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Dynamics of human-water interactions in the Kilombero valley, Tanzania: Identifying drivers of change and human action using a collaborative approach

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Large-scale land use intensification to meet growing food demand is at the core of many African development corridors. These development corridors focus on crop production in high-potential areas and on increased farm sizes. The Kilombero valley, being part of the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) presents such a high-potential area. At present, the seasonally flooded wetland of the Kilombero River is mainly used by small-scale farmers to produce rice and maize during the wet season. Some community-based irrigation systems do exist, which reduce risk of climate variabilities regarding e.g. the onset of the rainy season and which allow year-round farming. Only two large-scale farming systems are operative at the moment. Like other sub-Saharan wetlands, the Kilombero valley floodplain is a highly dynamic environment, which is aggravated due to increasing variability in the onset and intensity of the wet season. To understand the hydrological dynamics a SWAT (Soil and Water Assessment Tool) model has been set up to model the catchment processes under different land use and climate scenarios. The Kilombero valley is also highly dynamic regarding socio-economic developments such as migration into the valley and the visions about the valley with respect to crop intensification. Understanding how visions about the future shape agricultural practice and hence human water interaction is crucial to model possible changes and dynamics of the socio-ecological system.

In this study, we show how a collaborative modelling approach with key stakeholders from local communities, enterprises, NGOs, governmental institutions, policy and academia presents an important source to understand different perceptions about the future and their impact into today's practices influencing the natural system. Furthermore, we show on a farm level, how focus group discussions with different types of farmers also highlight drivers of change and human action. Both collaborative exercises contribute to scenario-building, which is grounded on the perceptions and visions of the people whose actions shape and respond to this highly dynamic environment. By using the results of the SWAT model of the Kilombero catchment as a basis for discussion within the collaborative modelling exercise we can contrast different perceptions of hydrologic and socio-economic change.

In general, this research shows the high potential of combining typical natural science methods like hydrological modelling with methods from social science like focus group discussions and collaborative scenario-building in order to understand the human impact on environmental changes and its dynamic interactions.

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