

## **Improving the consideration of hydrogeological characteristics to assess the contamination groundwater by pesticides at national scale (France)**

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According to the European Water Framework Directive, Member States have to conduct study of anthropogenic pressure and its impact on the status of water bodies, and to implement programs of measures in order to reverse any significant and sustained upward trend in the concentration of any pollutant. Focused on pesticides in groundwater, the aim of this work is to propose new tools to the stakeholders to identifying groundwater bodies presenting a risk of not achieving « good chemical status ».

Several parameters control the transfer of a pesticide from the soil to the groundwater: climate conditions (i.e. recharge), soil and hydrogeological characteristics, pesticides physico-chemical properties. The issues of this study are (1) to take account of hydrogeology context, besides soil and pesticide physico-chemical properties relatively well studied as in registration procedure; (2) to work at national scale which involve to consider variability of land uses and practices, (hydro)geology and climate conditions.

To overcome difficulties, this study proposes to identify, when data make it possible, the main driver (hydrogeology or pesticides properties) which explains transfer of pesticides into groundwater at the water body scale. This aspect is particularly innovative as, to date, hydrogeology contexts are usually not considered. Thus, for instance, timeframe of transfer in the unsaturated zone is also considered.

Despite work being performed for several substances with contrasted physico-chemical properties, the outcome will be a classification of substances in different groups according to their chemical properties and their potential occurrence in groundwater.

The work is based on existing data only. From French databases, BNVD (French national database of the sales of pesticides) and ADES (national French data base on groundwater resources gathering), we are able to link pesticides use and groundwater impact. As a first step, several specific pesticides were selected as study case and lead to distinguish groundwater bodies as:

- Groundwater bodies where pressure cannot be evaluated ;
- Groundwater bodies with no pressure (sale) ;
- Groundwater bodies where pressure (sale) lead to an impact (quantification of the specific substance) ;
- Groundwater bodies where there is a pressure (sale) but no impact which means (1) geological conditions offer a natural protection of groundwater quality or (2) the transfer time into groundwater is longer than the observation period or (3) the fate of pesticides lead to a limited transfer.

From the different maps and the pesticides studied, final results would be to classify groundwater bodies as:

- The main driver is hydrogeology: whatever the substance i.e. whatever the pesticide properties, impacts on groundwater quality are similar. Either, geological conditions protect the groundwater resources, pesticides do not transfer to groundwater or, there is no natural protection, whatever the substance, it transfers to groundwater.
- Geological conditions are not the main driver but the pesticide properties do. Therefore, depending on pesticides physico-chemical properties, substances will transfer to groundwater or not. A classification of substances in several groups according there properties (DT50 and Koc) will be performed.

The main expected outcome of this project is the establishment of methodology of characterization of the link between pressure and impact, at national scale. Final results would provide operational tools to the stakeholders to go further in the pressure and impact analysis of the pesticide in groundwater to improve the risk evaluation and adapt program of measures to reach the “good chemical status” of groundwater bodies.