



## **Trendy: a user-friendly tool for the analysis of groundwater quality trend in response to the European policy**

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Groundwater represents the largest reservoir of all the freshwaters available on earth (excluding glaciers and ice caps). In Europe, groundwater supplies about the 75% of inhabitants for drinking use and it is also largely used for industry and agriculture. Since groundwater moves slowly through the subsurface, the impacts of anthropogenic activities can last for a long time, threatening the good quality of groundwater.

The described context highlights the importance to preserve or improve the groundwater quality. To this aim, the EU policy (Water Framework Directive 2000/60/EC, Groundwater Directive 2006/118/EC) requires that “any significant and sustained upward trend in the concentration of any pollutant should be identified and reversed”, because they would lead to the failure of one or more of the WFD’s environmental objectives. Hence, appropriate measures should be applied to revert these trends and the reversal should be statistically demonstrated.

A guideline for trend and trend reversal assessment has been recently published in Italy, based on the EU and Italian policy requirements. The suggested procedure examines annual concentration values at the available monitoring sites. The trend analysis is carried out through the Mann-Kendall test. In order to compute the statistical significance (set at 90%) the effective sample size has been taken into account. The trend slope, calculated with the Sen’s method, is used to forecast the concentration scenarios at 2021 and 2027 (WFD 2nd and 3rd cycle end). The Pettitt test, largely used for the changing point assessment in climatology, was suggested for the demonstration of the trend reversal.

In this communication, we present Trendy, a web-based platform facilitating the implementation of the Italian guideline at the groundwater body (GWB) scale. Trendy identifies the presence of an upward trend, calculates its statistical significance and value (as mg/L/year) and the expected concentration values (as mg/L) at 2021 and 2027 at each monitoring site. Further, it calculates the chemical status of the GWB at the two WFD cycle ends to assess the environmental significance of the trend. In addition, both a Pettitt test and a Mann-Kendall test have been implemented in order to examine the trend reversal. Finally, Trendy provides a map with the localization of the monitoring sites, differently colored as for the trend results. In order to test the efficiency of the tool with real data, a case study from an Italian groundwater body is presented. Its user-friendliness makes Trendy a useful tool for the reporting to the European Commission about the existence of upward trend in the groundwater bodies defined at risk, according to the Water Framework Directive.