British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

# Urban soil chemistry data for Great Britain

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## Introduction

The British Geological Survey (BGS) urban soil chemistry dataset identifies areas of elevated topsoil concentrations of potentially harmful chemical elements (PHEs) and can be used in conjunction with proposed soil screening value (SSV) for assessing ecological risks and/or the soil guideline value (SGV), which is a threshold used in the preliminary assessments for land contamination.

PHEs, including arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb), occur in the environment both naturally and as a result of human activities. Under certain circumstances these can be harmful to plants, animals or people. Whether or not a particular PHE constitutes a hazard depends on a variety of factors including, e.g. its chemical form (speciation), concentration, soil or water acidity (pH), the type of vegetation cover, the extent of exposure and the dose received. PHEs exist in a range of inorganic forms which have varying toxicity. Ambient background concentrations of PHEs in surface soil from natural and non-natural sources are required for: i) risk assessments and, ii) establishing whether elevated measurements may be the result of significant anthropogenic contamination.

## The BGS urban soil chemistry dataset for GB

The BGS urban soil chemistry dataset comprises of two different products: a) the BGS digital **point source urban soil chemistry data** giving the locations and concentrations (mg/kg) of As, Cd, Cr, Ni and Pb in urban topsoil samples and b) the BGS digital **estimated urban soil chemistry data**, which indicates the estimated geometric mean concentrations (mg/kg) of As, Cd, Cr, Ni and Pb in topsoil derived by spatial interpolation of the **point source urban soil chemistry data**. Figure 1 displays the GB urban areas for which both the digital point source and estimated urban soil chemistry data are available.

## How is it derived and what does it show?

Both urban soil chemistry datasets are derived from high-resolution urban soil geochemical data from BGS's Geochemical Baseline Survey of the Environment (G-BASE) project. To derive the **estimated urban soil chemistry data**, data were transformed by taking the natural logarithms as urban soil geochemical data generally have large positive skewness coefficients. To overcome the bias associated with traditional measures of location (mean) and scale (standard deviation) for log-normal data, the inverse distance weighted (IDW) mean and standard deviation of log transformed element concentrations were used for mapping the spatial variation in As, Cd, Cr, Ni and Pb concentrations. The estimated data are 100 m grid values calculated from the nearest four soil samples. Figures 2 and 3 show estimated Cr and Pb concentrations in topsoils for the Greater London and Thames Gateway region. Figures 4 and 5 illustrate the relationship between the point source data and estimated urban soil data for As in Northampton and Pb in the Camden area of Greater London.

