Planning & development

Applied geological maps

Presenting earth science information for planning and development

Richard Ellison, Ed Hough & Holger Kessler, *Keyworth*

In the late 1970s and early 1980s the former Department of the Environment realised that much useful information on the geological map was not being used for planning and development, as it was too complicated for most non-geologists and was not presented in a relevant form.

At this time the idea of an applied geological mapping study was initiated. It would present earth science information in non-technical reports suitable for use by planners, developers and others concerned with land use and development.

As part of the applied geological mapping studies, it was decided that separate *thematic maps* should be prepared. These showed only one or two simple topics, or themes, for example 'bedrock geology', 'rockhead contours' or 'drift thickness'. The preparation of these thematic maps also permitted additional information to be shown which normally did not appear on geological maps, and it encouraged the collection of more diverse earth science information.

A later development was the combination of key elements from these thematic maps on to *summary maps* which were specifically designed to assist in land-use planning. The derivation of these different types of maps can be summarised thus:

Geological map

↓

Thematic maps

↓

Summary maps

Thematic and summary maps fall broadly under the term *applied geological maps.*

Such studies use geological, geomorphological, and soils maps as the basis from which a variety of themes are extracted, with additional information incorporated as appropriate. They require the collection and collation of earth science information from a wide variety of sources. The benefit of this approach is that it brings together information that is often widely scattered in a number of places and whose existence is not widely known to planners and developers, and whose relevance may not be understood.

The most recent studies place greater emphasis on establishing databases of basic information. Digital cartographical techniques have been used to give greater flexibility to map production, and the exploitation of digital methods has paved the way for the integration of applied geological mapping databases with Geographical Information Systems (GIS).

One of the factors driving change is legislation and regulation that increasingly requires environmental aspects of planning to be more fully considered than has previously been the case.

T Cullen, BGS © NERC

Manchester city centre: the urban environment is being transformed through investment and redevelopment.

The main **planning and development issues** that affect the ground are:

- Provision of land suitable for development.
- Protection and development of mineral and water resources.
- Protection of agricultural land.
- Provision of waste disposal sites.
- Control of pollution.
- Conservation of landscape.

In applied mapping projects these issues are underpinned with information regarding **earth science factors** such as:

- Derelict land and contaminated land.
- Ground stability.
- Water resources and groundwater pollution.
- Mineral resources.
- Flooding.
- Soil resources.
- Conservation of earth science sites.

Planning & development

The increasing use of GIS will make it much easier for information from diverse sources to be combined and interrogated. In particular, it should enable the value of earth science information to be more easily understood in a geographical context, and facilitate the retrieval of map-based information about earth science issues.

The manipulation of planning and earth science information together should assist the development of techniques for risk assessment related to ground conditions.

"... increasing use of GIS will make it much easier for information from diverse sources to be combined and interrogated ..."

The future

A new urban geoscience project in Manchester is bringing together a large range of data-sets in a GIS. Manchester and Salford are major development areas, including Salford Quays (Lowry and Imperial War Museums) and Trafford Park, while Manchester city centre is still being rebuilt following the 1996 bombing. East Manchester is undergoing a multi-million pound investment over the next ten years, managed by New East Manchester, a partnership comprising the City Council, English Partnerships, and the regional development agency. At the heart of this area is the Eastlands site, a former gasworks and colliery that is the venue for the 2002 Commonwealth Games. Consequently, Manchester is an ideal area in which to provide integrated geo-environmental data.

Data-sets collated:

- Revised digital geological maps.
- Engineering and hydrogeological properties data.
- Digital downhole borehole data.
- Water level information.
- Thickness of Quaternary deposits and engineering rockhead.
- Digital elevation model (DEM).
- Geochemical data.
- Historical and modern topographical maps.
- Current land use: classified according to guidelines from the National Land Use Database (NLUD).

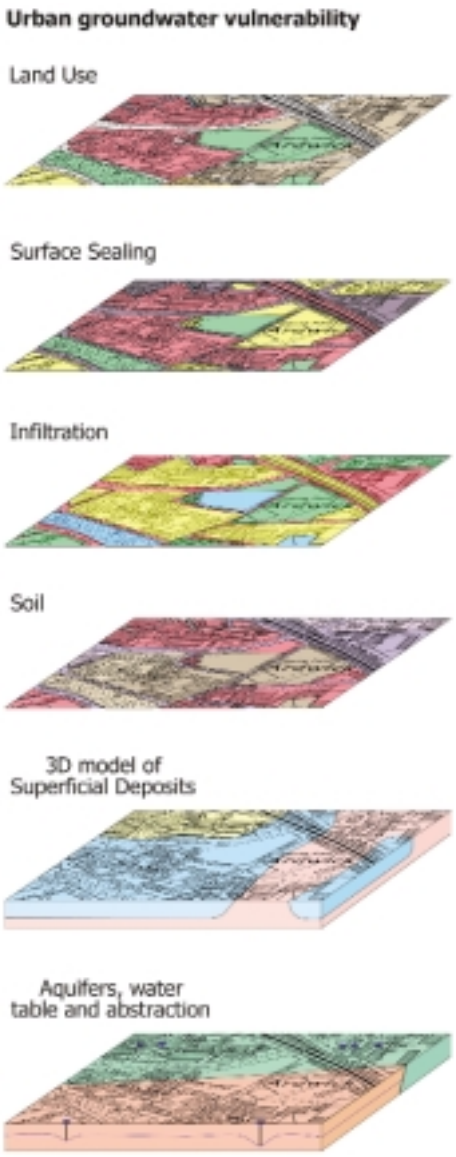
Range of outputs:

- Potentially contaminative past land use: classified according to guidelines from the former DETR and Local Authorities.
- 3D models of the base, thickness and composition of superficial deposits, and engineering rockhead.
- Urban water regime: including depth to water table, percolation rates through the unsaturated zone, and infiltration and drainage information.
- Likelihood of shallow groundwater as an engineering hazard.
- Groundwater vulnerability: based on the effect of surface sealing, soil disturbance, and superficial geology.

The demand for groundwater vulnerability assessments in urban and industrial areas will increase as local authorities assume the responsibilities set out under part IIa of the Environmental Protection Act, 1990, and the EU water framework directive. The new water regime information brought together under this project will be a valuable source of information, for example in the prioritisation of brownfield development sites.

In times of increasing problems with flooding, this project will also assist in understanding the urban water pathways and provide information for the design of sustainable drainage systems that will mitigate flood risk in urban and peripheral rural areas.

This project is setting standards for a new phase of applied geological mapping that will provide a broad range of information suitable for use on a regional and local scale, and to underpin the more detailed investigations that are required for site specific development.



C Wardle, BGS © NERC

A diverse range of data-sets may be combined and interrogated in a GIS.

For information about the project, contact:

Richard Ellison
Tel: +44 (0)115 936 3177
e-mail: r.ellison@bgs.ac.uk