Sediment characterization during oxidation and ripening and evaluation of its potential reuse

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The environmental impact and possibilities for remediation and reuse of contaminated sediments was investigated. Water- and EDTA-soluble metal concentrations in sediments from 3 different rivers were monitored during 5 months after dredging. Furthermore, pH-dependent leaching behaviour of heavy metals and the influence of thermal treatment on the release of metals were investigated in order to evaluate possibilities for remediation and reuse of the sediments, such as thermal treatment or the production of bricks and light weight aggregates (LWA).

In the 3 sediments, pH, which was originally in the range 7.1-7.8, decreased until a minimal value of 6.5-7.0 was reached between day 21 and 28. Hereafter, pH increased again to a value close to the initial pH of the sediment on day 150. Since the pH of the sediments remains almost constant, the amount of metals released from the sediments during oxidation was rather low. After 3 months of ripening, between 32 and 88% of the total Zn-, Cd-, Pb-, Cu- and Ni content could be removed from the sediments by washing with NH4-EDTA, while for As, Cr and V less than 4% of the total concentration could be removed. Since the sediments display an elevated acid neutralizing capacity, washing the sediments with acids to remove heavy metals does not seem a feasible option. Drying at elevated temperatures (900, 1000 and 1100 °C) increased the H2O extractable concentrations of As, Cr and V, while the mobility of Zn, Cd, Ni, Cu and Pb decreased. For the 3 sediments, the pH of the H2O-extract increased, up to a value of 11 when they were fired at 1100°C.

In general, the sediments investigated in this study represent a relative low risk for the environment when exposed to upland conditions. If the sediments would be used for the production of bricks or light weight aggregates, the increased mobility of As, Cr and V upon thermal treatment of the sediments should be considered.