sustainable use and for pollution prevention. The Tagliamento River basin (Friuli Venezia-Giulia Region; northern Italy) can be considered as an ideal test site for such approach, as is characterised by important water resources of high quality, both superficial and underground and was studied in detail in the frame of an EC funded "LIFE" project. In particular, in the Quaternary deposits of the plain, up to a depth of 500 m, six artesian aquifer systems exist. The analysis of a large amount of lithological, geomorphological and hydrogeological data that allowed us to define a) the principal aquifer system of the area down to a depth of about 500 m; b) the geometrical characteristics of the aquifers; c) the hydraulic parameters; and d) the chemico-physical characteristics of the water. In a selected test area, the conceptual hydrogeological model was integrated by a detailed and repeated three-dimensional (3D) resistivity survey using combined Electrical Resistivity Tomographies (ERT) and Time-Domain ElectroMagnetic soundings (TDEM). ERTs were mainly used to get detailed information

about geometry and porosity of the overburden and to calibrate the shallowest TDEM information which gave reliable results about the geometry of the deepest aquifer and about time-variation of the geophysical response of the shallowest one. With the support of the lithological and geophysical information drawn from a purposely drilled deep well in that selected area, all the aquifer sequence present there was characterised from the hydrogeological point of view.