SCIENCE RESEARCH INTERNAL REPORT N0.31

SCIENCE AND INFORMATION: A KEY TO WISE RESOURCE MANAGEMENT

(Resource Management Law Reform Discussion Paper)

by

Mary McEwen and Robin McColl

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Science and Research Directorate,
Department of Conservation,
P.O. Box 10-420,
Wellington, New Zealand

September 1988

SCIENCE AND INFORMATION : A KEY TO WISE RESOURCE MANAGEMENT

(RESOURCE MANAGEMENT LAW REFORM DISCUSSION PAPER)

Mary McEwen and Robin McColl

Conservation Sciences Centre, Department of Conservation
PO Box 10420, Wellington

SUMMARY

This paper argues the fundamental importance of science and research in the review of resource management statutes being carried out in New Zealand at this time. These statutes should provide for continuance of nationally managed survey and research on natural resources, resource use and environmental management, and for the maintenance of national databases of objective, scientifically-based information available to all.

Environmental quality is a requirement for economic and social wellbeing. Management of natural resources should be on a thorough understanding of ecosystems and the principle of sustainable use. Scientific information and interpretation is a prerequisite for this. Many 'natural disasters' could have been prevented in New Zealand by applying scientific information to land use decisions. The need for scientific research and information in resource management should be recognised by statute. Basic resource information should be available to all people as a 'public good' and any charges should be kept to a minimum, following the current guidelines for charging for official information.

The quality of information should be consistent throughout the country so that national perspectives can be obtained. The devolution of responsibility for resource information to regional agencies may result in unacceptable variation in resource information and standards of management practice from one part of the country to another.

Central government is identified as the institution best able to fund strategic research into the inter-relationships of ecological and physical systems and to maintain national databases of objective scientific information. The organisation of scientific effort into national science centres enables costs to be held to a minimum and lessons learned in one area to be shared with others.

Regional government has need of regionally-based information and is best placed to collect certain types of basic resource data. Regional survey and technical capability supported by nationally developed methodologies for survey and information handling offer an effective means of providing for information needs at a scale appropriate to regional government. This does not replace the need for national science agencies and information at a scale suitable for national planning and management. The cost of replicating in each regional government unit, many specialist skills and technical facilities, cannot be afforded by a country with a population as small as New Zealand's.

1) **INTRODUCTION**

The Government is currently reviewing the laws for managing air, land, and water use and mining. This paper discusses science and information aspects of resource management.

New Zealand is a unique and distinctive island archipelago with a complex geological and biological history. The landscapes have a character found nowhere else and the biota a high degree of endemism, due to long isolation. New Zealand's distinctive and recognisable character comes mainly from those places as yet little modified by man and inhabited by a fauna and flora unique in world terms.

New Zealand is also a geologically complex country, tectonically young and susceptible to earthquakes, with a rugged landscape and diverse climate. In the past, scientific research has helped to resolve problems unique to this country in order to provide the roads, bridges, hydro dams and buildings that have made development of its natural resources possible. Much scientific research effort has also been invested in development of primary industries including agriculture, plantation and indigenous forestry, and fisheries. This research, largely performed by scientists in government departments, has been taken for granted because it has worked so well and efficiently.

Natural resources cannot be used productively without altering the ecosystems of which they are a part. Ecosystems are the basis for sustaining life and as such they must be protected. The complexity of ecosystems and the subtleties of resource management are accepted but not well understood by most people. Again science and research have played a large role in providing knowledge of these matters.

A factor in the success of any review of resource management statutes will be to ensure that the role of scientific research and information in resource management is dealt with at the appropriate time in the review and that any revised legislation makes provision for appropriate scientific inputs to the management process. The unique features of New Zealand's environment place particular responsibilities on its resource managers, from both national and international perspectives.

This paper identifies the roles of science and research in resource management and examines the role of government in providing a base of scientific information and skills. Two options for resource management are considered: a governed approach or a market-driven approach. In addition, devolved or decentralised approaches to government are discussed.

