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Application of SWAT for the analysis of the water quality of the river Grote Nete

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In order to reach the goals set by the Water Framework Directive (WFD) of the European Union, a lot of research is still to be carried out in Flanders (Belgium). Hydrological models, such as SWAT (Soil and Water Assessment Tool), can be very useful to study water quantity and water quality issues in river basins.

SWAT is a physically based, semi-distributed river basin simulator developed by the USDA Agricultural Research Service (ARS). It aims at the quantification of the impact of land management practices on the water quantity, on sediment transport and on the water quality in large complex watersheds with varying soil, land use and management conditions and over a long period of time.

For the case study, a SWAT model was developed for the catchment of the river Grote Nete in Belgium. The river Grote Nete is a tributary in the river Nete, that is itself a tributary of the river Scheldt. Characteristics of the area (428 km^2) are sandy and loamy-sandy soils, four important classes of land use (residential, pasture, corn and mixed forest), small slopes and a yearly precipitation of around 900 mm. Also, several canals were dug in the Nete catchments.

Models were built for the Grote Nete, using SWAT 2000 and a beta version of SWAT 2005. After manual calibration, the model efficiencies were assessed by means of the Nash-Sutcliffe efficiency, considering both the chronological and the ranked flows at the outlet of the river basin. When considering the values of the efficiencies, both models were seemingly quite similar and workable for making predictions on the water quantity. Comparison of the water balances obtained from the two models, however, made it clear that although the global water balances were realistic for both models, large differences existed with respect to the composition of the outflow: while the

flow consisted mainly of groundwater flow in the SWAT 2000 model, the SWAT 2005 model generated mainly surface runoff. Based on the available data although, it could not be stated which composition had most affinity with reality.

Such differences obviously affect also the water quality simulations. An additional problem with regard to the water quality simulations relates to the lack of available water quality data in Flanders in order to calibrate the models: the low frequency of the quality sampling by the governmental agencies - typically once or twice a month - does not allow to analyse the dynamics of the water quality processes.

As a conclusion, it can be stated that the reliable use of (semi-) distributed models such as SWAT, in order to obtain a better integration of the management of all water resources, require additional data and additional research, e.g. to include remote sensing data in the calibration process.