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Research Interest: Spatially explicit scenarios of landscape change in the northern Mkomazi river basin, Tanzania

The livelihoods of most people living in the nearly 4000 km² large Mkomazi River Basin, which is part of the Pangani River Basin in Tanzania, are provided by farming and livestock keeping. These activities strongly depend on sufficient availability of water resources, since the lowlands of Mkomazi Basin are dominated by hot-dry climate. Highly important for the supply of stream flow and groundwater to the lowlands are montane forests on the West Usambara and South Pare mountain ridges. Unfortunately, water resources emerging from the mountains are diminishing due to a decreasing extent of the water rich montane forests and increasingly water-consumptive agriculture, like ginger cultivation. The inevitable result of this development is that stream flow in Mkomazi River and water supply to the extensive irrigation schemes in the valley decline. Additionally, projections for regional climate change indicate an increase in drought events during future rainy seasons. Mainly as a result of population growth, water demands for agriculture however, are constantly rising. These conflicts between reduced water availability, intensifying land-use pressure and the necessity to conserve precious ecosystems in the region need to be modelled in spatially explicit way. This will pave way to develop adequate adaptation and mitigation strategies.

A research with the title 'Spatially explicit scenarios of landscape change in the northern Mkomazi river basin, Tanzania' is proposed to investigate the relations between vegetation / land-use and different soil-water regimes. It is aimed to identify critical thresholds in hydrological conditions which will help to assess vegetation vulnerability to changing water regimes. Lastly it is intended to develop scenarios depicting land-use under different options of climate change and social-economic development.
In order to fulfil these tasks comprehensive data collection is planned in about 150 plots which will be selected representing relevant soil – hydrology – land-use combinations.
The data collected in these plots will be used to develop logistic regression models, calculating the probability of a given plant functional type to occur at a certain soil, water and nutrient regime. In a next step each plant functional type, vegetation type and land-use type will be evaluated according to their ecosystem service provisioning. After up-scaling the plot data to landscape scale by development of a modelling shell, the distribution of plant functional types in Mkomazi river basin will be modelled according to down-scaled climate change scenarios. This will be targeted to identify critical thresholds of change and to assess the vulnerability of the Mkomazi river basin to climate change.
This research will provide crucial data for the future land-use and water resources management in Mkomazi river basin, which will have to adapt to impacts of global change. Therefore this research will be beneficial to the large number of people whose livelihoods depend on the natural resources in Mkomazi river basin.