Geophysical Research Abstracts
Vol. 12, EGU2010-9121, 2010
EGU General Assembly 2010

Artificial Post mining lakes – a challenge for the integration in natural hydrography and river basin management

Petra Fleischhammel, Dagmar Schoenheinz, and Uwe Grünewald

Brandenburg University of Technology Cottbus, Chair of Hydrology and Water Resource Management, K.-Wachsmann-Allee 6, 03046 Cottbus, Germany (petra.fleischhammel@tu-cottbus.de)

In terms of the European Water Framework Directive (WFD), post mining lakes are artificial water bodies (AWB). The sustainable integration of post mining lakes in the groundwater and surface water landscape and their consideration in river basin management plans have to be linked with various (geo)hydrological, hydro(geo)chemical, technological and socioeconomic issues.

The Lower Lusatian lignite mining district in eastern Germany is part of the major river basins of river Elbe and river Oder. Regionally, the mining area is situated in the sub-basins of river Spree and Schwarze Elster. After the cessation of mining activities and thereby of the artificially created groundwater drawdown in numerous mining pits, a large number of post mining lakes are evolving as consequence of natural groundwater table recovery. The lakes' designated uses vary from water reservoirs to landscape, recreation or fish farming lakes.

Groundwater raise is not only substantial for the lake filling, but also for the area rehabilitation and a largely self regulated water balance in post mining landscapes. Since the groundwater flow through soil and dump sites being affected by the former mining activities, groundwater experiences various changes in its hydrochemical properties as e.g. mineralization and acidification. Consequently, downstream located groundwater fed running and standing water bodies will be affected too.

Respective the European Water Framework Directive, artificial post mining lakes are not allowed to cause significant adverse impacts on the good ecological status/potential of downstream groundwater and surface water bodies. The high sulphate concentrations of groundwater fed mining lakes which reach partly more than 1,000 mg/l are e.g. damaging concrete constructures in downstream water bodies thereby representing threats for hydraulic facilities and drinking water supply. Due to small amounts of nutrients, the lakes are characterised by oligo¬trophic to slightly mesotrophic conditions. The aquatic flora and fauna are limited to a few well adapted species.

Therefore, the issue of hydrochemical constitution of the lakes' waters becomes more and more relevant. The prediction of water quality development in post mining lakes is a key requirement to regulate and manage the later hydrochemical conditions. Initially, this prediction was made by individual case studies for single lakes. By means of an iterative research process during the last years, hydrochemical lake models were developed as prediction tools, which allow a complex processing of interconnected post mining lakes and their integration in natural hydrography with respect to quantitative and qualitative evaluation.

To counteract the poor water quality of mining lakes, flooding by surface water from neighbouring river basins, e.g. the river Neisse, shall support a quicker and thereby hydrochemically less damaging lake filling. However, this external flooding is only feasible under conditions of high runoff and therefore only as intermitted practice applicable. Additionally, technological measures of water treatment have to be applied to achieve the required effluent quality and to ensure the designated use. Regrettably, these technologies aren't commercially standard up to now and are not sustainable, while flooding or provides a huge amount itself of positive potential for hydrochemical stabilization.

The river basin management of the rivers Spree and Schwarze Elster is attended by a common working group of the Federal States of Brandenburg and Berlin as well as the Free State of Saxony. The quantitative distribution of the regionally available water considers the potential use for drinking water supply, process water, ..., and the flooding of open-pits. However, due to the formulated rank order, the flooding of the numerous mining open pits in Lusatia is on the last position. To guarantee a reliable flooding and a continuous water supply of the post mining lakes, additional water resources have to exploited. Additionally, the prospected climate induced changes in water

supply have to be taken into account for a sustainable integrated water resources management in the Lusatian post-mining district.