Resources

Technology and information

Leading the way towards more sustainable mineral development

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Britain's economy depends on the availability of mineral raw materials obtained from the natural environment, whether at home or overseas. However, mineral extraction almost always leads to some adverse environmental impact. In a densely populated island like Britain, mineral extraction causes conflicts with other desirable aims of society both by loss or change to valued landscapes, habitats or archaeological features and by impact on people's lives. The issue is one of balance: how to weigh the need for minerals and minerals-based products against the need to conserve mineral resources and protect the environment.

Unlike many other forms of development, such as roads, housing and commercial development, mineral extraction is a temporary use of land. Some operations may last for many years, but ultimately when the deposit is depleted the land is restored to a new or its original use. Mineral workings can provide opportunities for environmental benefits including landscape enhancement and the creation of sites of nature conservation importance. A life-cycle assessment of mineral-bearing land through extraction and restoration to eventual re-use will ensure that sustainable patterns and standards of development are achieved.

Mineral extraction depletes a finite, non-renewable resource. The long-term objective of any sustainable development strategy must therefore be to seek ways of using fewer primary minerals. New technologies help to bridge the gap between what is available and what is needed. They lead to changing consumption patterns through the introduction of alternative materials and substitute products, and they provide the means for improved recycling, waste minimisation and enhanced product designs. Technological advance in combination with other economic factors, can cause a certain type of mineral deposit to become viable — and further technological change can cause it to become non-viable. A particularly good example of this is provided by the history of England's sedimentary iron ore industry.

Physical exhaustion of mineral in the ground is often not the cause of the demise of an industry: there is a continually evolving demand for minerals due to changing economic, technical and environmental factors. Consequently, areas of potential economic interest for minerals are not static but change with time and in ways that cannot easily be predicted, as can be seen from the recent decline of the deep-mine coal industry in Britain.

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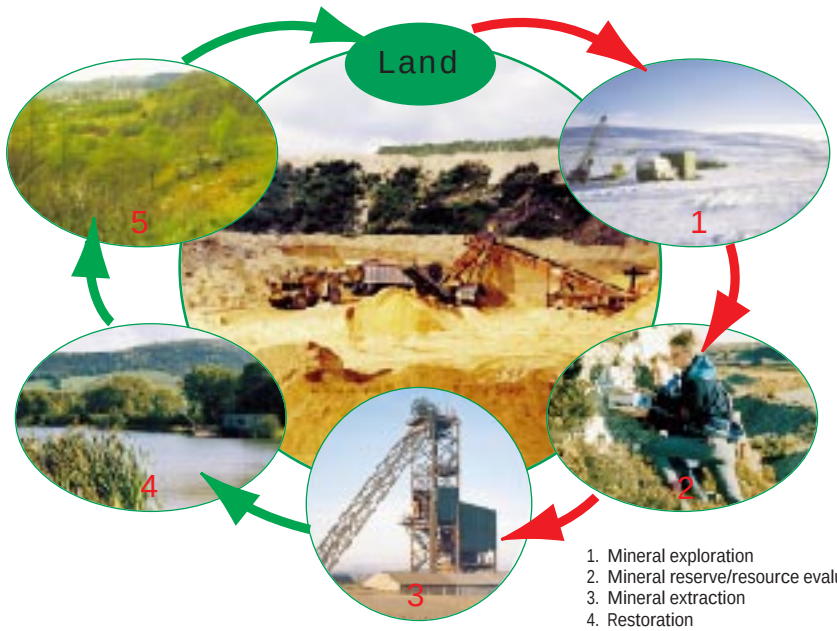
Access to reliable and up-to-date information on the nature, quality and extent of mineral resources is essential for decision-making in resource management. Basic mineral resources information supports mineral exploration and development, and this leads to new discoveries and an expanding resource base. Data on the properties of resources, as well as their distribution, allows specific resources to be matched with their most appropriate use. An understanding of whether these properties can be modified or enhanced by



1. Mineral exploration
2. Mineral reserve/resource evaluation
3. Mineral extraction
4. Restoration
5. Re-use (agriculture, residential, nature conservation, amenity)

Life cycle of mineral-bearing land.

Resources

England's sedimentary ironstones

The development by Thomas and Gilchrist in 1878 of a basic lining (hard-burnt dolomite) for the Bessemer steel converter made possible the use of phosphatic iron ores in steelmaking and resulted in the major development of the large, albeit low-grade, Jurassic ironstones of eastern and central England. These deposits dominated iron ore production in Britain until 1980, when large-scale production ceased. Cumulative output was some 1200 million tonnes.

There were several reasons for the demise of the industry. The availability of iron ore from high-grade deposits overseas and the decline in ocean freight costs meant that competition was a major factor, but the introduction of the Basic Oxygen Steelmaking (BOS) process was also critical. BOS greatly improved the economics of steelmaking because of its speed, but the process also favours the use of low-phosphorus iron ores. Consequently, the low-grade, phosphatic ironstones of England are unsuitable for this process and no longer constitute a viable source of iron.

