

# HCB-contaminated sediments in the Upper Rhine – a case study while developing a sediment management plan

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## Introduction:

Due to the construction of the impoundment weirs in the Upper Rhine the passage of solids transported by the river is severely restricted. The hydrological situation causes every year settlement of fine-grain sediment in the headwaters of barrages. These sediments have to be dredged to guarantee the safety of the dams and the discharge of floods [1].

During the period 1960-1985, large amounts of hexachlorobenzene (HCB) were discharged into the High Rhine. Although the main source of HCB has decreased its input to negligible levels since many years, the sediments in the barrages of the Upper Rhine are still contaminated with HCB and are moving downstream when they become remobilised.

## Results:

It is concluded from combined analysis of sediment monitoring and echo soundings that in the headwaters of the Iffezheim barrage sedimentation occurs at a rate of 150,000 to 200,000 m<sup>3</sup> per year. This is for the 15 years period from 1992 to 2006 in general in agreement with the amount of annual dredging activities. Due to sedimentation and remobilisation in terms of erosion or dredging a mixing of older and recent sediment layers and a rather heterogeneous contamination pattern has been found in an extensive investigation in 2005 (bore-hole sampling down to several meters in sediment depth), i.e. with respect to HCB. The risk of potential remobilisation of contaminated sediment due to erosion or maintenance activities needs further investigations considering the complex geometries and flow situations on local scale.

Suspended sediment which is gained continuously in the Upper Rhine by sedimentation methods show also very heterogeneous HCB-concentrations which are significantly increasing in the section from Weil to Marckolsheim (Fig. 1). No relevant HCB-emissions in this section could be found. The reason for the increasing HCB-concentrations is quite unclear and the mechanisms for HCB-transport is not yet fully understood.

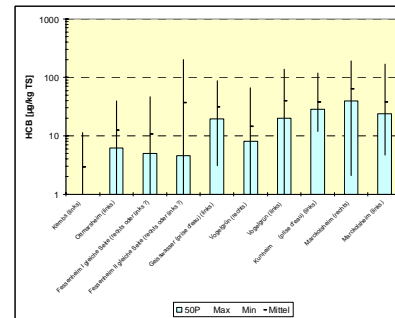


Fig. 1: Concentration of HCB in suspended sediment in the Upper Rhine

In order to assess modalities for remediation it is necessary to find common agreement. Due to the heterogeneous results for HCB in sediments previously applied methodology to assess the ability of remediation did not show a sustainable fundament. Various sampling methodologies for suspended matter result in various assessment proposals.

Tab. 1: Different results for HCB and grain-size distribution dependent on various sampling methodologies at Koblenz [2].

	BiSam	Centrifuge
HCB (µg/kg)	40	10,8
< 20 µm (%)	32,9-53,3	54,7-98,5

**Discussion:** Recent assessment criteria do not match actual sediment pollution and have to be adjusted. Basically a sediment management plan desires an integrative evaluation on catchment scale, since the situation e.g. at Iffezheim is strongly dependent on the temporal development within the upstream chain of barrages, where significantly higher sediment HCB-contamination has been found.

**References:** [1] Huber et al. (2004) *Proceedings of WODCON XVII* [2] Breitung et al. (2005) BfG-1474