



## **Assessment of natural background levels and threshold values for groundwater bodies in the Upper Rhine Valley (France and Germany)**

**Kunkel (1)**, G. Berthold (2), A. Blum (3), P. Elsass (3), J.-G. Fritsche (2), F. Wendland (1) and R. Wolter (4)

(1) Research Centre Jülich (FZJ), Jülich, Germany, (2) Hessian Agency for Environment and Geology (HLUG), Wiesbaden, Germany, (3) Bureau de Recherches Géologiques et Minières (BRGM), Orléans, France, (4) Federal Environmental Agency (UBA), Dessau, Germany

According to the requirements of the EU Water Framework Directive (EU-WFD, article 17.2a) criteria for the assessment of the chemical status of groundwater have to be developed, which may serve as starting points for a trend reversal (article 17.2b) in case the good status is failed. Against this background in the EU project BRIDGE an EU-wide applicable approach to assess natural background levels (NBLs) and threshold values (TVs) for the definition of the groundwater chemical status has been developed by the authors.

The procedure developed here had been applied to the aquifers of the Upper Rhine Valley Germany and France, i.e. aquifers with high relevance for water supply (Loose-rock sediments of Quaternary). In total data from about 1700 monitoring stations each were used. The natural background levels (NBLs) are assessed based on observed concentration distributions for up to 50 different hydrochemical parameters (e.g. electric conductivity, O<sub>2</sub>, pH, DOC, Ca, Mg, Na, K, NH<sub>4</sub>, Fe, Mn, HCO<sub>3</sub>, Cl, SO<sub>4</sub>, NO<sub>3</sub>).

In order to assess NBLs for each of the investigated parameters, the observed concentration distributions are separated into a natural and an influenced component. This is done by excluding samples with purely anthropogenic substances (e.g. PAC, pesticides) as well as samples, for which indicator substances for anthropogenic inputs (e.g. nitrate) are exceeding a certain value. The remaining groundwater samples are evaluated statistically. The NBLs are defined as the concentration range between the 10% and 90% percentiles of the concentration distributions in the selected samples.

The threshold values (TVs) are derived on the base of NBLs. In order to guarantee that the TV should be higher than NBL, but lower than "a not acceptable reference value" (REF), e.g. Drinking water standards, ecotoxicological values etc., the TV is regarded as being the concentration value which is half of the difference (50%) between NBL and the reference value.

In the contribution, the methodology developed will be described and selected results for the Upper Rhine Valley will be presented. This will be followed by the discussion of possible consequences for water resources management issues arising from the requirements formulated in the EU water directive with regard to the definition of the "good groundwater chemical status".

This project has been founded by the European Commission within the 6th EU Research Framework Programme.

**KEYWORDS:**

EU water framework directive (article 17), groundwater quality, natural background levels, threshold values, Rhine valley