Natural and anthropogenic soil geochemical characteristics of Belfast, Glasgow, Cardiff and east London, in the UK

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The British Geological Survey's Geochemical Baseline Survey of the Environment (G-BASE) project is responsible for the systematic geochemical mapping of the land surface of Great Britain. Samples of soils, stream sediments and stream waters collected at an average density of 1 sample per 1.5 km2 are determined for up to 46 elements/parameters. Concerns over land quality in population centres have raised interest in the concentrations and behaviour of chemical substances within the urban environment. This prompted the G-BASE project to expand the geochemical survey into urban areas. The sampling strategy of urban areas differs to that of the regional survey as only soil samples are collected, but at a much higher density of 4 samples per km2. Top (5 - 20 cm) and deeper (35 - 50 cm) samples are collected at each site. 22 urban centres from different parts of the UK have been surveyed so far, giving an extensive dataset of over 16000 samples. This provides a unique picture of the status of UK urban soil chemistry.

In this study, various data analysis techniques have been used to identify the main features of urban soil geochemistry in Belfast, Glasgow, Cardiff and East London. One apparent outcome of the study so far is that there are similarities between all urban centres, including elevated levels of metals such as Pb and Zn in comparison with the regional baseline. All four of the cities have a significant industrial past and the data indicate a legacy of soil contamination. For example, Glasgow housed a large chromium ore processing plant which left soils in the south-east of the city with extremely elevated concentrations of Cr. However, the concentrations of other contaminants, such as As and Cd are lower than might be expected given the extent and duration of the city's industrial heritage. This is also true of Belfast where the distribution of environmentally sensitive elements is most strongly influenced by the underlying parent material. Notably high concentrations of Cr, Ni and Cu are controlled by the presence of the Antrim Basalts. In contrast the long industrial history of Cardiff is reflected by elevated concentrations of several contaminants, some of which (Zn and Sn) are amongst the highest observed so far in the 22 urban areas surveyed. The most recent urban data available are for the region of East London; the precursor to a major sampling effort that will take place in 2008 and 2009 to complete a baseline geochemical survey of London. The London survey, known as "London Earth", will cover an area of approximately 1600 km2 that is home to a population exceeding 7.5 million. Over 6000 sample sites will be visited, making it one of the largest and most comprehensive urban studies to date.