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Hydrology-Based integrated Modeling of a peripherial semi-arid Human-Eco-System

C. Jackisch

Dept. Computational Hydrosystems, Center for Environmental Research UFZ
(conrad.jackisch@ufz.de, Permoserstr. 15, 04318 Leipzig, Germany)

Scarce data and limited knowledge meet the people's needs and the urgent obligation to act. Hence the study at hand stands right in the epicenter of the ungauged catchment problem, the integration of various data sources, remote sensing and "ground truth", limitation of scenario analysis and real problem oriented environmental science of the human-eco-system.

We will present a possible framework of catena-based landscape analysis, hydrologic modeling and agent-based strategy analysis. It combines practicability, knowledge about landscape and model characteristics and the obligation to answer questions of land use strategies under strongly water limited conditions. As investigation site the Mod river catchment shall be exemplary for the semi-arid rural world of the 21st century. The 512 km^2 large area is located in central north-western India in the District of Jhabua, Madhya Pradesh Province. It is characterized by monsoon climate, a degraded ecosystem and social-economic problems.

We conducted a multi-method landscape analysis to represent this complex human-eco-system as realistic as possible without long-term meticulous investigation and clear focus on the model's requirements. A combination of on site sampling, laboratory analysis, remote sensing, *soft* data acquisition and general knowledge was employed to set up a sound database for the hydrological model WASA. This model was extended by a module for crop simulation after the de Wit approach and a

cropping decision agent in order to analyze land use strategies.

We could show that WASA and the developed extensions are able to perform reasonably well also under limited knowledge and without parameter calibration. Based on the modeled landscape behavior it was detected that authorities overestimate groundwater recharge and thus its potentials. The analysis of different land use strategies which was realized through different agent constraints and generated weather time series made apparent that weather anticipation does not prove to have great impact on the realization of good harvests and adapted cropping. It also proposes agricultural subsidies as outstanding drivers of land use decision. Nevertheless explanatory power of the derived model complex for due strategy analysis still is limited. Especially interactions at the land surface like tillage activities and vegetation feedbacks lack sincere comprehension.