

Minerals for a crowded island

Planning for sustainable development

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David Highley, BGS © NERC

The extraction of kaolin-rich ball clay in Dorset may look unsightly while the clay is being worked, but this industry underpins a strong and vibrant high-quality ceramics industry in Britain and Europe manufacturing products such as sanitary-ware from which we all benefit.

Great Britain is a crowded, island with a total population of around 58 million. England, with 50 million inhabitants, is particularly densely populated. The population density of Great Britain is around 250 per square kilometre, and that of England is 380 per square kilometre; values for the highly urbanised areas are much higher. These figures compare with population densities per square kilometre of around 120 for Nigeria, 235 for Brazil, 333 for India, 800 for Java and 5600 for Hong Kong.

Britain is part of the privileged economic elite of the world in terms of

gross material wealth, gross national product, and per capita income. Britons are lucky to live in an economy that has sustained relatively high standards of living for most of its people for decades. The present standard of living of the average Briton is, in large part, sustained by the annual consumption of large amounts of minerals for both energy and non-energy uses. Most of us depend on minerals for almost every minute of every day. We wake up and switch on the light using electricity generated from coal, oil, gas or nuclear minerals, transmitted in aluminium cables and wired to the house through circuits made from copper; we travel to work or school by road or rail systems made of iron and steel, crushed rock and sand and gravel, plastics derived from hydrocarbon minerals, and powered by a range of hydrocarbon fuels; we spend the day at our workplace in buildings made from brick clay, sand and gravel, various metals, hydrocarbon derivatives, and gypsum; and we eat our meals, prepared in metal vessels, on mineral-based plates, made from high-quality ceramics using

clays, feldspars and silica. Almost every gadget, tool, and recreational equipment item we use is ultimately manufactured from a mineral raw material. Examples include mobile telephones (which incorporate more than twenty mineral-based materials) and television sets (containing a variety of metals, as well as silica sand in the faceplate glass which also contains strontium).

The net result of our economic and leisure activity is that every woman, man and child in the year 2001 in Great Britain consumed approximately: four tonnes of primary fuel (oil, coal etc.); 3.8 tonnes of primary aggregate minerals (crushed rock, sand and gravel); half a gram of palladium (used in mobile telephones and catalytic converters); 172 grams of tin; and 11 kilograms of aluminium, to name just five mineral-based commodities. This high mineral consumption is a symptom of 'western' life-styles and contrasts starkly with the relatively low mineral and energy demands of the less developed parts of the world. The intensive use of minerals causes an economic, social, and environmental impact on virtually all continents. For example, to support a city the size of London, Glasgow or Newcastle over the



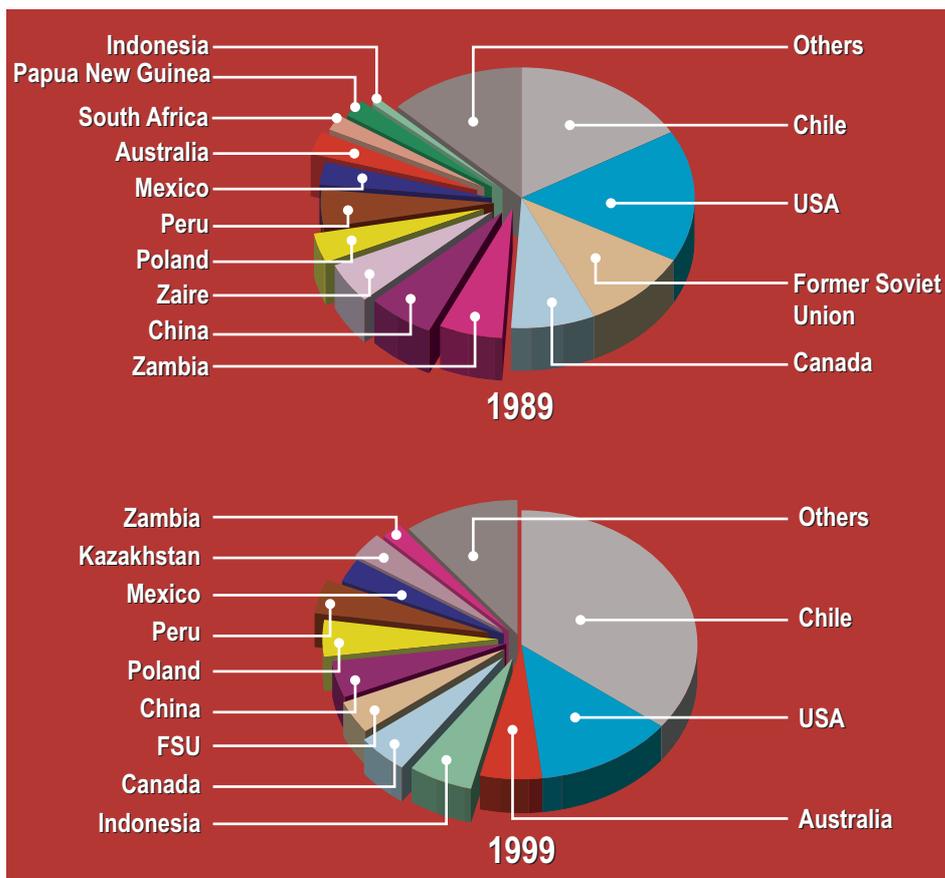
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High-quality ceramic sanitary-ware: an example of the products manufactured from minerals that consumers in the developed world depend on in their everyday lives.

