Sediment and water quality in the River Clyde post-industrial catchment, Glasgow, UK

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Many European cities' environments have been affected by urban and industrial processes. Resulting chemical contamination poses current and future environmental threats, as many substances, including heavy metals, are toxic in high concentrations and their occurrence could have long-term implications for ecosystems and human health.

The city of Glasgow, situated along the lower River Clyde and upper Clyde estuary in the west of Scotland, UK, was formerly one of Europe's leading industrial centres. Subsurface coal mining, shipbuilding, textile, paper and engineering industries have left their mark on the environment of Glasgow and the surrounding River Clyde catchment. Residues from such past industrialisation may be buried in river sediments, or may undergo mobilisation in river waters, and subsequently be deposited elsewhere, including downstream in the estuary or sea.

The British Geological Survey (BGS) is responsible for the national strategic geochemistry survey of the UK, known as the Geochemical Baseline Survey of the Environment (G-Base), characterising the chemistry of the UK surface environment via the collection of stream sediment, stream water and soil samples [1]. In order to assess sediment and water quality in the River Clyde catchment, BGS collected c. 2000 rural stream sediments across the Clyde basin. As part of G-BASE and in collaboration with Glasgow City Council (GCC), BGS collected an additional 118 stream sediment and 133 stream water samples from all tributaries draining into the River Clyde within the GCC area as part of the Clyde Tributaries Geochemical Project[2]. In a separate study, BGS, in collaboration with GCC and the Scottish Environment Protection Agency collected 68 sediment and eight water samples in the Clyde Estuary under the Clyde Estuarine Contamination Project [3]. These surveys form part of BGS's multi-disciplinary Clyde-Urban Super-Project. Stream sediment and surface water samples underwent analysis for approximately 29 chemical elements.

The current project integrates and interprets these three datasets, to identify contaminant distribution in the River Clyde catchment. GIS maps of element

concentrations from the combined dataset show elevated levels of metal elements such as Cr, Cu, Ni, Pb and Zn in the urban area, compared with the rural environment. We will present analysis at a sub-catchment scale, in order to identify firstly natural background levels and then, in that natural context, the additional influence of anthropogenic sources on overall levels of potential contaminants.

These datasets provide an excellent test case for assessing urban impacts on environmental quality and improve the understanding of processes controlling pollutant migration through the river system into the estuary.

References

[1] Johnson et al. 2005. Geochemistry: Exploration, Environment, Analysis 5, 347–357

[2] Fordyce et al. 2004. British Geological Survey Commissioned Report CR/04/037 (Edinburgh: BGS)

[3] Jones et al. 2004. British Geological Survey Commissioned Report CR/04/057 (Keyworth: BGS)

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