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Scarcity and Growth Reconsidered

V. Kerry Smith

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Volume 8

Scarcity and Growth Reconsidered

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Foreword

In recent years, a renewed interest has emerged in the availability of natural resources for continued material well-being and economic growth. Sharply rising energy costs, increased prices of natural resources generally, widening popular support for a clean environment and improved health, the current uncertain state of the economy, and a genuine concern for the future have all contributed to the public's recent questioning of whether or not it will be possible to provide and maintain a reasonably high material standard of living for all while ensuring that the overall quality of life remains unchanged.

Despite a history of research in this area and the current resurgence of this activity, a number of fundamental issues concerning natural resource scarcity remain both controversial and unresolved to this day. While the main concern involves the continued erosion of a finite natural resource base and whether or not technological improvements can keep pace with rapidly increasing demands for goods and services, it does not represent the whole story. A spectrum of other related problems confronts our society as well. An increasingly important set involves the detrimental side effects of production technology. These byproducts range from despoiled landscapes and pollution to toxic materials in the environment. Although some effects are limited to local degradation, others are more global in character and may even threaten natural systems which are essential for the support of life. The latter, more severe, impacts appear to be associated with some of the new technologies. Material well-being and the quality of the natural environment are integrally related, and policies established to address one will ultimately have an impact on the other. Clearly, the provision of goods and services and the uses and quality of the natural environment must be considered as a whole, and tradeoffs will be necessary.

The conference upon which this volume is based addressed some of these issues by bringing together in a single forum a wide range of professional opinion covering three principal areas of current research on resource availability.

In the first area, dealing with economic modeling of the role of natural resources, Joseph Stiglitz presents an overview of the neoclassical perspective on the contribution of natural resources and stresses that for the most part natural resources are not sufficiently different from other inputs to production activities to require amendments in this type of analysis. Herman Daly and Nicholas Georgescu-Roegen disagree completely with Stiglitz. They maintain that physical laws imply that natural resources are essential for the maintenance of human well-being and therefore conventional economic models must be substantially amended to reflect this.

In the section on geological appraisals of the limits of resource availability, the second area of research, H. E. Goeller evaluates resource availability from the perspective of several hundred years, ignoring any of the impediments—economic, legal, and political—that might prevent the realization of these ultimate prospects. By contrast, Donald Brobst points out that it is essential to both recognize and take account of these impediments in any assessment of the physical quantities of resources available for future use by mankind.

In the third section, on economic measures of resource scarcity, Gardner Brown and Barry Field question past measures of resource scarcity and offer some guidance as to how one might approach the problem under idealized conditions. While the data necessary for carrying out their suggestions currently do not exist, the authors do suggest ways in which construction of these more desirable measures might be undertaken. On the other hand, Harold Barnett maintains that the same tools and measures that were used in his and Chandler Morse's now classical study of resource scarcity published by Resources for the Future almost two decades ago (*Scarcity and Growth: The Economics of Natural Resource Availability*, 1963), are still capable of being used today. Moreover, Barnett uses a wide array of more recent international data with these measures to develop the original thesis of *Scarcity and Growth* that natural resources, with the possible exception of timber, do not appear to be becoming increasingly scarce. Fisher's paper reviews both of these arguments and provides a link between cost, price, and rent-based measures of resource scarcity.

If the continuing debate over natural resource adequacy is to be finally resolved, the underpinnings of each position's arguments must be understood. The literature has been dominated for too long by the rhetoric from each school without substantial progress toward an appreciation of the reasoning responsible for their conclusions. The objective of this volume is to identify the sources of the differences in each group's arguments and, in so doing to direct attention to avenues for future research.

Indeed, the conference has already led to a program of research at RFF supported by the National Science Foundation and the Electric Power Research Institute. It is our sincere hope that this first product of this program at RFF will stimulate research that will both enhance our understanding of the issues surrounding judgments on natural resource adequacy and contribute to the public policy initiatives in the area.

March 1979

Walter O. Spofford, Jr.
Director, Quality of the
Environment Division

Preface

The objective of this volume is to report on an effort to reconsider the long-run importance and availability of natural resources for economic growth and material well-being. These concerns were among the contributing factors which motivated the founding of Resources for the Future. It is not surprising, then, that they formed the basis for some of RFF's first research efforts. One of the most influential products of this research was the work supervised by Harold Barnett. Indeed, the volume to which the title of this book refers summarizes this research. For nearly two decades, Harold Barnett and Chandler Morse's *Scarcity and Growth: The Economics of Natural Resource Availability* has had a significant impact on the attitudes of economists and policy makers toward natural resource availability.

