

# Physical Resources and Environment

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Natural resources pose some difficulties of definition to the physical scientist but to the social scientist concerned with economic development these difficulties assume formidable proportions. The Vernon Committee were called upon to enquire into 'the economic availability of known basic physical resources'; not surprisingly, it was found impracticable to apply any rigid test of economic availability. The Committee therefore adopted the broad approach of regarding resources as economically available if, on their assessment, the resources 'may be expected to play a part in the economic growth of Australia'.

This approach involves a multiplicity of judgments which collectively are less rigorously based than are the normal findings of economists. Although the classical economists were preoccupied with the role of physical resources in the process of growth, contemporary economists, also preoccupied with growth, have virtually ignored the role of resources. There may well be good reasons for this. But a consequence is that the concept of economic availability has received scant attention in the literature on growth, and no generally accepted method of evaluating the economic availability of resources exists. Few studies have even discussed the techniques of measurement and evaluation of resources with regard to determining their economic availability.

Admittedly resource endowment is itself a changing concept associated with the dynamics of economic growth. In the long run the resources required by the national economy alter in response not only to shifts in demand but also to changes in the organization and technology of production. Moreover, the composition of the resource inventory also alters as a result of exploitation, discovery, technology, and relative price trends.

Yet in the short run a catalogue of 'known basic physical resources' would comprise those natural materials required by the economy in its response to the national market and its position in international trade. In general, these resources can be defined within broad limits as to their economic availability under given conditions. However tentative the definitions might be, they would at least provide a reasonably valid basis from which to explore the broad relationships inherent in the resources-growth problem.

As it is, the approach of the Committee largely begs the question. If basic resources are held to include climate, water supply, soils, forests, minerals, and marine resources, then Appendix B to the Report contains much valuable data. But the data are couched essentially in physical terms, and for the most part they summarize knowledge available in greater detail elsewhere. Although in the first instance physical resources must be defined physically it is desirable that subsequently, if at all possible, an attempt be made to redefine them in terms of their economic availability. Since this has rarely been done and then only on a very restricted scale, the Committee's terms of reference furnished a unique challenge for an economic appraisal of Australia's resources.

Such an appraisal would have required an assessment of the comparative advantages among areas at present supplying, or capable of supplying under given conditions, material inputs for the national economy. The assessment might have been expressed in an index of access embracing transport and all the other costs arising from the exploitation of a particular resource. It would have been necessary to restrict the analysis to specific resources and specific markets, since no satisfactory general index of access to cover the aggregate of basic resources within an area has yet been devised. In any case, some resources, for instance climate, are not amenable to such measurement. Yet notwithstanding the complexity and size of the problem, an economic appraisal of basic physical resources would seem, at least to this reviewer, to be an essential starting-point for an understanding of Australia's growth potential.

Instead the Committee paid particular regard to the question whether, and to what extent, the availability of physical resources may impose limitations on the rate of economic growth. Here the Committee were on familiar ground, for in general western economists have taken the view that the role of physical resources in the process of economic development is worthy of but passing attention as a limiting factor. Certainly the constraints imposed by the form and location of physical resources become less pronounced as technological and institutional knowledge and control over the economy grow. There is for example increasing technical substitutability of factors. But the call made by resource development on capital and labour has to be judged in terms of its influence on the rate and pattern of growth relative to other alternatives. In this sense an assessment of economic availability involves very much more than the pin-pointing of actual or incipient bottlenecks.

Foremost among the economic shortcomings of Australia's physical resources, despite self-sufficiency in most minerals of economic importance, are the deficiencies in petroleum, phosphate, sulphur, nickel, and various other minerals. Nearly one-third of Chapter 3, and more than one-third of Appendix B, deal with this basic question of mineral resources and their deficiencies. In Australia the total expenditure on exploration for minerals, other than petroleum, compares unfavour-

ably with that in Canada, and the Committee stress the need to intensify the search for those minerals, including petroleum, in which Australia is markedly deficient. For balance of payments and strategic reasons the discovery of adequate supplies of these minerals, particularly petroleum and to a lesser extent phosphate, would have an importance that needs no underscoring.

