

Agriculture vs. Water supply: Nitrate contamination of Ground Water - Occurrences - Avoidance - Management -

07/2015

Title of the project:

Loss of natural nitrate reducing capacity in subsurface environments

Client:

DVGW Deutscher Verein des Gas- und Wasserfaches e. V.

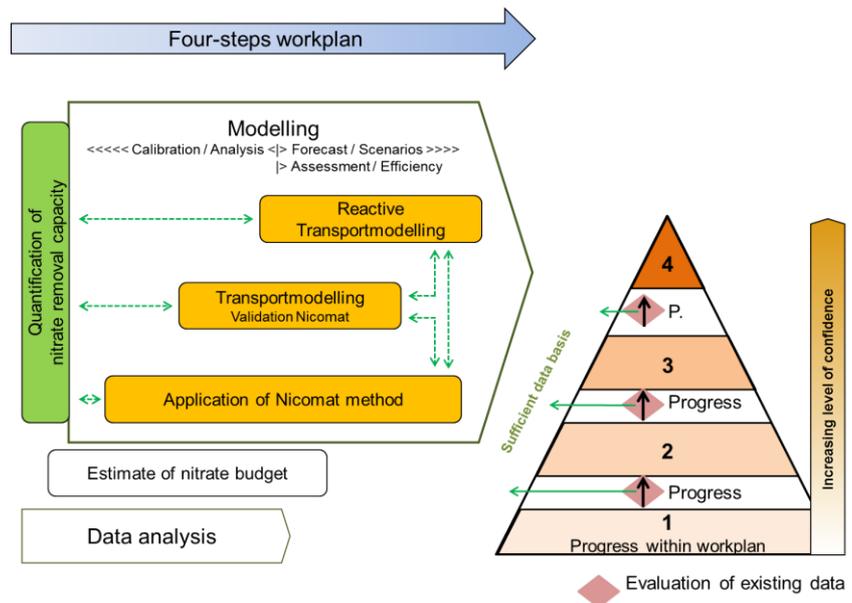


Challenge:

Nitrate is a common contaminant in aquifers around the world resulting from the application of mineral fertilizers and animal manure. Under anaerobic conditions it can naturally be transformed to gaseous nitrogen compounds that eventually evade to the atmosphere. However, in recent years rising concentrations of nitrate in groundwater abstraction wells have been observed in many areas across Germany indicating that aquifers have lost the ability to naturally transform nitrate. Together with four research partners we evaluated the consequences of decreasing nitrate removal rates in aquifers for 16 water suppliers in Germany.

Solution:

We developed a hands-on methodological framework which was designed to **characterize and quantify the current nitrate removal capacities of aquifers**. Using a computational modelling approach we were able to **predict the nitrate removal**



capacity of an individual aquifer for the upcoming decades depending on expected future nitrate inputs within the respective catchment. Modelling results served as a sound basis for decision making allowing public water suppliers to react as early as possible to predicted changes in water quality.

We evaluated the sustainability of current water management strategies with regard to nitrate contamination using a four-step assessment – from simple budget calculations to complex hydrogeochemical fate-and-transport modelling. Finally the economic impacts of increasing

nitrate contamination in aquifers used for drinking water abstraction were calculated. **We conducted a cost-benefit analysis** by comparing different options to reduce nitrate (cooperation with farmers, acquisition of farm land, extending existing water treatment technology) with the aim to advise water suppliers of how to deal with the problem in the most efficient and sustainable way.

Duration of the project:
2010 - 2013

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