

Modeling human-water-systems: Towards a consistent water consumption data set for Central Europe

The water cycle of most river basins in Central Europe is heavily influenced by human management such as reservoirs, withdrawals and usage, agriculture and forestry. River basin management may impact directly or indirectly on the water cycle. Quantification of such impacts based on observed anthropogenically influenced hydrographs requires detailed knowledge of the actual reservoir operation and of the actual amounts of water withdrawal and consumption. Especially quantification of the indirect impact of management practices is challenging, and can only be explored by sophisticated modeling approaches.

Meanwhile, documentation of actual amounts of water withdrawal and consumption as well as operation of reservoirs and lakes is neither spatially comprehensive nor temporally continuously available over the period of runoff observations. In some Central European countries, including Germany, data recording is undertaken decentrally by plenty of river basin authorities. Therefore, data collection is a time-consuming procedure in many countries. In fact, the data base is often not sufficient to investigate the anthropogenic impact on the water cycle. Regarding large scale modeling, water withdrawals are therefore sometimes estimated by assumptions whose reliability is difficult to validate.

We intend to develop an alternative generalized approach for deriving water withdrawal and consumption rates for German river basins and their transboundary subbasins. One possible way is using spatially comprehensive and well documented water usage data along with socio-economic proxies which have a better temporal coverage. Those proxy data must further be suitable to make assumptions on future water demand to be considered in climate change and water management scenarios. Subsequently, the limitations of water management options in periods of water scarcity can be identified under consideration of water consumption scenarios.

The designated research takes place within the framework of a three-year research and development program at the German Federal Institute of Hydrology (Bundesanstalt für Gewässerkunde), which started in June 2015. With the current contribution we present and discuss the methodic key aspects of the project.