Various proposals designed to stimulate mineral exploration are advanced. Australia lags far behind the United States and the Soviet Union in its programme of topographical mapping, while its expenditure on mapping compares unfavourably with that of Canada. The Committee therefore recommend that the programme of mapping, geological as well as topographical, be accelerated. They also endorse the view that liaison between the Bureau of Mineral Resources and private companies should be extended so as to ensure the widest use of the latest exploration techniques. Moreover, they suggest that, if it is deemed necessary to conserve particular mineral resources such as phosphate and this policy discourages the search for these minerals, consideration be given to instituting a system of compensatory rewards for the discovery of large deposits. Another incentive proposal is that because mineral exploration and development could be discouraged by the massive investment required, particularly in remote areas, governments might give more assistance in the provision of overhead capital. Such a policy, by reducing the amount of private investment to a level within the range of Australian entrepreneurs, might also in time reduce the extent of overseas control. With these proposals, at least in principle, few would quarrel.

Petroleum, as might be expected, comes in for special treatment. Since 1962 the search for oil in Australia has been stimulated and intensified by the discovery of commercial oil at Moonie in southern Queensland and by widespread discoveries of payable quantities of natural gas. So beneficial would the discovery of adequate supplies of crude oil be to Australia that in the Committee's opinion the Commonwealth should increase its direct financial assistance along existing lines. However, to ensure that Australia would derive an increased benefit from any discoveries made, they suggest that the assistance should be conditional on the Commonwealth having the right to purchase at some later date shares in companies on some fixed basis. They further consider that increased Commonwealth subsidy should be largely channelled into the more promising areas. Concern is also expressed at the size of some of the older tenements: in Western Australia, for instance, one is more than five times and another four times the area of Tasmania. That the Commonwealth, whatever its attitude to the right to purchase shares might be, is essentially in accord with the main proposals appears evident from the extensions to the subsidy scheme embodied in the 1964 legislation and from the substantially increased appropriation for subsidy payments in the current financial year.

The only other outstanding deficiency highlighted by the Com-

mittee is in the supply of softwoods. Balance of payments considerations would suggest the desirability of extending the area under softwood plantations and of developing tree farming in Australia. But the problem is primarily one of alternative land uses, and the Committee review it under primary industry rather than under physical resources. To cite the reason given for this: 'It is extremely difficult to consider Australia's forests as a resource without discussing problems affecting the establishment, development and management of all forests and the utilization of forest products' (B.57).

Another renewable resource virtually dismissed in Chapter 3 (except of course for the physical summary relegated to Appendix B) but discussed at greater length in Chapter 8 is fisheries. Yet both forestry and fisheries can be studied by reference to the economic availability of resources, which inevitably invokes questions of development and utilization, as distinct from current economic activity. Both topics, together with the rest of Chapter 3, might well have been integrated with profit in the discussion on the industrial pattern. But given the structure of the Report, the allocation of material between Chapters 3 and 8 shows no very clear distinction.

One obvious distinction, though even this finds endorsement in Chapter 8, is the wholly admirable plea made throughout Chapter 3 for more research into Australia's physical resources. The plea relates not only to mineral resources discussed above but also to forests, fisheries, water supply, and soils. The Committee criticize the lack of uniformity among the States in the compilation of forestry statistics, a basic deficiency that will be remedied by the recently established Australian Forestry Council. The value of extending our knowledge of forestry potential might also have been stressed, particularly as the techniques for evaluating forest resources have latterly been greatly improved. A cartographic summary of existing knowledge, portraying forests classified not crudely as 'exploitable' and 'potentially exploitable' but in more specific, preferably physico-economic terms, would have been a welcome addition to the appendices. Similar comments could be made concerning marine resources.

Water supply and soils are obviously physical resources of fundamental significance. Although the Committee believe that Australia's limited water resources are unlikely to prove a serious impediment to economic growth, at least in the next decade or so, they call for far more research and planning in the most effective use of water. This echoes the views of the Australian Water Resources Council, which was formed in 1962 as a recognition by the Commonwealth and State governments of the necessity to extend and co-ordinate research into water resources and such allied problems as evaporation and desalination.

