



## **Groundwater Quality Monitoring in Italy for the Implementation of the EU Water Framework Directive**

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In 1999 the Italian Parliament approved a comprehensive law with regards to all the aspects of the water cycle, including monitoring of groundwater. The new norm takes into account the EU Directives, and charges the regions to create monitoring networks, according art. 8 of the Water Framework Directive (WFD). The approach of the Italian regulation (Annexes 1 and 3 of D.lgs.258/2000) is, on the whole, coherent with the technical guidelines listed in annexes II and V of the WFD. On basis of the new law, the national environment agency gathers data and produces assessment reports on the contamination of groundwater in the Italian country, and updates the data set coordinated by the European Environment Agency through the environment information and observation network (EIONET), which brings together just over 300 environment bodies, agencies, public and private research centres across Europe.

In Italy more than 85% of the drinking water is extracted from aquifers (ISTAT, 2004), hence the preservation of groundwater is crucial. Therefore during the last years, a huge amount of data on groundwater quality has been collected, by the regional environmental agencies, in order to define the chemical status: more than 3000 points are sampled at least twice a year, and a minimum set of 14 chemical-physical parameters is compulsory determined (Temperature, Total Hardness, Conductivity, HCO<sub>3</sub><sup>-</sup>, Ca, Cl<sup>-</sup>, Mg, K, Na, SO<sub>4</sub><sup>-</sup>, NH<sub>4</sub>, Fe, Mn, NO<sub>3</sub><sup>-</sup>) as well as priority substances, that can

represent a critical pressure for the groundwater bodies. The systematic monitoring, for environmental purposes, is carried out presently in 60% of the Italian regions, and all the relevant drinking water sources are controlled.

The hydrochemical data are classified according a threshold approach, described in annex 1 of D.lgs. 258/2000, which takes into account the concentration of pollutants and natural substances. 5 classes are considered: very good, good, sufficient, inadequate, peculiar with natural high values of unsuitable substances and hence not polluted although not adequate for several human uses. The collected data show that NO<sub>3</sub>- is the main pollutant, locally IPA, heavy metals and organic compounds are present in concentration exceeding the allowed limits. Along the coasts of the Italian peninsula salt water intrusion occurs as an undesired impact of overexploitation of aquifers.

In the following an overview of the 2002 classification of Italian groundwater is reported. Points 3141 quality class: 1-very good-6.4%(200); 2-good-39.8%(1249); 3-sufficient-12%(376); 4-inadequate-23.4%(735); 0-peculiar-18.5% (581). The most polluted water bodies are located below the most permeable portion of highly settled alluvial plains, the less contaminated aquifers stretch along the mountain carbonates areas of the Alps and Apennines, where human activities are sparse and protected wilderness is prevailing. Due to volcanic and tectonic activity, almost 20% of groundwater is classified as "peculiar" and is often exploited as thermo-mineral resource; besides, parts of Po alluvial aquifer contain peculiar groundwater (with Fe, Mn, As of natural origin) due to a long residence time(> 100 year). This class, not listed the WFD, has been included in order to take into account the EU definition of Pollution (WFD, art. 2, item 33): only the introduction of Pollutant due to human activities must be reduced, whereas the presence of some substances, like As or F, is often a consequence of rock-water interaction and doesn't mean contamination.

Some interesting examples, concerning the Italian approach to groundwater monitoring, are those of Veneto, with the mapping of several water bodies at increasing deep; Emilia Romagna, facing the nitrate pollution; Umbria, managing over 100 telemetered stations at springs and wells, Campania, mapping the chemical status at regional scale.

The collected data have been extensively used for the compilation of river basin management plans (art. 13, WFD), by River Basin Authorities and Regional Bodies, with the aim to ensure the sustainability of the groundwater resources utilisation. Further efforts are in progress in order to complete the monitoring of the whole country.