THE ECONOMIC VALUE OF GEOSCIENCE INFORMATION

[1]REEDMAN A J and [2]CALOW R [1]British Geological Survey, Keyworth, UK. [2]British Geological Survey, Wallingford, UK.

Summary

Most countries have a national geological survey organisation (GSO) that is largely funded from tax revenue by central government. Their establishment reflected a general belief that GSOs were useful and fulfilled a national need. However, relatively little effort has been made to apply quantitative methods for establishing the value of their work. With many GSOs facing funding difficulties, particularly in developing countries where government financial resources are overstretched, GSOs need to be able to demonstrate the economic as well as the social value of their programmes.

Introduction: Geological Survey Organisations and Geoscience Information

The main mission of a GSO has traditionally been to carry out systematic geological surveys eventually covering the entire nation and resulting in the accumulation of large amounts of data of various types. The systematic assembly and processing of data and its communication to a variety of users identifies GSOs as providing a national geoscience information service. The scope, type and extent of individual GSO's programmes, which together constitute this information service, vary widely according to a number of factors. For example, the geological diversity of the earth's crust dictates that nations are variably endowed with geological resources and vulnerability to geohazards. This natural variation in a nation's geological environment will influence the priorities accorded by a GSO to its various programmes. Furthermore, national governments have different perceptions of the economic and social relevance of the geosector which will affect their assessment of the national priority to be accorded to geological resource and geohazard assessment and to the funding of their national GSOs. In developing countries where there is bound to be fierce competition amongst the widely diverse government agencies for scarce government funding, GSOs will be under threat if the value of their work is not proven.

Costs and Benefits of Survey Programmes

One fundamental assumption underpinning the funding of GSOs is that geological and other geoscience surveying programmes realise diverse economic and social benefits and that these benefits far outweigh survey costs. If GSOs can estimate the value of such benefits then they can, by comparing their costs with the value of resulting benefits, establish a more objective way of prioritising the elements of their own surveying programmes and more securely establish their place in the list of national priorities.

Maps as Information

Here we will consider the information provided by GSOs in the form of geoscience maps. If the information thus provided by GSOs has value, then the implication is that it is useful and this 'usefulness' can be maximised if the users or customers are identified and due attention is paid to their needs. In investigating and responding to the needs of users not only are new applications of geoscience information being developed but also better and clearer ways of transmitting the information. Converting geoscience data collected during systematic geological, geochemical and geophysical surveys of a country into digital databases and producing Geographic Information Systems which allow users to both isolate and combine the particular layers of information in which they have a specific interest is well established as the way forward for GSOs as an essential part of their national geoscience information service. However, the major products of many developing country GSOs are still in the form of traditional, printed maps.

Applications and Value of Map Information

In order to carry out an evaluation of the benefits accruing from the availability of a geological map we must first understand how the information on the map is to be used; in essence the main use can be summarised as 'reducing the risk in making land-use decisions'. The land-use decisions may cover a wide variety of planned usage; for example, routes for major road or railway development, areas to be designated for urban development, establishment of waste disposal sites, mine and quarry development, agriculture and forestry usage or establishment of a protected area for recreation and conservation. All these examples involve the risk of an expensive error being made if no, or only inadequate, information on the underlying geology is available. Improvements in the available geological information enables superior decisions to be made.

Arriving at a figure for the value of the improved information is not necessarily easy; the process involves an examination of the incorporation of the improved information into the decision making process, the effect it had on the decisions and the impact of the decisions. Some form of quantitative measure must be applied to each of these stages. This leads to a system of comparing the costs of providing the information against the value of the resulting benefits. Often the value of the new information can be stated in terms of 'the extra costs avoided' as measured against the costs of proceeding with a project in the absence of the information.

A Recent Case Study

In a recent project investigating the value of geoscience information in developing countries, the British Geological Survey, together with the Indonesian Directorate General of Geology and Minerals and the Geological Survey and Mines Department of Zimbabwe, is examining the impact of the provision of geological information by GSOs on the mineral exploration activities carried out by the private sector. Mineral exploration companies have a clear idea of what they require in terms of data and information from GSOs. Amongst these requirements are the availability of good geological, geochemical and geophysical maps. It is worth noting here that GSOs in a number of developing countries have, in recent decades, neglected such systematic geological surveying. This is illustrated by the fact, for example, that rather less than one third of the land mass of Africa has published geological map coverage at scales of 1:250 000 or greater and much less is covered by systematic geochemical surveys.

The costs associated with a particular programme of geological surveying and map production are easily identified and are usually a matter of record. Identifying and establishing the value of benefits, both direct and indirect, is usually more complex and generally less precise. Negative impacts have also to be taken into account. In our study, not complete at the time of writing, it is clear that geological survey campaigns in Bolivia, Indonesia and Zimbabwe each costing a total of a few million dollars, generated investment by the private sector of several tens of millions of dollars in each area. Fuller details will be presented during the symposium at the International Geological Congress, and a manual will be available demonstrating methods of cost-benefit analysis of geoscience information as represented on geological maps.

Relatively few studies of this type have been carried out though our project builds on previous work in industrialised countries (Bernknopft *et al* 1993; Bhagwat and Berg 1991). An unpublished study by the UK Department for International Development of a geological mapping project in Kenya estimated that ‘costs avoided’ in future development projects in the area would amount to an average of ten per cent of the total cost of the mapping project each year for the foreseeable future.

Conclusion

It can be demonstrated that geoscience mapping programmes, as carried out by GSOs in developing countries, can deliver geoscience information resulting in economic benefits whose value far exceeds the total costs of the mapping programme. If they are to continue in existence, GSOs need to adopt methodologies that allow them to carry out cost-benefit analysis of their various geoscience information acquisition and delivery services in order to prioritise their activities and demonstrate their developmental value in quantitative terms. A project recently carried out by the British Geological Survey on behalf of the UK Department for International Development will result in a manual which aims to assist GSOs in acquiring the relevant methodologies appropriate to their developing country status

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