2) UNDERLYING PHILOSOPHIES

Living organisms and their non-living environment are inseparably related and interact upon each other in ecosystems. All interactions are governed by the laws of thermodynamics which can be summed up in the following way: matter can be neither created nor destroyed and it takes energy to get energy. Nothing can be thrown away and there is no such thing as a free lunch; societies do not consume resources, but borrow them from one part of the earth, transport, process, make use of them and then discard them. Such devastating environmental problems as the greenhouse effect, the disposal of toxic wastes and the contamination of groundwaters demonstrate these fundamental laws.

Technological development tends to become potentially more dangerous to life. The development of, for example, nuclear power generation, genetic engineering, large-scale mining, large-scale marine harvesting, and powerful biocides such as tributyl tin, require the development of a supporting technology to maintain environmental quality.

Environmental quality is a requirement for economic and social wellbeing. Resource developments may reduce, maintain or enhance environmental quality. With appropriate knowledge the outcomes of development can be predicted and society can plan and decide on optimum resource use.

The observations above support an ecosystem approach to resource use in which all known interactions are considered and the management practices aim at sustainability of resources. The goal of sustainability assumes that long-term benefit is more worthy than short-term expediency. By contrast, resource use decisions which lack depth of planning or are decided solely by free trade in property rights are likely to be determined by the need for short-term gain and thus will fail to satisfy an adequate range of social goals including the needs of future generations.

While there is an international movement towards deregulation of economies to enhance the efficiency of specific sectors, it has been noted by economists that the provision of ‘public goods’ remains a natural role of the state. Environmental quality is a ‘public good’. People should be able to expect an environment with an adequate supply of clean air, clean water and open space including beaches, riparian strips and larger areas of natural ecosystems. Australian economist, Michael James (1988) records that regulations applying to the environment and to such other ‘public goods’ as consumer standards, occupational health and safety have, in fact, been increasing in some Western countries in recent years. The limitations of markets in determining resource uses have been recognised in these countries. The complexities of the effects of resource use on ecosystems have led to a general recognition of the need for planning, environmental impact assessment, and an adequate information base. In the past, successive New Zealand governments have ensured that a reasonable degree of environmental quality has been maintained, but the extent to which government should be involved in resource management is now being questioned.

Resource management based on knowledge of ecosystems and the principle of sustainable resource use, is the basis of the proposed New Zealand conservation strategy. Scientific understanding is used to predict the environmental impacts caused by proposed developments, taking into account both average and extreme events, such as floods. This requires knowledge of natural processes, appropriate national, regional and local resource information, skilled expert judgement, continuous, long-term databases and appropriate management tools such as resource-use models.

In New Zealand, national science agencies have consistently led the way in identifying management issues and in providing the expertise to advise on appropriate management techniques.

3) WHY SCIENCE IS NEEDED?

Whichever scenario for resource management is chosen, the governed or the market approach, scientific information and interpretation is a prerequisite. It is required for defining and proving resources, (for example mineral prospecting), establishing sustainable yields, minimising the risk of adverse environmental impacts, improving the cost-effectiveness of extraction and use of resources, defining procedures and practices, and predicting the outcomes of actions.

Numerous examples can be provided of the benefits of scientific information gathering and interpretation for optimum resource management although there have been few analyses of them in economic terms.

New Zealand examples of the use of scientific information in land use planning and management include the planting of pine forest on the Mangatu Block, East Cape, to prevent soil erosion after native forest had been removed; the rehabilitation of Molesworth Station after the land had deteriorated badly following over burning and grazing by sheep and particularly rabbits; and the routing of pipelines and transmission lines using scientific survey information to determine the route with the least impact. There are also many cases where lack of sufficient scientific inputs have been costly or even disastrous, for example, the Abbotsford land-slide in Dunedin, coastal erosion at Omaha Beach north of Auckland (and several other sites) and the collapse of the canal. Scientists would have advised against development in some of these localities. The uncontrolled use of geothermal energy at Rotorua is an example of resource management where the local authority and private interests allowed over-use of the

resource to continue in spite of scientific evidence suggesting that use should be limited. There are, unfortunately, many other examples of development going ahead in spite of scientific evidence warning of negative consequences. A major example of this resulted in devastation caused by Cyclone Bola in the Gisborne area last March. As early as 1920 scientists had predicted that 'the effects of deforestation in this district would be greatly increased sheet-washing of soils; great increase in the number of slips, slumps and rain-gullies; aggradations of the stream-beds...and more severe and frequent floods'. This scientific advice, based on the results of strategic research, was not heeded and the scientific predictions have become manifest over the intervening years, at great social and economic cost.