The Committee see a corresponding need for co-ordinated and increased effort in soil surveys and research, even though they consider Australia's land resources more than adequate to support the increases in production required by economic growth. Perhaps

what may be needed here—and this is only the reviewer's rambling thought following on from the references to the Forestry Council and the Water Resources Council—is an Australian Land Resources Council to co-ordinate the work in this field of the C.S.I.R.O. and the State Departments of Agriculture. Certainly consideration should be given to the desirability of carrying out a co-ordinated comprehensive land-type classification of our settled areas. Such a classification could be undertaken more readily than detailed soils surveys (though these should be extended anyway), and yet would be more precisely geared to the criteria necessary for a broad assessment of economic potential. Given the Committee's approach, it is perhaps disappointing that Appendix B contains no cartographic summary of the present state of soil-survey coverage of Australia; nor does it review the excellent work of the C.S.I.R.O. in classifying land resources in northern Australia. Nevertheless, the Committee aptly conclude that whether all the research into basic physical resources can be undertaken, and in what order, are matters for determination in the light of practical possibilities as well as of the costs and benefits involved.

A highly commendable feature of the Report is the emphasis placed throughout on the need for initial cost-benefit studies to be made of all major resource-development projects. Cost-benefit analysis is of course no panacea for resolving the problems of resource development. It cannot be expected to establish with a high degree of accuracy the relationship between the economic costs and the economic benefits from a project. Nor can it necessarily resolve conflicts among potential users. Furthermore, considerations other than purely economic ones may affect the choice between alternative developments, as for example the choice discussed in some detail by the Committee between potential developments in northern Australia and alternative developments in the south-east. But in recent years the principles and procedures of cost-benefit analysis have been progressively improved. They now furnish a logical framework within which the difficult job of establishing development priorities can be made. Even when public investment decisions cannot rest solely on economic grounds, cost-benefit analysis remains a valuable prerequisite to decision-making.

Nevertheless, as the Committee rightly point out, relatively little use has so far been made of cost-benefit analysis in Australia. This has been notably the case at the State level, where the situation is further aggravated by the paucity of suitably qualified staff to undertake feasibility studies. It is indeed remarkable, certainly by comparison with the United States, how seemingly insignificant has been the part played by cost-benefit analysis in post-war decisions involving large public investment. Over the past decade a number of important studies has been prepared by the Commonwealth Bureau of Agricultural Economics—a review of the work done so far might have been of value—but there remains considerable scope for extending such analysis within the primary sector alone. Within the tertiary sector the scope is vast.

The Committee focus attention on several fields where cost-benefit analysis would be especially advantageous. A striking example is in the field of irrigation development, partly because of the limited water resources available but also because irrigation farmers in Australia have not borne the full economic cost of the water they have used. Rapid urbanization has also raised problems, particularly in Victoria, of increasing competition between irrigation and industrial users of water. It may be necessary in future, as the Report points out, for the price of both irrigation and urban water to be adjusted more closely to its cost. Moreover, it is argued that proposals to develop new land for agricultural and pastoral production should be evaluated not merely in terms of the costs incurred and the benefits accruing to the development but, in addition, by comparison with comparable investment in land already in production. It is of course in respect of dissimilar alternatives that the detailed technique used in cost-benefit analysis assumes critical importance. The Committee further conclude that in northern Australia the entire range of the costs and benefits of projects should be kept under continuing review.

To facilitate the investigation of proposals for major development projects, the Committee recommend the creation of an independent Special Projects Commission. This body staffed with specialists in cost-benefit analysis should evaluate projects at the request of the Commonwealth and State governments as well as on its own initiative. The recommendation undoubtedly has great merit, providing of course—and perhaps here is the rub—that State governments are prepared to avail themselves consistently of its services. But there is already, as the Committee indicate, marked co-operation between Commonwealth and State instrumentalities in the evaluation of major development schemes, and in so far as the Commonwealth contributes finance for such schemes their evaluation by the Commission would be assured.

But the work of the Special Projects Commission need not stop there. Presumably aside from its primary functions the Commission would be suitably equipped to probe such general but less immediate problems as urban water economics, problems which have never aroused much enthusiasm either among students of public policy or among economic theorists. There is in fact unlimited scope for fundamental research into the entire resource allocation process. If the Commission were to provide research leadership in this problem area it might even, as background to its main activity, investigate in a continuing programme the economic availability of known basic physical resources.

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