Understanding heterogeneity and structure in urban environments: a tool for the assessment of risk and interpretation of geochemical data


Understanding the spatial and temporal development of anthropogenic and natural soil systems along with associated geological deposits has long been acknowledged as an important underpinning information in the planning and geotechnical assessment of new urban developments. However, such information has only rarely been linked with the interpretation and use of urban geochemical surveys during the risk assessment process. In recognition of this the British Geological Survey (BGS) has been developing a portfolio of supporting techniques and methodologies to assist in (a) developing a better understanding of the nature, history and potential future of the urban subsurface and (b) integrating this knowledge into a risk-assessment framework that may be used in a predictive manner with a variety of potential scenarios.

In this poster we present some examples of BGS studies in which we are developing techniques that better enable the incorporation of geochemistry and associated risk assessment models with other contextual data from a range of urban environments. It is proposed that such integrated datasets should form the backbone to a range of scenario development and planning models enabling more accurate prediction of risk and options for its mitigation prior to, during and after extreme events.

**Baseline data**

**Source:** How much? Where? What is it? How long has it been there?

**Pathway:** What are the most likely pathways, proximity to contamination, geology, hydrogeology, on what time scale is transport likely to occur and sensitivity to other hazards/extreme events.

**Target:** What are they? How many are there? Planning consent, proximity to contamination, how sensitive and land use.

**Characterisation of artificial ground**

- The 3D model of the Glasgow subsurface is based on large-scale, high resolution, 3D geological models and maps of large urban areas.

**Integrated risk models**

- **Source - Pathway - Receptor paradigm.**
- **Rule-based GIS software for prioritising site investigations - SOURCE RANKING - in the context of Source - Pathway - Receptor paradigm.**
- Multiple source, multiple pathway, multiple receptor.
- Provides an initial screening of potentially contaminated sites within the GIS environment.
- Prioritises sites for further action.
- Rules for prioritisation developed by BGS scientific experts.
- Not designed to provide a quantifiable risk assessment.

**Needs and knowledge gaps:**

- There is an increasing need for better integration and interpretation of geochemical data with a wide range of other datasets describing the urban environment and its stressors, especially within the context of short and longer term hazards. In the context of the earth sciences and medical geology this requires integration between areas more traditionally focussing on physical hazards, groundwater quality, and chemical and biological hazards. The increasing development and sophistication of 3D and 2D models of urban environments together with GIS based risk assessment tools offers considerable scope for emergency planning either in real time or via scenario planning. However, the design of such systems must take into account the need to be dynamic linked, updateable in real time and above all user focussed.

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