4) **RESOURCE BASED ON SCIENTIFIC KNOWLEDGE**

Seldom will all the necessary scientific information required for decision making be available. Decisions can be based only on the best available information at the time. A previous investment in research and survey creates the ability to move quickly into new areas of resource use. A database of central government funded research and survey information in New Zealand has helped industry to plan resource development cheaply and efficiently and so far to avoid some of the worst environmental disasters which have occurred overseas.

The inputs of science to resource management range from basic surveys of resources and resource-use impacts to long-term research on processes. Certain of these inputs are presently available only from national science units, whereas others are available locally although with widely differing standards.

National surveys (e.g. of climate, water, soil, geology, land use capability, forest types, sites of special wildlife interest etc.) have been carried out in New Zealand for many years and form the main source of information on natural resources. A wide range of other biological survey information has been gathered as well, although this tends to have been less formalised. This work has provided an array of nationally maintained databases of objective, scientifically-based information about natural resources.

Similarly, national programmes of research have over many years provided a vast repository of knowledge, held and maintained by a range of national research agencies. While there may be scope for a more efficient organisation of both the information already held and the agencies themselves, the continuation of this national data collection capability, with appropriate funds and staff, is a vital component of resource management in New Zealand.

This paper submits that there is considerable benefit in recognising by statute the need for science and research information input into resource management; and that benefit would result from providing a clear mission to the resource management agencies

involved to ensure the continuity, quality, neutrality, and availability of resource information to all interested parties in the long-term national and regional interest.

5) WHO SHOULD PROVIDE THE SCIENCE ?

The Government is presently considering the devolution of resource-use decision-making to the regional and local government level. In the case of science and research there are dangers in devolution and advantages in national organisation that warn against such moves.

Past experience has shown that the quality of information collected by regional management agencies such as acclimatisation societies and catchment authorities is highly variable, not only because of differences in the resources available between regions but also because of differences in the quality of staff available to such agencies and differing perceptions of the need for accuracy or length and frequency of records. Another problem is that different survey methods may be employed by different agencies.

The Water Resources Survey (DSIR) submission on the Resource Management Law Reform states that the 'fundamental requirement for equitable and efficient resource management' is 'that decisions are made with a sufficient quantity of objective, scientifically-based, information of defined quality, which is available to all interested parties'. This supposition is strongly endorsed. For reasons stated above, the devolution of responsibility for resource information to local or regional government is likely to lead to a reduction in standards or the presentation of views. This has the potential to cause variation in resource information and standards of management practice from one part of the country to another, leading to social inequity and unequal opportunities for resource and/or enjoyment. Resource users may exploit reduced standards to increase their opportunity for damaging practices such as waste discharge or land disturbance. A regional deterioration in resource management could be a national disaster or even be internationally reprehensible.

Regionalisation may also hinder a national on priorities and on the importance to the of certain resources, especially those present in several regions. Regionalism could easily become parochialism. Where the same regional councils or other agencies which make the resource-use decisions also employ the scientific staff providing the database, there is potential for internalising conflict. A national approach with resource-use decisions made at the regional or local authority level, using scientific information gathered by an agency of national government, would be much more transparent.

Another major consideration is the shortage of technical resources. It takes many years to train specialist scientists and there are limited numbers of experts available in New Zealand in certain scientific disciplines. New Zealand relies heavily on international science inputs including publications, exchange of ideas at international conferences and exchange visits of scientists and technicians. Scientists are an internationally tradable commodity. The national science groups are better organised to access international data or staff resources than are other groups.

Substantial regionalisation of science effort has the potential to dilute science resources to the extent that units are too small to provide an adequate range of skills, to have adequate equipment at their disposal, and to generate good research through peer interaction. Regional science units would often be below 'critical mass' and would dissipate their efforts trying to be 'jacks of all trades', but ending up being 'masters of none'.

