



An Integrated Decision Support System with Hydrological Processes and Socio-economic Assessments

Yang Yu (1), Markus Disse (1), and Ruide Yu (2)

(1) TUM, chair of hydrology and river basin management, Munich, Germany (yang.yu@tum.de), (2) Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, China (yuruide@sina.com)

The debate over the effectiveness of Integrated Water Resources Management (IWRM) in practice has lasted for years. As the complexity and scope of IWRM increases, the difficulties of hydrological modeling is shifting from the model itself into the links with other cognate sciences, to understand the interactions among water, earth, ecosystem and humans. This work presents the design and development of a decision support system (DSS) that links the outputs of hydrological models with real-time decision making on social-economic assessments and land use changes. Discharge and glacier geometry changes were simulated with hydrological model WASA. Irrigation and ecological water were simulated by a new commercial software MIKE HYDRO. Groundwater was simulated by MODFLOW. All the outputs of these hydrological models were integrated as inputs into the DSS in three types of links: regression equations, stationary data inputs, or dynamic data inputs into DSS as the models running parallel in the simulation periods. Within DSS, three types of logics were established: equations, conditional statements and fuzzy logics. The programming was realized in C++.

The implementation of DSS takes place in the Tarim River Basin. With the mainstream of 1,321km and located in an arid area in northwest China, the Tarim River is China's longest inland river. The Tarim basin on the northern edge of the Taklamakan desert is an extremely arid region. In this region, agricultural water consumption and allocation management are crucial to address the conflicts among irrigation water users from upstream to downstream. Since 2011, the German Ministry of Science and Education BMBF established the Sino-German SuMaRiO project, for the sustainable management of river oases along the Tarim River. Project SuMaRiO focus on realizable management strategies, considering social, economic and ecological criteria. This will have positive effects for nearly 10 million inhabitants of different ethnic groups. DSS is the main outcome of SuMaRiO. The overall goal of the DSS is to integrate all crucial research results of SuMaRiO, also including stakeholder perspectives, into a model based decision support system, which allows a Sustainability Impact Assessment (SIA) within regional planning. This SIA will take into account the perspectives of all relevant actors in the problem field of land and water management in the Tarim River Basin, to understand ecosystem services (ESS) and integrating them into land and water management. Under scenario assumptions, possible actions and their impacts are estimated in a semi-quantitative way with the help of sustainable indicators, which includes climate indicators, socio-economic Indicators, management Indicators, and ESS Indicators. A user-friendly graphical user interface (GUI) was developed to assist the decision-makers and common users, with Chinese and English versions available at the moment.