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Establishing the environmental risk of metal contaminated river bank sediments

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Climate change predictions indicate an increase in the frequency and duration of flood events along with longer dry antecedent conditions, which could alter patterns of trace metal release from contaminated river bank sediments. This study took a laboratory mesocosm approach. Chemical analysis of water and sediment samples allowed the patterns of Pb and Zn release and key mechanisms controlling Pb and Zn mobility to be determined.
Trace metal contaminants Pb and Zn were released throughout flooded periods. The highest concentrations of dissolved Pb were observed at the end of the longest flood period and high concentrations of dissolved Zn were released at the start of a flood. These concentrations were found to exceed environmental quality standards. Key mechanisms controlling mobility were (i) evaporation, precipitation and dissolution of Zn sulphate salts, (ii) anglesite solubility control of dissolved Pb, (iii) oxidation of galena and sphalerite, (iv) reductive dissolution of Mn/Fe hydroxides and co-precipitation/adsorption with Zn.
In light of climate change predictions these results indicate future scenarios may include larger or more frequent transient 'pulses' of dissolved Pb and Zn released to river systems. These short lived pollution episodes could act as a significant barrier to achieving the EU Water Framework Directive objectives.