

Mineral resource information for a sustainable future

Protecting our natural life support systems

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Sustainable development is an expression which is used increasingly in the context of mineral resources, particularly where new or extended mining and quarrying activity is envisaged. Sustainability is far more than simply an eco-buzzword, rather it is a key objective to which every developed country in the world aspires, and one which is enshrined in UK government policy. So what is meant by sustainable development? The World Commission on Environment and Development defines it as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs. At a minimum, sustainable development must not endanger the natural systems that support life on earth: the atmosphere, the waters, the soils and the living beings'*.

Almost all naturally-occurring mineral resources are non-renewable so, by definition, any extraction, however small, can never be wholly sustainable. However, society's needs are such that the demand for minerals is unlikely to decline significantly in the foreseeable future. As a result a compromise approach is generally adopted, whereby mineral extraction is permitted, but in the most sustainable way. Thus sustainable development is not only concerned with protecting the environment and conserving natural resources, but also with achieving high and stable levels of economic growth which will

provide opportunities for all of society. In the minerals industry it should involve adequate resource knowledge, adoption of best practice methods during extraction and sympathetic restoration and after care, with due regard for biodiversity.

Mineral production is a major sector of British industry: in 1998 the total value on an ex-mine or quarry basis was £16,995 million amounting to 2% of GDP. Although the lion's share of this came from North Sea oil and gas pro-

duction, coal, construction, industrial and metalliferous minerals collectively contributed nearly four thousand million pounds. Translated into production figures, the current annual demand for aggregates is 218 million tonnes which equates to a *per capita* need of 3.8 tonnes. Despite the decreasing demand for coal, we still mine around 41 million tonnes, approximately one third of which is opencasted. With an annual output of 2.4 million tonnes Britain is the world's second largest producer and exporter of kaolin (china clay). The country also produces a wide range of other industrial minerals including (with production figures in thousands of tonnes), ball clay (964), potash (1014), rock salt (700), fireclay (577) and silica sands (4662).

A prerequisite for sustainable development is comprehensive and informed land-use planning at both national and local levels. This should offer 'from cradle to grave' advice and orientation for both planners and developers, covering all aspects of development from early identification of resources to final site reinstatement. Mineral planning must be underpinned by a sound knowledge of resources, their nature, extent, quality and quantity, the scope of current extraction and legacy of former workings. Moreover, this information must be in a form where it can be readily integrated

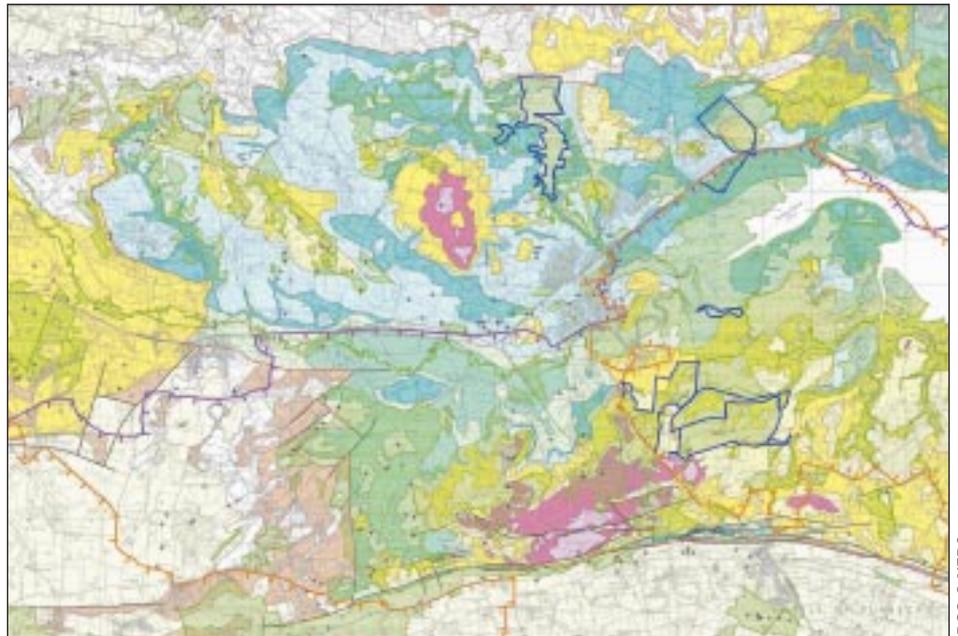


Restoration, foreground, and current extraction areas at Bestwall Sandpit (Aggregate Industries), Dorset.

Don Cameron, BGS © NERC

with other data sets, such as cultural and environmental constraints, to aid impartial decision-making.

The BGS has considerable experience and expertise in the provision of impartial advice to mineral resource planners and developers in Britain. The extensive sand and gravel assessment, undertaken by the Institute of Geological Sciences (the forerunner of the BGS) in selected areas of England and Scotland, during the 1970s and early 1980s, was born out of a need to minimise potential land-use conflicts. All of the borehole information collected during this study, together with some of the geological linework is now digitised so that it can be made available rapidly, in individually customised form.



Surface and subsurface distribution of ball clay-bearing host clays in the Wareham Basin, Dorset, in relation to Sites of Special Scientific Interest (green), Areas of Outstanding Natural Beauty (purple), and Heritage Coast (orange).

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To help planning authorities achieve the right balance between the protection of the environment and wealth creation, the BGS now produces, on a county basis, concise statements of mineral information. These are mainly in the form of maps accompanied by short reports, which are imported into a Geographical Information System (GIS). The work, Mineral Resources for Development Plans, is funded by the Department of the Environment, Transport and the Regions (DETR) and the main elements of information presented are:

- The geological distribution of all important mineral resources
- The location of current mineral workings and the mineral produced
- The extent and status of mineral planning permissions
- The extent of nationally designated planning constraints, including Areas of Outstanding Natural Beauty, National Nature Reserves, Sites of Special Scientific Interest and Scheduled Monuments.

To date, information is available for 36 Mineral Planning Authorities in England and Wales, and a further five maps, covering 19 authorities are in production. Using the GIS, regional themes may be built up from the county mineral resources data. These can be used to examine regional issues such as provision of landbank information for sustainable aggregate or by using transport themes to examine the movement of primary materials.

Baseline geological information for minerals planning in Scotland is available in the Mineral Portfolio Report Series. This comprises a series of thematic reports and maps, outlining potential deposits of selected bulk minerals, including crushed rock aggregate, limestone, dolomite, silica rock, silica sand, fireclay and talc.

In parallel with the County Maps series, which are primarily designed for mineral planners, the BGS is currently developing a GIS that provides minerals information on Britain for a much wider range of customer applications. MINGOL (Minerals GIS On-line) provides state-of-the-art GIS on the nature and distribution of metallic, industrial and constructional mineral deposits, within the context of current planning and environmental constraints.

It forms an easily-accessible minerals information system, based on the capture and integration of BGS mineral resource data sets, from which value-added products can be developed to meet customer needs.

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In the future there will be an increasing requirement for such systems to become 3D and the BGS is already using state-of-the-art 3D modelling software packages on a local scale to assist with mine planning and development. Modelling can help in determining the most efficient extraction methods whilst minimising waste and any adverse environmental effects. Some of the latest software allows the fourth dimension, time to be included, allowing planning authorities and the general public to see the likely effects of a proposed mineral development before and during extraction, and after restoration.