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Using science to help manage contaminated sediments in urban river systems

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Half the global population live in urban centres and such centres have suffered a legacy of pollution which has degraded water and sediments. It is therefore critical that scientific advances are fully utilised to aid in the remediation and management of urban river basins. The research presented here is focussed on characterising sediments, and sediment-water interactions, in an urban catchment in Northwest England (the Mersey Basin, 5000 km^2) with the view to improving management strategies for water and sediment quality.

Chemical and mineralogical analysis have been integrated to provide novel information upon contaminant loading, mobility and long-term behaviour in sediments in two critical parts of the urban river basin: street-deposited particulates (a major source of contaminant sediment to urban waterways) and sediments deposited in receiving water bodies (in this case urban docks).

Chemical analysis on street particulates has shown that they are both spatially and temporally heterogenous and mineralogical analysis (SEM, XANES/EXAFS) has shown that they are also mineralogically heterogenous, with iron oxides, glasses and chlorides are the most important phases hosting contaminant metals. Such data informs both management practices and models of contaminant mobility and its impacts upon surface waters.

Once sediment is deposited in canals and other standing water bodies they act as a store of historical contamination and may also need characterising from the viewpoint of risk assessment for dredged material disposal. Integrated geochemical and

mineralogical analysis (including SEM, XANES/EXAFS) has shown that metals in sediments in The Mersey Basin are hosted by anthropogenic grains (e.g. industrial glasses) that are undergoing dissolution in porewaters, thereby leading to increased contaminant mobility. However, at the same time minerals precipitated in the sediment column (e.g. iron phosphate) are taking up metals, thereby acting as long term sinks. Understanding the balance between these processes is critical for sustainably managing these systems.