The British Geological Survey (BGS): Geoscience for decision making

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It is the increasing public awareness of the environment that brings the science undertaken by the British Geological Survey (BGS) into the public eye. The Survey is the nation's principal supplier of objective, impartial and up-to-date geological expertise and information for decision making for governmental, commercial and individual users. We maintain and develop the nation's understanding of the rocks, soils and groundwater that make up the subsurface, to improve policy making, enhance national wealth and reduce risk. An important part of what we do involves communicating our geological knowledge to a variety of stakeholders and the general public.

BGS does this as part of the Natural Environment Research Council (NERC) family through maintenance of national capability in the geological sciences and developing research with academic, government and industrial partners in strategic areas; these include energy and natural resources, our vulnerability to environmental change and geo-environmental hazards.

We also undertake contractual research which involves "putting the survey science to work" in association with national and international government agencies and with industry. This represents about half of our total £55 million budget and about 30% of our manpower.

My key challenge in the coming years will be to make the most of the different arms of BGS. This will build on the "public good" role of the BGS within NERC, sharpening our research focus as part of the new NERC science plan, and further developing a new knowledge transfer and commercial model of the BGS.

Developing the BGS

The BGS was created in 1835 as the Geological Ordnance Survey and it was in July 1845 that the Geological Survey Act provided the Survey with a legal framework designed "to facilitate the completion of a Geological Survey of Great Britain and Ireland."

Much of Britain's geology is hidden from us by vegetation and the built environment, so that what we produce can often be difficult to obtain, and is an interpretation of a limited amount of observational data. Nonetheless, one might ask why, in more than 150 years, this has not been completed. In fact, the entire digital coverage of Britain will be complete by about 2012. In the future, our interpretations will need to be regularly updated as new data become available. Mapping will be focused on strategic issues (for example for potential geological disposal of nuclear waste) and in key regions at a finer scale and involving multi-dimensional models.

The geological coverage of the UK underpins a plethora of geological information that is essential for our day-to-day living. It is the translation of the geological map and data into knowledge for society that is the most important role of the Survey. In addition, the needs of the country have shifted from being dominantly resource based in the 19th and most of the 20th century to being dominated by environmental issues in the 21st century. It is only recently that geologists have embraced the study of surface processes and their relationships to landscapes, to climate and to biology and habitats in marine and continental environments.

Modern technology is revolutionising the way we display, model and deliver information to end-users. Multi-dimensional models of the subsurface, fundamental in dealing with issues of urban and regional development and resource modelling will be the norm of the future. The BGS is a world leader in dealing with geospatial information, which is widely accessed by users ranging from the British homeowner, who requires information for purchasing a house, to insurers, local authorities, surveyors, civil engineers and many other professions. Recently, a world-wide initiative called "OneGeology" was launched by the BGS to create a dynamic digital geological map data for the globe at a target scale of 1:1 million. We also hope to be working with the European Space Agency in developing geological maps of the planets.

BGS as part of a research council

BGS has been in the NERC family since 1965. Most geological surveys of the world report directly to a minister in the domain of technology, industry, and/or science. The fact that the BGS establishes its science strategy within

that of NERC, several tiers below a minister, has advantages and presents challenges.

Much of our scientific activity is for the public good and a survey by Roger Tym and Partners in 2003 estimated that the "value" generated by BGS science impacts on as much as 5-8% of UK output. Clearly, this sort of delivery for NERC within its DTI remit is essential for the nation. NERC wants to better identify, evaluate and support these activities within its research centres, but it will also recognise that some of its centres, specifically the BGS, undertake important nation-building tasks that may not always be a direct underpinning of the NERC science strategy.

Our relationship with NERC allows us to develop research projects and to build national capability, for example in new mapping and monitoring technology, and also to exploit our data in partnering on exciting new strategic research programmes funded by NERC and other research councils. I include below a "case-study" to demonstrate our relationship with NERC and other stakeholders:

Case-study: Energy resources and their management

Through its mapping BGS provides Government with an assessment of its energy reserves both onshore and offshore. It is generally accepted that fossil fuels will remain a significant source of energy for the UK for some time to come. However, the continued use of fossil fuels will require us to store the CO_2 produced in power generation and large industrial processes. The most appropriate solution for the long-term storage of the CO_2 in the UK will be geological storage. This will involve injecting pressurised CO_2 into deep saline fluids and pore spaces that are contained in rocks, normally sandstones, in underground reservoirs which particularly occur offshore. In a broad sense, we foresee three stages: **(1)** assess and define the extent of the reservoirs; inform Government of the available capacity; work with industry and Government in defining protocols for sequestration; **(2)** a research element which will require specific geophysical measurements, probably involving new technology, and also an understanding of the thermodynamics of CO_2 in a specific type of reservoir; **(3)** long term monitoring of the reservoir both during, and after, injection of CO_2.

Stages 1 and 3 are part of the public good role of BGS; **stage 2** would involve an intensive research programme with universities and industry that could be part of a NERC thematic programme in their new strategy on **"The next generation science for planet Earth".**

I used the carbon capture and geological storage example above to demonstrate the links between the public good role of BGS and the academic and industrial research environment. I could have chosen other examples, such as groundwater resources, deep underground storage of nuclear waste, ground stability, and coastal and estuarine response to climate change. All of these science research areas are timely and critical to the future of the UK, all requiring BGS to develop close links with universities and other research centres.

BGS as an international leader

The BGS "brand" is very strong internationally and our overseas work, until 1965, was carried out by a separate Overseas Geological Survey. We are currently operating in about 15 countries on projects commissioned by the UK Department for International Development, the World Bank and the European Development Bank. Our main role is to provide the basis for generating wealth and rebuilding the natural resource infrastructure through the provision of state-of-the-art geological information, training and institution building. This capacity building is important for the British presence overseas and creates long-term financial benefits for both Britain and the countries in which the BGS works; for example, we are in the final stages of a three year project to rebuild the Afghanistan Geological Survey.

The BGS needs to use its overseas presence to act on behalf of the university community in building academic links in the developing world. It can also provide infrastructure for exciting co-funded projects involving geology, landscapes and ecosystems and including urban and rural development.

Models for BGS commercial activities

BGS has a broad remit and the tension between the contractual research and core programme funded by NERC can mean that sometimes our scientists do not have the time to fully exploit their science. BGS needs to create innovative BGS–university–industry contractual research partnerships and we need to review the way we undertake this research.

Contractual research is currently managed under NERC directives, either as contracts, direct sales or as licensing agreements. BGS has developed technology which can be "spun-out". We continually investigate all possibilities for commercialisation and knowledge transfer of our applied research. A road map of future commercial options, including time-scales, costs, benefits and dis-benefits to BGS and NERC, is being developed. This will most probably include the possibilities of both the migration of suitable activities to a commercial arm of BGS and also the growth of new activities and sectors.

BGS as a national resource

The BGS is a valuable national resource. It is unique among the geological surveys of the world in having both a broad applied geo-environmental research programme, and working under a mixed funding profile involving NERC core funding, contracts from national and international agencies and from industry, and income from data licensing. It plays a central role in providing scientific information not only for decision-making for Government, but for also for horizon–scanning. By means of strategic partnerships with universities and other leading geo-environmental research bodies, the Survey will develop as the focus of applied geological research in the UK, and as leaders of this science on the European and international scene.

For more information please consult our web site http://www.bgs.ac.uk/