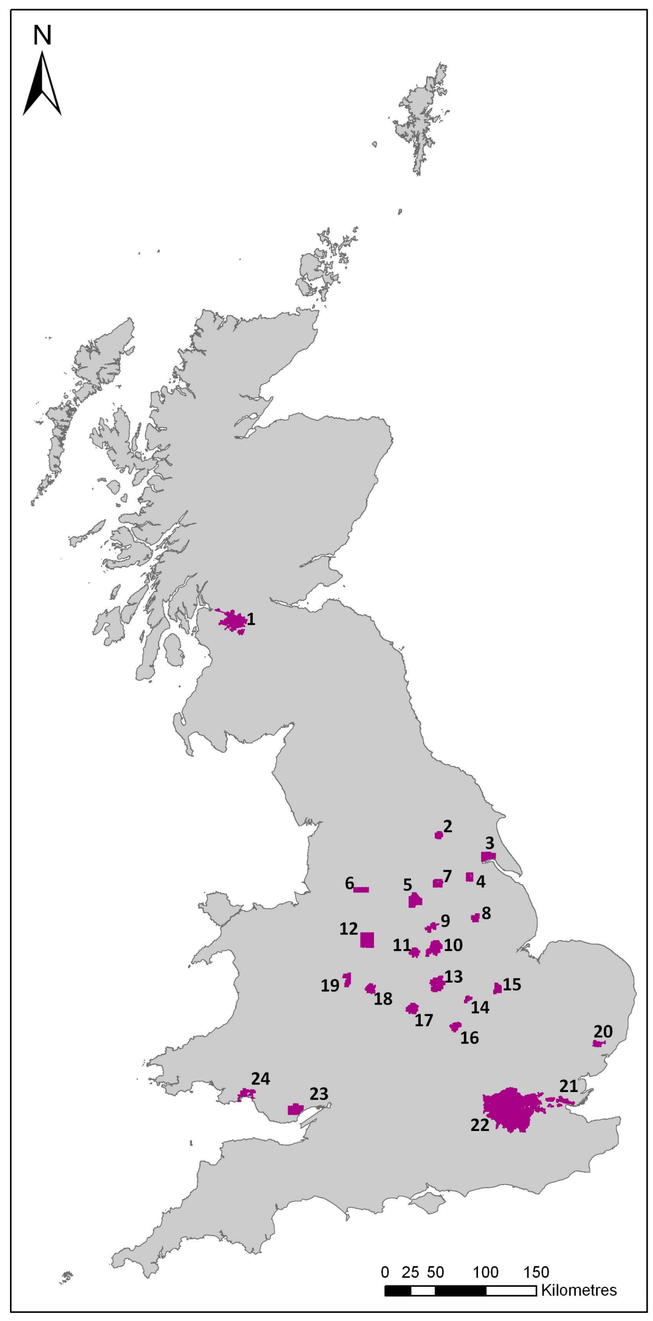


**Figure 1** Extent and availability of the BGS urban soil chemistry dataset for GB v2 currently comprising of 24 urban areas.

