



Modeling of the Contaminated Sediment in the Erft River

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Sediment transport processes play an important role in the surface water systems coupled with rainfall-runoff and contaminant transport. Pollutants like heavy metals adsorbed mainly by fine sediment particles can be deposited, eroded or transported further downstream. When the toxic pollutants deposited before and covered by cleaner sediment are remobilized by large flow events such as floods, they pose a hidden threat to the human health and environment. In the Erft River, due to mining activities in the past, the heavy metals release from the tributary Veybach on the downstream water and sediment quality is significant. Recent measurements prove the decreasing concentration trend of heavy metals in the river bed sediment from the Veybach. One-dimensional hydrodynamic model COSMOS is used to model the complicated water flow, sediment erosion, deposition and contaminant mixing and transport in the mainstream of the Erft River. It is based on a finite-difference formulation and consists of one-dimensional, unsteady sub-model of flow and transport, coupled with a sub-model of the layered sediment bed. The model accounts for the following governing physical-chemical processes: convective and dispersive transport, turbulent mixing deposited sediment surface, deposition, consolidation, aging and erosion of sediment, adsorption-desorption of pollutants to suspended particles and losses of pollutants due to decay or volatilization. The results reproduce the decreasing profile of the pollutant concentration in the river bed sediment nicely. Further modeling is to analysis the influence of the mixing process at the water-riverbed interface on the contaminant transport, hydrological scenarios impact on the remobilization of the sink of pollutant and its negative consequences on the river basin.