

Spatial variability of water chemistry and nitrogen loads of headwater catchments in rural areas of the Saarland (Germany) - a contribution to wastewater treatment concepts

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Summary

Wastewater treatment is of great financial concern in many states of Germany. In the rural areas of the SAARLAND (German state at the border to Luxembourg and France) investments for wastewater treatments in the next years will mount up to 400 mio. € Nevertheless, decision makers are still left with the question, if these investments result in an effective and sustainable water treatment.

To answer this question, the ministry of environment, related authorities and the University of the Saarland (Geographical Institute) started a Project to investigate seven small headwater catchments with predominantly Triassic series of Muschelkalk. Aims of this study were the following: (i) the description of the spatial variability of water chemistry upstream and downstream of small villages (in these villages only mechanically treated waste water is discharged into the brooks), (ii) calculation of nutrient loads of differently managed catchments (predominantly woodland, meadows or fields) and (iii) the relative importance of non-point pollution sources to point pollution sources.

Results indicated that spatial variability of nitrate concentration during base-flow conditions was quite similar in intensively used agricultural areas. Nitrogen fluxes were predominantly controlled hydrologically. The nitrogen load (kg N per ha) from non-point pollution sources amounts from 32.5 to 43 kg N / ha * a in intensively used agricultural areas. This load, forecast to one square-km, is equal to the N-load of 800 – 1000 population equivalents. Thus, non-point pollution sources are a major part of the overall nitrogen pollution in the rural areas.

The results are important criterias for the sewage disposal plan of the Saarland (disposal plans are obligate according to German water law) and can serve as a first part of a river basin management according to the European Water Framework Directive. To lower non-point N-pollution changes in agricultural management practices are necessary.