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A catchment-wide assessment of bed sediment metal concentrations in the first industrial city

Rachel Hurley, James Rothwell, and Jamie Woodward
University of Manchester, SEED, Geography, United Kingdom (rachel.hurley@manchester.ac.uk)

Manchester is often heralded as the 'first industrial city'. Rapid industrialisation in the 18th and 19th centuries saw vast quantities of fine-grained sediments (e.g. boiler ash and cinders) and contaminants (e.g. dyes, bleaches, and chemicals) deposited into the river channels of the Irwell and Mersey in a manner largely unchecked until the 1970s. Although water quality has improved in recent decades, there is a paucity of information on fluvial sediment quality and the extent to which a legacy of historical contamination persists in the contemporary river network. Forty five sites were sampled across the Irwell and Mersey catchments during low flow conditions in spring/summer 2015. Fine-grained bed sediment was collected using the Lambert and Walling (1988) method. Wet sieving was used to isolate the <63 μm fraction for geochemical analysis. Heavy metal concentrations were obtained via XRF with a particular focus on As, Cr, Cu, Pb and Zn. In order to explore controls on sediment-associated metal concentrations, additional characteristics of the bed sediment were also investigated, including particle size and organic matter content. Enrichment factors, based on mean concentrations obtained from pre-industrial floodplain deposits, were calculated. The enrichment factors reveal severe or very severe metal contamination across the whole catchment, including the headwater basins. Relationships between bed sediment quality and hotspots of historic industrial activity have been examined – these reveal complex spatial patterns associated with the high number and variety of historic contaminant inputs. These data form the first baseline assessment and will be used within a larger project investigating the impact of extreme hydrological events on bed sediment quality and transfer in these catchments.