

Tracking Polychlorinated Biphenyls (PCB) after an incident along a river system – Case study Elbe River

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In spring 2015, extremely high concentrations of Polychlorinated Biphenyls (PCB) well above the long-term average were detected in suspended particulate matter (SPM) within the River Elbe. They were released due to abrasive blasting of the old coating from a bridge in the upper part of the River, approximately 50 km upstream of the first measurement site. PCBs are persistent organic pollutants, preferentially bound to fine-grained fractions of the SPM. Results from monitoring of contaminants in SPM along the Elbe indicate the further dispersal of the PCB-contaminated sediments. These measurements include yearly investigations on PCB concentrations in sediments in the inner reaches of the Elbe, an additional longitudinal survey in 2015 and monthly monitoring of PCBs in SPM at stations along the river including the Elbe estuary (Germany).

The Elbe estuary is of major economic importance since Hamburg harbour, one of the largest harbours in Europe, is located there. Maintaining the harbour includes dredging and, i.a., relocating large amounts of the dredged material within the water body. High PCB concentrations in sediments could lead to restrictions on the relocation of these sediments.

This study aims at tracking the fate of PCB contaminated material released from the point source of the incident site along the whole river stretch and at estimating its impact on the quality of sediments and consequently on dredging activities in the estuary. The ratio of high (PCB 138, 152 and 180) versus low (PCB 28, 52, 101) chlorinated PCB congeners proved to be a suitable tracer to distinguish the PCB load released by the incident from the long-term background signals. As Delor 106/Clophen A60, which contains approx. 90% hexa- to decachloric congeners, was an additive in the coating of the bridge, the pattern of PCBs released by the incident is dominated by the highly chlorinated PCB-congeners PCB 138, 153 and 180. At the tidal weir Geesthacht, the entrance to the estuary, an increase of PCB concentrations and a shift of the PCB pattern were observed in July 2015 for the first time. Within the Elbe estuary, a change of the PCB pattern and concentrations only could be found up to a monitoring station 25 km downstream of the tidal weir (still upstream of Hamburg). No indication of increased PCB concentrations or changed PCB ratios originating from the incident has been found so far at monitoring stations located downstream of Hamburg harbour.

The future development of PCB concentrations in the Elbe estuary depends strongly on river discharge: parts of the PCB contaminated sediments are retained in sedimentation areas along the whole stretch of the River Elbe and may be resuspended with rising discharge and subsequently transported to the estuary. Hence, PCB concentrations in SPM could rise and affect the management of dredged material. Therefore, continuing monitoring activities are still necessary to record the PCB input into the estuary and finally into the North Sea.