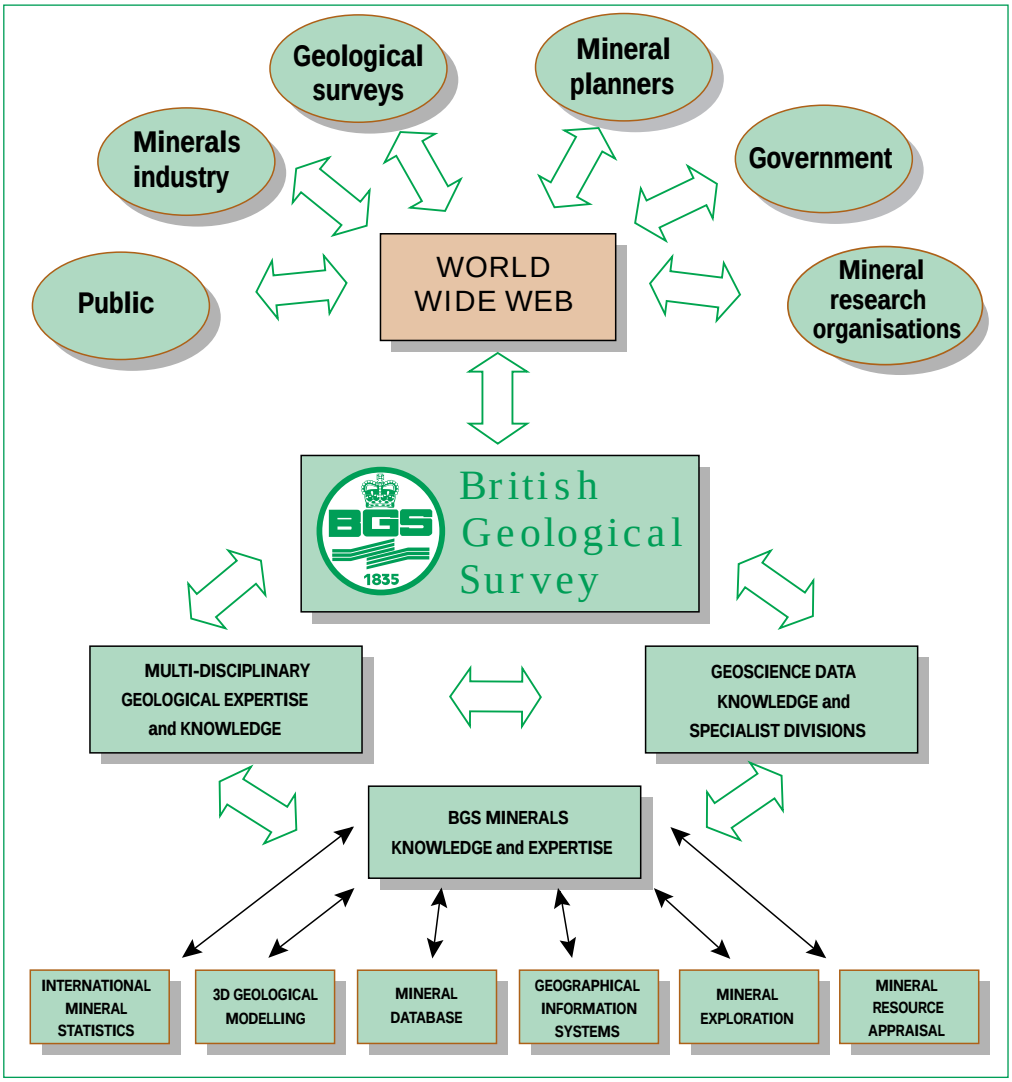
Their extraction, like that of tin in south-west England, contributed greatly to the economic development of the country and had they not been worked when the economic circumstances were right then the wealth they created would have been lost to the nation.

blending and/or mineral processing allows scope for producing value-added products from existing resources, as well as facilitating the use of unconventional deposits, including mineral wastes. All these factors will contribute to the more efficient use of primary resources. In the wider context of sustainable development, mineral resource information is of increasing importance for resource management and land-use planning, and for the establishment of the baseline data needed for environmental impact studies and environmental guidelines.

Knowledge management is a new and fast-growing discipline, founded on developments in IT and communications over the last decade. The very success of IT has led to the availability of an excess of information, often in an unstructured form. Knowledge management systems address this problem by providing a mechanism to locate, organise and use information and expertise. Too often, knowledge is held in individual systems or 'silos', which are very efficient in creation and processing but fail to attract added value because of their isolation. Value is added to these systems when information within them is classified using an intuitive taxonomy, allowing other users to quickly find what they are looking for.

The last issue of Earthwise was published for Minerals '98. This initiative has been very successful in bringing together many participants from industry, professional organisations, government and the general public with the aim of identifying, understanding and prioritising issues concerning the need for minerals, environmental protection and improving the quality of life.

Successful and sustainable management of Britain's natural assets, including its mineral resources, requires the integration of a wide range of land-use and related information. The development of efficient systems for combining, analysing and delivering such information will become an increasingly important element in ensuring that balanced choices are made in the future.



Data transactions.