The assessment and conservation of landscape multifunctionality and diversity implies the development of indicators to evaluate natural and anthropogenic changes and their impact on the landscape. Since wetlands respond very sensitive to changes within ecosystems, multifunctional analyses of their process dynamics as well as their interaction with other hydrologic and ecological landscape components provide valuable information for such an impact assessment. This includes their natural and socio-economical functions within the landscape as well as their importance for the water and nutrient cycles. The ongoing research has shown that the process dynamics of wetlands are very complex and their response to land use changes in their basin is different in terms of temporal scale and magnitude as well. Hence, any research aiming to improve the scale-based understanding of wetland dynamics in a landscape perspective must comprise a multidisciplinary and integrated approach.

Such a framework was applied by the research project in the semi-arid headwater basin of the Umzimvubu River in the Eastern Cape Province of South Africa. The landscape is characterized by extensive afforestation in the headwaters, which may affect the multifunctionality of the widespread wetlands. The project investigates 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. The overall objective is to identify and assess indicators that have relevance for the sustainable functioning of such inland wetland systems within a landscape perspective. The methodological approach integrates disciplines from hydrology, geomorphology, bio-ecology and geoinformatics, i.e. bio-ecological surveying, remote sensing, GIS analysis as well as rainfall-runoff simulations. As a result different types of wetlands have been identified and analyzed in terms of their terrain position, vegetation characteristics, hydrological dynamics, and their individual response due to afforestation. The results emphasize that the wetland extent has changed in response to afforestation. Such changes, however, are different for the various types of wetlands. The hydrological modelling indicates that afforestation significantly impacts the hydrology of the wetlands depending on their geomorphologic setting, spatial extent, and the type of planted species.

In conclusion, wetland dynamics and their services for the landscape are influenced by land use changes directly, including their recharge/discharge dynamics, water retention capability, water quality regulation, etc. as well as indirectly due to loss of habitat functions and biodiversity.