WATER QUALITY MODELLING FOR THE WETLAND REGION SPREEWALD

Balla D., Gabriel O., Kalettka T., Dietrich O.

In future time decisions are demanded with respect to water management for the Spreewald region. This concerns besides problems of water availability the water quality. Two main questions are essentially: Which role does the wetland play for matter retention, e.g. with respect to high sulphate entries from upstream, and how do water management strategies affect Spreewald rivers water quality with respect to flooding or water-table draw-down in the wet zones.

A deterministic water quality model for the Spreewald region was developed considering the main quality processes: lateral mixing of point sources, matter transformation in the water column, interaction between sediment and water, matter exchange between the land and the river system.

Basically, the Dutch software package DUFLOW was used, especially the hydraulic tool and selected water quality modules for channel quality processes.

The groundwater-surface water exchange was indicated as exfiltration of groundwater towards surface water in times of water excess, and infiltration of surface water towards groundwater in times of high evapotranspiration rates due to water supply via the canalised and weir-equipped river system.

In a first approximation these changing matter flow directions were taken into account by simplifying the diffuse, distributed sources at channel bottom to point loads. For this purpose the wetland area was discretised into small units considering - besides vegetation, soil properties, water-table constraints, the groundwater chemistry. These area-point loads are calculated for monthly time steps using water volumes, generated by a specially developed water balance model for the Spreewald wetland, and representative groundwater concentrations.

As external boundary conditions as well as for model calibration long-term data bases for both, discharges and hydrochemical parameters, were available. Several water distribution schemes were considered using historical water stages at weirs. Nevertheless, within the Spreewald wetland additional hydrological and hydraulic data were necessary, inclusively sediment parameters.

As a result the sulphate retention was estimated. Under dry conditions the Spreewald acts as a sink because of water and matter uptake by wet areas, and under wet conditions as a sulphate transformer by exfiltrating reduced groundwater into the river system. In the first case the wetland may reduce the sulphate concentration by 40% and in the second case by about 50%.