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Assessment of potential climate change impacts on the regional water resources of Lusatia

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Abstract
Lusatia is one of the driest regions in Germany: already under current climate conditions the climatic water balance is negative. Due to excessive open-cast lignite mining activities the water balance of the catchments of the rivers Spree, Schwarze Elster, and Lusatian Neisse is profoundly disturbed. Potential changes of future climate and land use conditions will certainly impact the natural hydrologic conditions and consequently water management measures have to be adjusted in order to alleviate the water tense situation. Simulations of the Soil and Water Integrated Model (SWIM) for subcatchments without influence of lignite mining and water management driven by scenarios of the Statistical Analogue Resampling scheme (STAR) assuming a further temperature increase of 0 K, 2 K and 3 K, respectively, showed an aggravation of the situation: Due to higher potential evaporation natural discharge is decreased especially in the vegetation period.

The objective of this study is to assess potential climate change impact for the catchments of the rivers Spree, Schwarze Elster, and Lusation Neisse. Due to the strong anthropogenic impact on the discharge, the traditional approach of calibrating hydrological models based on time series of observed discharges is constrained. In order to estimate potential climate and land use change impacts for the named river catchments SWIM was first calibrated for subcatchments without influence of mining activities and water management. In a second step, the model was set up for the all catchments using model parameter regionalization. Climate change impacts were estimated using climate scenarios STAR (3 scenarios, 100 realisations each) and WettReg (3 scenarios, 10 realisations each). Land use change was considered for several scenarios focusing on the reduction of the groundwater depression cone caused by lignite mining and on a potentially increased cultivation of agricultural energy

crops. Both, changes in quasi-natural river discharges at certain gauge stations and temporally and spatially distributed changes of water balance components, were analyzed in order to estimate whether climate or land use changes will be the dominant reason for potential changes of water resources. The simulated discharges will later be used as input data for the long term water management model WBalMo in order to assess potential climate and land use change impacts on water users and managed discharges as a prerequisite for climate and land use change adaptation strategies.