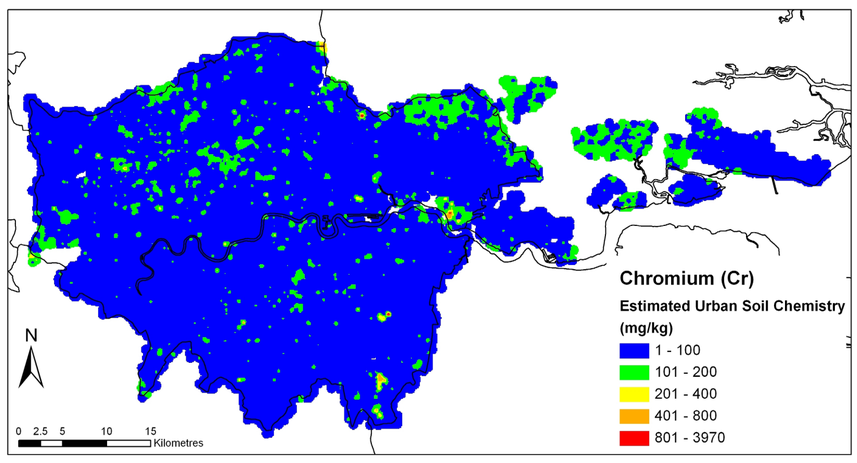


**Figure 2** Estimated Cr concentrations in urban topsoils of Greater London and Thames Gateway North.

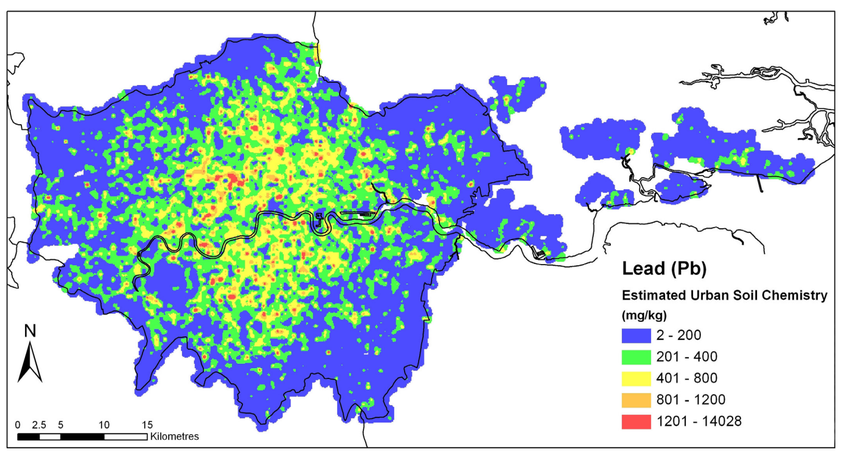


**Figure 3** Estimated Pb concentrations in urban topsoils of Greater London and Thames Gateway North.

## What can it be used for?

The urban soil chemistry data for As, Cd, Cr, Ni and Pb in topsoils can be used to assist Local Planning Authorities (in conjunction with SSV and SGV) to identify those areas where a risk assessment may need to be carried out by developers. It can also be applied to establish whether elevated local PHE concentrations in urban areas may be the result of significant anthropogenic contamination by comparing the urban soil PHE data with information on historic and current land uses as well as with the BGS **estimated soil chemistry data** for rural soils.

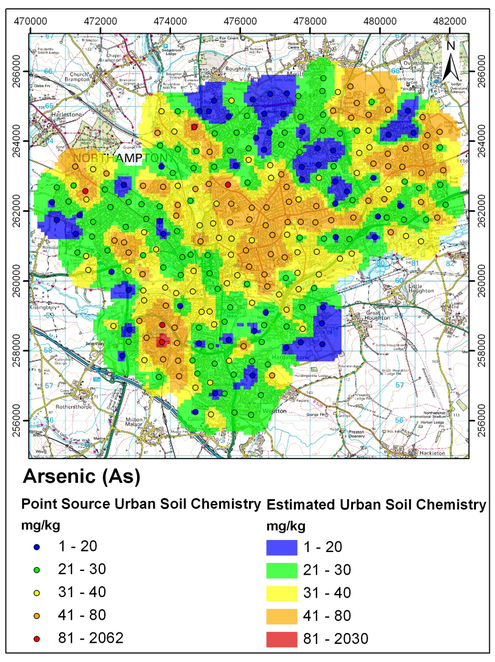


**Figure 4** As map of Northampton displaying the relationship of the point source and estimated data.

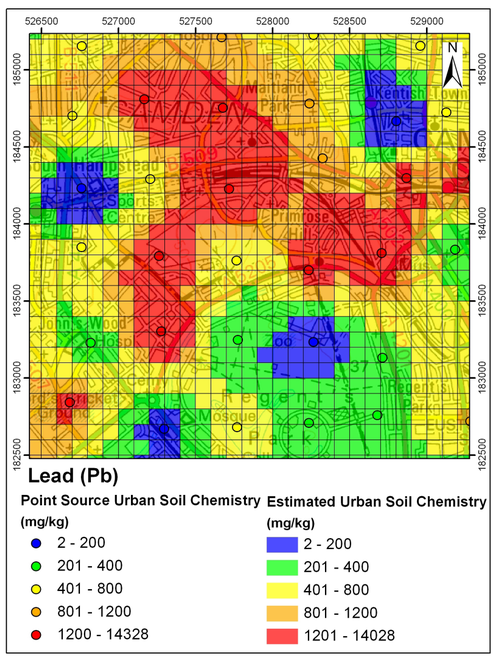


**Figure 5** Detailed Pb map of parts of Camden and Regents Park, Greater London displaying both point source and estimated data based on 100 x 100 m grid polygons.

## Further information

More information about the range of digital data available from BGS can be found at www.bgs.ac.uk/products. To license data or for more details please contact the data team at digitaldata@bgs.ac.uk

## What are the limitations?

Urban soil PHE concentrations can relate to both natural and/or anthropogenic sources and may be significantly lower in organic rich soils (> 15–20 % OC). The dataset is based on, and limited to, the interpretation of the records in the possession of BGS at the time the dataset was created (March 2011). Both the point source and estimated data should be used with caution as PHE concentrations in urban soils are often characterised by strong spatial variation over short distances.

## Contact information

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