Impact of land use changes on the hydrological wetland dynamics within a basin perspective using an integrated approach

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Impact of land use change on the degradation and eventually extinction of wetlands have received increasing scientific and public awareness. As a result, their natural and socio-economical functions and importance for the water and nutrient cycles are subject for research worldwide and there are numerous definitions for different types of wetlands. Summarizing the ongoing research it is understood that the process dynamics within wetlands are complex, and that their response to land use changes in their catchments is different in terms of temporal scale and magnitude as well. Therefore research methods aiming to improve the understanding of such complex systems and their response to land use changes such as large scale afforestation must comprise a multidisciplinary and integrated approach. Such an approach was applied by the research project in a palustrine wetland type in the semi-arid headwater basin of the Umzimvubu river in the Eastern Cape Province of South Africa. Integrating disciplines from hydrology, geomorphology, biology and geoinformatics the project’s overall objective is to identify criteria that have relevance for the sustainable functioning of such inland wetland systems within a basin perspective. Remote sensing analysis, field survey and rainfall-runoff simulations will be jointly applied to identify the impact of large scale afforestation within the catchment during the last ten years. First results of the study indicate significant evidence that the wetland extent had been changed, but the investigations also revealed that such changes are different regarding the type of the specific wetland. The project will furthermore investigate these dynamics and the outcome will be fed into an integrated generic landscape model comprising the different wetland process dynamics and considering the spatial and temporal heterogeneity of their respective scales.