

ASSESSING THE HUMAN HEALTH RISKS POSED BY INDUSTRIALLY CONTAMINATED URBAN SOIL: CHROMIUM IN GLASGOW

A. Broadway^{1*}, J.G. Farmer¹, B.T. Ngwenya¹, M.R. Cave², F.M. Fordyce³

-
- ¹ School of GeoSciences, University of Edinburgh, Edinburgh, Scotland, UK.
 - ² British Geological Survey, Keyworth, England, UK.
 - ³ British Geological Survey, Edinburgh, Scotland, UK.

A.Broadway@ed.ac.uk

Many cities throughout the UK have a long history of both urbanisation and industrialisation, resulting in elevated concentrations of potentially harmful elements (PHEs) in soils. A recent survey by the British Geological Survey (BGS) of the Glasgow urban environment has highlighted numerous sites with PHE concentrations exceeding guideline values generated by the Contaminated Land Exposure Assessment (CLEA) model. Whether or not these sites pose a hazard to human health depends on a number of factors, including the bioavailability of the associated PHEs. The most important pathway for exposure to PHEs in contaminated land is believed to be through ingestion of the soil itself. This is a particular problem with young children.

As part of a new 3-year project to investigate soil metal bioaccessibility and human health risk, this poster will present information on heavy element contamination in the Glasgow urban environment and possible methodologies of assessing associated bioaccessibility. This will include the Physiologically Based Extraction Test (PBET), first proposed by Ruby *et al.* (1996), which is essentially a two-stage sequential extraction using various simulated gastrointestinal biofluids. The main focus area of the project will be the widespread chromium contamination around S.E. Glasgow and South Lanarkshire, although other elements, such as lead and arsenic, will also be considered at various locations in the city and its environs. The project will extend previous work performed under the NERC URGENT Programme on the major chromite ore processing residue issue in Glasgow (Geelhoed *et al.*, 2002; Hillier *et al.*, 2003).

Surface soil samples have been collected from across the Greater Glasgow area. The sites selected all displayed a high content of chromium (or other PHEs) and potential degree of human contact, e.g. commercial and residential, recreational, urban open space and tended open space. Initial pre-PBET work will focus on chromium speciation using both chemical and mineralogical (XRD/SEM) analysis. By using a base extraction method, Cr(VI) will be selectively leached from the soil matrix. When combined with a total digestion method, both Cr(VI) and Cr(III) can be evaluated in the soil samples.

Geelhoed, J.S., Meeussen, J.C.L., Hillier, S., Lumsdon, D.G., Thomas, R.P., Farmer, J.G., Paterson, E.: 2002. *Geochimica et Cosmochimica Acta*, **66**: 3927-3942.
Hillier, S., Roe, M.J., Geelhoed, J.S., Fraser, A.R., Farmer, J.G., Paterson, E.: 2003. *Science of the Total Environment*, **308**: 195-210.
Ruby, M.V., Davis, A., Schoof, R., Eberle, S., Sellstone, C. M.: 1996. *Environmental Science & Technology*, **30**: 422-430.
