



Rule-based Decision Support System (DSS) for the ecohydrological Assessment of the EU WFD's Programmes of Measures

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During the previous years a significant water quality improvement of the water bodies in North Rhine-Westphalia (NRW) has been achieved. But there still exist considerable deficits in the morphological structure. The results of a morphological quality assessment study indicate that 48.6% of the small and medium sized water bodies in NRW are classified as 6 or 7 out of 7 classes, where class 1 stands for a natural state and class 7 for a completely unnatural state.

Measures to improve the morphological structures are normally expensive and time-consuming. They have to be interdisciplinary planned by hydrologists, ecologists, geographers and hydraulic engineers. To avoid large and expensive renaturation projects, measures that support the dynamic development are preferred. Mathematical modelling of such measures and predicting their impacts is time consuming and highly complicated. However, experts have a satisfactory experience about selecting the suitable measure and predicting the effects of its implementation in water streams. The preliminary objective of this work is to acquire these expertises to formulate a rule-based system.

The aim of the DSS is to support decision makers in selecting the suitable measure to improve the morphological conditions in water bodies taking into consideration the ecohydrological objectives of the European Water Framework Directive (EU WFD). The DSS contains the expert knowledge as if-then rules necessary for selecting feasible measures to reach the good ecological status. Furthermore it comprises rules that predict the impacts after implementing the measure.

The DSS answers questions such as what combination of measures will be the best to reach the goal of the EU WFD for a certain water body in NRW. It considers all existing restrictions while searching for the best combination of measures. The DSS delivers and evaluates statements about the effects of feasible measures and combinations of measures. Discrete time steps are included in the rules to add the time-dimension to the qualitative simulation of water bodies' behaviour after implementing a certain measure.

The DSS is not developed to deliver detailed planning of measures. It rather supports in finding the right measure and to identify implementation priorities based on the current situation. It helps to get an overview about the required measures in a whole catchment area. The DSS ensures a uniform accomplishment of the programmes of measure in NRW since it is based on fixed rules.

This paper presents the objective of the DSS as a tool for implementing the EU WFD. A description of the DSS concept will be illustrated. The methodology of construction the rule-based system will be demonstrated using several examples. The results of selecting the feasible measures will be presented and discussed. A brief description for further development of the DSS will be provided.