

# Sediment in the urban Mersey river basin, northwest UK: implications for basin-scale management and sustainability.

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Half the global population live in urban centres (UN, 2007). Cities have suffered a legacy of pollution which has degraded water, sediments, air and wildlife. Our research, in collaboration with the user community and legislative bodies, is focussed on characterising sediments, and sediment-water interactions, in an urban catchment in Northwest England with the view to improving management strategies for water and sediment quality. The Mersey Basin is a large catchment (5000 km<sup>2</sup>), with a well-developed integrated catchment management plan (through the Government-funded Mersey Basin Campaign).

The aims of this research programme are to characterise the sources and nature of sediment in an urban river catchment, to determine their role on contaminant transport and mobility, and to develop models that integrate sediments and water with the view to the sustainable management of sediment and water quality, compliant with the European Water Framework Directive.

## **Road Deposited Sediment**

Our research has shown that these particulates are highly reactive in the Mersey Basin and contain high levels of metal pollution. Spatial analysis shows that contaminant levels are highly variable and it is likely that street sediments reflect local pollution levels. Their composition is also temporally variable, indicating that seasonal variations in rainfall and atmospheric deposition are important. Chemical speciation analysis shows that iron oxides, glasses and chlorides are important phases hosting contaminant metals.

## **Urban Rivers**

Urban rivers within the Mersey Basin are highly flashy, due to their culverted nature, and carry high levels of contaminated suspended sediment through them during high flows. Therefore,

understanding their impact upon receiving water bodies has been important. Our finding is that as a result of this sediment transport during only high river levels, pollution events in urban rivers are acute, but short-lived. Phosphorus concentrations in both the water and sediment in these rivers is high as a result of major point-source inputs from sewage treatment works. Our research is informing the management of these point sources.

## **Canals, Docks and Harbours**

Once sediment is deposited in canals and other standing water bodies they lead to reduced capacity of shipping draft, and act as a store of historical contamination. The former requires sediment dredging, and so the sediments need characterising from the viewpoint of risk assessment for dredged material disposal. Chemical diagenesis taking place in these sediments also leads to the release and remobilisation of contaminants stored in these sediments, with marked impacts upon overlying water quality. Our research has shown that an increased understanding of these diagenetic processes is needed in order to manage and sustain good water quality.

## **Applications**

This research has highlighted that water quality in cities is controlled to a large degree by the presence of sediment particulates in the water, or on street surfaces. These sediments have been largely ignored when considering water quality. However, under the Water Framework Directive we will need to consider the role that these sediments play in urban catchments. This is one of the first integrated studies to consider this.