The organisation of science into national centres enables establishment, overheads and administration costs to be held to a minimum, for duplication to-be avoided and scarce resources to be shared between regions. A national system enables the lessons learned in one area to be more easily applied or handed on to other areas. Devolution to regions of the responsibility for science and research is not likely to result in a better product or a better service to regions, and will be more expensive.

In the area of nature conservation, in particular, there is a need for a national perspective when resource-use decisions are being made. Local authorities may have responsibility for natural resources of national or international value without realising it. For example, a natural area in a particular locality may not seem special to the region, but when seen from a national perspective it may be the best remaining area of its type in the whole country. A system of national survey and databases enables these perspectives to emerge, so that New Zealand's national and international responsibilities for nature conservation are adequately met. Nationally managed surveys and databases also help to avoid duplication of effort and contradictory actions being taken on the same issue.

6) **WHO SHOULD PAY?**

Scientific inputs to resource management include basic consultancy (routine scientific interpretation), resource survey, inventory and interpretation, tactical research (to solve immediate problems) and strategic research (to provide new understanding). The type of science is an important determinant of (a) the way it is funded or purchased and (b) who does it. The degree to which a science agency can appropriate a benefit or profit from the work it does varies with the type of work. Some tasks can be (and are) charged

to a user; others cannot. Similarly the level of professional skills required varies with the task, some requiring the resources of specialist research groups and others able to be handled by science consultants or trained technical officers.

Central government is likely to be the only institution with the responsibility to appreciate the need to fund strategic research into the inter-relationships of ecological and physical systems, and to maintain the growing databases of objective scientific information on which resource management decisions are based. This is because of the size of the investment required, the wide range of users of the information involved, and the difficulty of persuading users to invest funds to provide benefits to future generations. While resource users may be expected to pay for short-term surveys and routine scientific interpretation such as that involved in environmental impact assessment, no examples are known to date of resource users in the private sector funding strategic research.

The beneficiaries of such work are so varied and widespread that funding through taxes seems the most equitable way of sharing the costs. While the-acquisition and maintenance of research and information may also be funded in part by levies on resource users, ultimately central government is best placed to take the steps to ensure that the information is collected in an objective and consistent manner to scientifically defensible standards.

Another factor is the desirability of having basic resource information (excluding that of a commercially sensitive nature) readily available to all people as a 'public good'. The transfer of information is encouraged and this provides for greater social equity and greater opportunity for all resource users, including third parties, to advocate their interest, which ultimately results in better decision making. For this reason it is desirable that the charging for the provision of information from existing databases be kept to a minimum following the guidelines for charging for official information, i.e., there should be no charge for the information itself but merely for its provision.

The information collected by the developer of a resource may not always be objective, particularly in the area of environmental impact assessment, since certain results may indicate that the development should not proceed. An independent source of objective information is required to ensure that a satisfactory assessment of environmental impact is made. The research or survey needed should be performed by a neutral organisation with no commercial interest in the outcome of the decision. Similarly, the custodians of the database should be independent of any commercial interest in the use of the data. Regional organisations may be unable adequately to separate their development interests from their environmental protection obligations, or to provide data to nationally comparable standards where this is required for national resource management. This argues for a governed approach to resource information and, furthermore, a central government role.

Regional government does, however, have need of regionally based information sources and is best placed to collect certain types of basic resource data. One of the most effective ways of operating may be co-operative surveys and information handling between national science agencies and regional technical groups. Such systems already operate in national and regional hydrological survey. Another way is for regional government to contract national science agencies to do the work for them, using nationally developed methodologies and standards. Regional survey and technical capability supported by nationally developed methodologies for survey and information handling offer an effective means of providing for information needs at the scale appropriate to the regions, but this does not replace the need for nationally based activity.

This submission considers that the most effective way in which long-term national, regional and local information requirements can be met in an objective, comprehensive and consistent manner is by the maintenance of nationally organised science agencies. The cost of replicating in each regional government unit, many specialist skills and technical facilities, cannot be afforded by a country population as small as New Zealand's.

ACKNOWLEDGEMENTS

We are grateful to Dr N C Lambrechtsen, Dr P Simpson and Dr P J Moors for their comments on an earlier draft of this paper.

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