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Assessing the Impacts of Climate Change on the Fate and Transport of Sediment Sorbed HCB and Cd in the Elbe River Basin (Germany)

K Moshenberg and S Heise
Hamburg University of Applied Sciences, Germany (Kari.Moshenberg@haw-hamburg.de)

Sediment-sorbed concentrations of Hexachlorobenzene (HCB) and Cadmium (Cd) in sections of the Elbe River basin significantly exceed maximum allowable concentrations established by the European Commission. Even though concentrations of both contaminants have decreased significantly over the past 15 years, levels remain elevated. In addition, previous studies have documented that downstream transport of contaminated sediment occurs primarily during high water events. Given anticipated climate-change induced changes in mean discharge, potentially including an increase in the magnitude of high and low water discharge events, this study seeks to evaluate the role of climate change in mediating the long-term fate and transport of HCB and Cd in the Elbe River basin. To better understand the transport of cohesive sediments and associated contaminants, a hydrodynamic and cohesive sediment transport model for a 230 km segment of the Middle Elbe River was developed. Of particular interest is contaminant transport to floodplains and retention time in the numerous groyne fields that line the banks of the Elbe River. Multiple climate change scenarios involving changes in the amplitude and phase of yearly streamflow were used to simulate contaminant transport throughout the Elbe River basin at 10, 15, and 25 years in the future. Integration of modeling output with the results of recently collected (2010, 2011) sediment data enabled an enhanced understanding of the dynamics of HCB, Cd and cohesive sediment in the Elbe River basin. Modeling results, challenges simulating transport in groyne fields, techniques for resolving