full range of mineral commodities they need entails the extraction of palladium from Russia (which currently produces about 65 per cent of the world's palladium), chromium from South Africa (which produces about 46 per cent of the world's chromium), antimony from China (which produces more than 80 per cent of the world's antimony), and copper from Chile (which produces around 35 per cent of the world's copper). So the economic and environmental footprint of our large British cities is truly global.

The BGS monitors the production, trade and consumption of a range of economic mineral commodities through publications such as *UK Minerals Yearbook* and *World Mineral Statistics*. The BGS informs and advises on both national and international current and historical mineral commodity trends. This work forms part of an integrated assessment of Britain's mineral requirements. For many mineral commodities (such as the bulk of our metallic mineral requirements) Britain looks to the rest of the world for supplies, thus passing on the inherent socio-economic and environmental impacts of mining these commodities. The world statistics show the extent to which the environmental gains of the developed world may have become the losses of the developing world as mines, 'dirty' smelters, and refineries are closed in the former and rebuilt, perhaps with less concern about pollution, in the latter. They also show that cost advantages and economies of scale, equally with geological constraints, are tending to concentrate the output of many minerals and metals into fewer countries.

Applied research in economic minerals focuses on themes such as minerals supply and planning; determining the quality, quantity, value and location of Britain's mineral wealth; evaluating positive and negative impacts of mineral development from grass-roots exploration to post-mining land remediation; and a range of related topics. Through this work the BGS has placed itself in a prime position to advise, inform and make recommendations on minerals-related issues from a non-partisan neutral position as a public sector research organisation. The BGS is regularly commissioned by the UK government to analyse ways in which Britain can achieve the optimum balance



World mine production of copper in 1989 and 1999. The copper Britain and other copper-mineral-poor countries require for economic development and prosperity are sourced from a wide range of countries. This is an example of the economic and environmental footprint Britain creates around the world to support its minerals-hungry economy.

between extracting the minerals the economy needs and protecting and maintaining our environment.

“... the economic and environmental footprint of our large British cities is truly global ...”

Over the past decade there has been an increasing resistance to developing minerals which Britain possesses in abundance, such as aggregates and limestone for cement manufacture. While in some specific cases it might be prudent not to extract minerals, this need not always be the case. A 'western' lifestyle is minerals-intensive and, even taking account of the most

efficient use of materials and energy — in which Britain currently has a good track record — and the maximisation of recycling, there will inevitably remain a demand for primary mineral extraction for as long as there is significant economic activity taking place. One of the key principles of sustainable development is avoiding the unnecessary export of environmental problems. If Britain is to follow this principle, new quarries will have to be developed to meet domestic materials demands, rather than importing mineral commodities from the international marketplace. This will reduce Britain's global environmental footprint. Only an integrated and holistic minerals expertise base, can begin to seek solutions and make progress towards meeting the mineral extraction requirements of our crowded island in a way that allows us to pass on as pristine an environment as possible to future generations.