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EU-Project MoNit: decision support system to assess the impact of actions and changing frameworks on the nitrate load in the Upper Rhine Valley. Models and scenarios.

M. Casper (1), **M. Johst** (1), J. Grimm-Strele (2), Th. Gudera (2), S. Korte (2), H. Lambrecht (2), B. Schneider (2), P. van Dijk (3), J.P. Rinaudo, (4), M. Finck (5)

(1) University of Trier, D, (2) LfU Baden-Württemberg, D-Karlsruhe, (3) ARAA, F-Strasbourg, (4) BRGM, F-Montpellier, (5) LUFA, D-Karlsruhe (Contact: johstm@uni-trier.de)

The large groundwater aquifer in the Upper Rhine Valley shows a high nitrate load due to various reasons. To decrease the input of nitrate a lot of regulations are currently in force and first steps are taken in the German and in the French part of the Upper Rhine Valley. Furthermore changing directives within the agricultural sector (e.g. the WFD) will affect future management practices and consequently the nitrate input into the aquifer.

Thus different working groups within the multi-national EU-INTERREG-III-project "MoNit - Modelling of the groundwater contamination by nitrate in the Upper Rhine Valley" are developing a simulation tool that allows the assessment of future nitrate load in an integrative way i.e. by taking into account conditions at the plot scale as well as socio-economical aspects and macro-scale transport processes. This tool will lead to well-founded evaluations of the efficiency of political decisions and help to prioritise the steps to reduce the nitrate input.

To achieve the aims five different models will be coupled: 1) A socio-economic model (development BRGM) to assess the response of farmers to changing directives. 2) A process-oriented soil-plant-model (STICS) to simulate the nitrate input as function of crop type, management practice, fertilizing method and climate at the plot scale. 3) A nitrate balance model (STOFFBILANZ) to calculate the nitrate load on a larger

scale incorporating the results of the soil-plant-model as far as possible. 4) A three-dimensional groundwater model coupled with a transport model to simulate the transport and reduction of nitrate in the whole aquifer (MODFLOW/MT3D). 5) A model to spatially interpolate the climate parameters and to assess the groundwater recharge (GWN_BW).

To simulate future scenarios four aspects are distinguished: climate, land use, management practices and economical factors. The appropriate definition of the different scenarios as well as the corresponding model parameters (e.g. amount of fertilizer, land cover) will result from expert workshops. There it has to be decided clearly which scenario needs which model. Some scenarios require a coupling of all described models. E.g. if the EU water framework directive changes, the farmers reaction concerning their management practice has to be determined. Then the nitrate input will be calculated at the plot scale and extrapolated to larger areas. Consequently the nitrate transport and reduction in the aquifer will be simulated. In contrast if climate changes (e.g. according to KLIWA 2050) the input of only one model may change (e.g. higher the precipitation higher the groundwater recharge) while the other parameters may stay constant.