



Harmoni-CA

Integrated Nutrient Transport Modelling to support the Implementation of the WFD: The Weisse Elster Case Study (Germany)

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Abstract:

The goal of the EU Water Framework Directive (WFD) is to achieve a good status of river ecology and water quality in the river basins of the EU member countries. This issue can be tackled only by comprehensive economic and environmental assessments. The presentation will show an integrated methodology and decision support system to contribute to the implementation of the WFD. The methodology has been developed within an interdisciplinary research project using the Weisse Elster River Basin (5,300 km²) as a case study. The river basin represents a subcatchment of the Elbe River in

Central Germany. The project focuses on nutrient management, river basin management and decision-making to achieve the good ecological status of surface waters. The related development of cost efficient measures includes successive steps of the required decision-making process. We identified (a) objective refinement, (b) option screening, (c) impact assessment, (d) combination of measures and (e) their implementation as critical steps for implementing the WFD. The methodology was developed within an interdisciplinary working group of natural and social scientists as well as organized stakeholders. Cost efficiency and multi-criteria analysis support the decision making process including the feasibility and acceptance of possible measures.

The presentation will focus on integrated modelling of nitrogen transport within the 4th order river Weisse Elster, combining terrestrial and in-stream transport processes. The mitigation of pressures from diffuse and point sources is thereby essential to meet the environmental objectives towards nutrients in surface waters. Therefore, we analysed and evaluated different land use scenarios on both ecological cropping systems and best management practices, and compared these scenarios with different strategies to reduce point source inputs. The results show that the opportunities to reduce nitrogen inputs from point sources are much lower as compared to the diffuse inputs by agricultural land use.

Additionally, the water quality model WASP5 has been used to investigate the impact of river morphology on water quality. In-stream processes were analysed to assess nutrient retention processes and their impact on the efficiency of measures. The simulation of the nitrogen retention processes was supported by uncertainty and scenario analyses. The results show that different morphological factors influence the nitrogen retention. Nevertheless, the potential of management measures to reduce nitrogen loads seems to be limited, which is caused by the restrictions to reach a natural state of river morphology.

The presented methodology for decision support has been discussed with the responsible authorities for the implementation of the WFD in the Weisse Elster catchment. This discussion led to a new joint project with the objective to put our methodology into practice. The project is conducted in several small pilot studies and will be financed by the environmental Ministries of the states Thuringia, Saxony, and Saxony – Anhalt.