Operable Water Quantity Model System to Support Water Quality Management in a River Sub-Basin

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The European Water Directive Framework (EU 2000) requires that water management authorities develop until 2009 management plans; programmes of measures should be coordinated for the whole of a river basin district; the general public, including users of water, should be informed, consulted and involved during the establishment and updating of river basin management plans, before final decisions on necessary measures are adopted. Ultimately, these river basin management plans shall ensure multiple societal functions of river basins and sub-basins, which serve as areas for settlements, for industry, for infrastructure; for the establishment of cultural identity, and as areas for indigenous vegetation. The importance of Sustainability of water quality within the watershed is the accepted overriding management goal.

To achieve sustainable water quality, authorities rely on operable strategies to assess water quantity. It is our objective to develop water quantity model systems that are designed in a way which allows direct coupling to water quality parameters to support comprehensive water quality management. Presently, state-of-the art water quantity model systems are either oriented to maintain runoff threshold values or oriented to handle flood events in a watershed. Here we want to report on a model system that combines these two objectives.

The catchment of the River Ruhr in the state of Nordrhein-Westfalen forms with its tributaries a sub-basin of the river basin Rhine; the Ruhr catchment area covers approximately 4.500 km^2. For many years the Ruhr River Association (*Ruhrverband*) oriented the supra-regional water management of the River Ruhr within the catchment area boundaries, which corresponds to EU requirements for management plans of river basin districts. Governmental authorities—environmental state agencies and various communal agencies—would provide the necessary data on characteristics within the terrain of a specific section of the catchment area.

Upon specific requests and in close cooperation with the Ruhr River Association we are presently developing a comprehensive management tool for the regulation of several reservoirs. Two questions are of prime interest: (1) real-time forecast to operate the reservoir system continuously; and (2) simulation of the reservoir system to derive improved operational rules. The model system is implemented at the reservoir operation center in Essen. Monitoring data log stations within the catchment area of the River Ruhr are directly linked to the reservoir operation center. This ensures that regional and local water quantity management needs are met timely.

Spatial data like location plans, gauging stations as well as temporal data like actual precipitation and discharge are publicly accessible online in static maps or in tabular form (Ruhrverband, 2002). The implemented computer aided design feature is suited to open the management decision process to the scrutiny of those who will be affected by these decisions

The UN Economic Commission for Europe (UN/ECE) initiated the development of the *Convention on access to information, public participation in decision making and access to justice in environmental matters* that was adopted by the majority of European states on 25th June 1998 in Aarhus (DK). The enactment of the Aarhus Convention in October 2001, after ratification by 16 European states (UN/ECE 2001), is considered a milestone for the realization of sustainability in regional and local environmental management plans. The Aarhus Convention takes into consideration digital methods of data assessment, storage and data presentation, which is an innovation compared to the European Directive for Access to Environmental Data (1990).

To ensure public participation as given in the EU Water Directive Framework and in the Aarhus Convention we will optimize the visualization of data for the management process; i.e. we plan to enhance data presentation of water quantity model systems used for river basin management by means of a WWW-portable GIS interface. The infosystem will turn into an arena where stake-holders as well as scientists, engineers and managers find relevant information.

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