

Remediation as a Contribution for a sustainable Sediment Management in the River Rhine

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Introduction: The River Rhine plays as the main waterway in central Europe a key role in ensuring Germany's contribution to increasing safety and competitiveness of Inland Navigation. The implementation of the EU Water Framework Directive focuses on a good chemical and a good ecological status of the water bodies at river basin scale. This has led to a stronger focusing on sustainable management of sediments. In the existing sediment management plan of the International Commission for the Protection of the Rhine (ICPR) [1] areas of risk and areas of concern are identified which may cause harm to the river ecosystem due to their high concentrations of hexachlorobenzene (HCB), a by-product of the siloxan production in the 70ties that was released into the river. Highly contaminated sediments are transported along the river bed and are still present in several impoundments in the Upper Rhine area e.g. Marckolsheim, Rhinau and Strasbourg and cause high risks for the river basin due to further transport caused by extreme or frequently arising floods. Maintenance dredging encourages the transport as well.

Every year, more than 100.000 m³ of sediments settle at the impoundment of Iffezheim near Karlsruhe (Upper Rhine) and have to be dredged in a cost-effective and environmentally-safe way by the Federal Waterways and Shipping Administration (WSV) in order to maintain the safety and ease of the navigation. Qualitative restrictions due to pollution and environmental hazard – in this case the presence of hexachlorobenzene (HCB) – are decisive for the decision of how to deal with the dredged material.

Methods: During the preparation of the sediment management plan of the ICPR, areas of risk were identified on the basis of the contamination level, the amount of sediments existing in the sedimentation areas and the risk of remobilization of these sediments. Detailed investigations with raster sampling in several depth levels were recently conducted to identify targeted remediation areas in order to minimize the remediation costs. Depending on the position and the potential remobilization risk, different possibilities of remediation measures will be discussed.

Results: High concentration levels for HCB and polychlorinated Biphenyls (PCBs) are verified in the sediments of the impoundments of Marckolsheim and Rhinau. The contamination of the sediment deposits partly reaches all the way down to the original river bed. Organic pollution in deep layers may be an indication of former industrially caused impacts, but may not affect the environment downstream due to a minor risk of remobilization by high flood or maintenance procedures in the water channel. However, high contamination is also detected at the sediment surface. In this situation, the risk for remobilization is much higher.

Discussion: The contamination load contained in the sediment deposits will be calculated to estimate costs and methods of remediation. Remediation options include excavating of contaminated sediments, capping of contaminated areas or combination of both methods.

To reduce the costs, various methods for the treatment of excavated sediments will be discussed in order to find the optimal disposal method.

Successful remediation may result in reduced financial effort managing sediments in impoundments during maintenance operation by the WSV in the long term.

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References: [1] IKSR (2009): Sediment Management Plan Rhine – Report No 175, Koblenz. http://www.iksr.org/index.php?id=190&L=3&tx_ttnews%5Btt_news%5D=496&cHash=d245a003a6d118b5a8d58098d19ec75e