



Impact of nutrient sources and water transfers on water quality in uMngeni

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The greater uMngeni catchment is under severe stress to supply the water demand to people in rapidly urbanizing areas. Water is already brought in from other near-by catchments to provide additional volume needed by the water users and additional transfer schemes are being implemented and/or considered. SMHI partnered with University of KwaZulu-Natal and Durban University of Technology during bilateral collaboration “Source to Sea: uMngeni River, South Afrika” to produce advanced decision-support for efficient management and reduction of water pollution.

Nutrient transport models are important tools for large scale assessments of macro-nutrient fluxes (nitrogen, phosphorus) and thus can serve as support tool for environmental assessment and management. The HYPE model (<http://hype.sourceforge.net/>) developed by the SMHI was set up and calibrated for two Water Management Areas including the uMngeni River basin using an agile approach with incremental model development and responsive scenario analysis. The model can quantify the impact from various sources to polluted waterbodies, distinguish between natural and anthropogenic influence, and simulate impacts of water management decisions. Source apportionment was performed to rank sources of nutrients along the river, with respect to e.g. agriculture and human settlements.

As of December 7, 2016, most dams in the uMngeni system were at 45-65% capacity. Drought continuing from 2014 exacerbates the impact of excess nutrients. In addition, large inter-basin water transfers increase flows and water levels in reservoirs in one river system while lowering them in another system. We investigate the impact of current withdrawals on water quality in the uMngeni and surrounding basins in a number of model scenarios and calculate the flow paths of nutrients during dry and wet conditions, respectively. The analysis will give some guidance in how operational water-management decisions affect water quality downstream, and which societal sectors that contributes most to eutrophication from source to sea.