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# Economic Theory of Natural Resources, by O. C. Herfindahl and A. V. Kneese

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# BOOK REVIEWS

## Economic Theory of Natural Resources
by
O. C. HERFINDAHL and A. V. KNEESE
Columbus, Ohio
Chas. E. Merrill, 1974, Pp. x, 405.

This is the first general textbook devoted to natural resources theory since A. D. Scott's *Natural Resources: The Economics of Conservation* published in 1955 and reprinted, with bibliographical notes, in 1973, in the Carleton Library series. Production of this new text was unquestionably a difficult task: apart from the problem of bringing together elements of a field which has grown extraordinarily rapidly in the last twenty years, much of the rewriting and editing must have fallen to a single author after the unfortunate death of Professor Herfindahl in late 1972.

The book is divided into four sections dealing, respectively, with basic theory, private production decisions in a capital theory framework, benefit-cost analysis, and problems of externalities and residuals. The first section provides essential background techniques in two chapters: calculus methods are introduced and applied to consumer theory, the theory of the firm, welfare economics (including the willingness-to-pay approach), market failure, and linear models.

Section two (chapters three and four) begins with a capital theory review emphasizing the Hirschleifer and Ramsey models. Missing from this discussion is a control theory formulation of intertemporal decisions, say, at the level of Dorfman's (1969) article. This omission is unfortunate since control approaches to the fishery and to the problem of mineral exhaustion occupy a large part of chapter four (pp. 169-84) and the reader is unprepared for the mathematics involved. The production models of section two also suffer from problems of balance and inadequate reliance on well-known treatments. The balance problem is illustrated by the comparatively short shrift given to forestry production (4 pages) with a forest land-value maximization model formulated without reference to the now classic Faustmann approach. The open-access fishery discussion is conducted without reference to the well-known recent treatments of Turvey (1964) and Smith (1968, 1969). Overall, this section, in the reviewer's opinion, is the weakest part of the book.

In contrast to the second section, section three (chapters five, six, and seven) provides a very strong treatment of the problems of

project evaluation. Chapter five presents a good review of benefit-cost problems including present value versus internal rate of return methods and the incorporation of administrative budget constraints and risk allowances into project decisions. Chapter six describes the Arrow problem of political consensus together with practical problems of the estimation of benefits and costs in irrigation, flood control, water-based recreation, and navigation. The final chapter in section three brings in the choice problem with complex project alternatives, cost allocation for multiple purpose projects, and public utility pricing with and without congested facilities.

The final section of the volume (chapters eight through eleven) reviews the theory of externalities and residuals balance. Chapter eight introduces the theory of effluent charges and stresses the heavy informational problems related to these charges when damage functions are mathematically nonseparable with respect to the discharges of two or more polluters. This problem, taken in conjunction with the sharing of residuals damages over a multitude of affected parties (not all of whose costs can be readily estimated), leads to the authors' advocacy of the "basin-wide firm" as a water management unit in chapter nine. The "basin-wide firm" idea receives concrete reinforcement in chapter ten with a description of studies of the Delaware River estaury. The alternative costs of meeting dissolved oxygen constraints with regulations and charges are explored in a model in which the estuary is viewed as an interrelated system of reaches, each of which sustains a dissolved oxygen level that is dependent on the volume and industry-mix of discharges in all reaches of the river taken separately. Chapter eleven generalizes the linear methods of the estuary study to the determination of pollution flows in a macroeconomic system, following Leontief's (1970) input-output model of residuals production.

The deficiencies of section two may prevent the Herfindahl-Kneese volume from being widely used as a text, except possibly at the advanced level. It stands as an important reference work however, particularly in the areas of benefit-cost analysis and water management. At this stage in the development of the resources field, solid books of readings may be the best method of supplementing courses.

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