A renewed questioning of the adequacy of our natural resources as conventionally defined; increased popular interest in preserving our environmental resources and improving their quality; and a more cautious, if not somewhat skeptical, view of technological change and economic growth made this seem an appropriate time to take stock of current views on natural resource availability. The papers in this volume were presented at a forum sponsored by the Ford Foundation in the fall of 1976. Larry Ruff was instrumental in initiating this effort. Prompted by the general concern over the need for a reevaluation of the Barnett-Morse work and a series of meetings with Harold Barnett, Herman Daly, Bruce Hannon, and Toby Page, Larry arranged for the funding which permitted organizing a research forum on these issues.

My own interest in this area was initiated eight years ago when John Krutilla first discerned that the treatment of the role of natural resources in economic activities made it necessary to reconsider the Barnett-Morse findings. I have been generously assisted in this task by support from Resources for the Future, before and after joining the staff and by a fellowship from the John Simon Guggenheim Memorial Foundation for the 1976-77 academic year. Since most of my own thinking on these problems has been influenced by John Krutilla, I was exceptionally pleased when he agreed to join with me in preparing the overview and concluding essays for this volume.

The forum was organized around three broad aspects of *Scarcity and Growth*: (1) the role of natural resources in economic modeling; (2) the nature of the physical constraints on the availability of natural resources; and (3) the ability of empirical methods to gauge the potential for stringencies in our natural resource endowments. The topics and research papers were selected to highlight the range of intellectual perspectives on natural resources in each case. This volume includes these papers, along with the remarks of the chairpersons of each session and introductory and concluding essays by John Krutilla and myself. While Tony Fisher's paper arose from his remarks on the third topic, it extends beyond comments on the papers by Harold Barnett, Gardner Brown, and Barry Field to a complete treatment of many of the issues central to evaluating scarcity measures which might be applied to appraising the availability of natural resources.

We were fortunate to have a distinguished group of natural scientists and economists participate in the forum. Their remarks and the overall discussion significantly influenced John's and my treatment of the problems associated with summarizing their views and more generally, in defining anew the questions which must be considered before a judgment on natural resource availability can be made.

The individual papers in this volume were reviewed by a number of persons, who are acknowledged by the authors. Special mention should be given to John R. Moroney of Tulane University and William D. Schulze of the University of Southern California for their most thoughtful and constructive reviews of the entire volume.

My editorial tasks were assisted immeasurably by the tireless efforts and thoughtful insights of Ruth Haas of the RFF editorial staff. I am sure all the authors share my appreciation for her significant input to the volume. Mary Kokoski served as research assistant and assisted me in numerous details associated with the final research product.

The introductory and concluding essays and related materials went through numerous revisions, all of which were patiently and cheerfully typed by John's and my secretaries over the period. Thus, I would like to express our collective appreciation to Mae Barnes, Cassandra Madison, Virginia Reid, and Diana Tasciotti.

Finally, I would like to thank my wife, Pauline, and son, Timothy, for their continuing support, which is so important to all that I do.

All responsibility for any remaining shortcomings with this volume rests with me.

March 1979

V. KERRY SMITH
Resources for the Future

Scarcity and Growth Reconsidered

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The Economics of Natural Resource Scarcity: An Interpretative Introduction

V. Kerry Smith and John V. Krutilla

I

Introduction

It is doubtful that any country has been more richly endowed with natural resources than the United States. The diversity and abundance of its resources contributed to America's rapid industrial development and emergence as a paramount world power. New supplies were forthcoming at rates equal to demands and at almost continuously falling supply prices, so that not until the mid-1900s was any general concern expressed regarding the adequacy of supplies of raw materials to sustain continuous economic growth.¹

The heavy demands of World War II led, in the early 1950s, to a review of the nation's agricultural potential and mineral resource stocks by two presidential commissions. The President's Materials Policy Commission (Paley Commission, 1952) found that over the next twenty-five years it was unlikely that there would be any general exhaustion of resources. However, there was concern about the apparent change in the trend of prices and particularly about some critical commodities. Indeed, it was felt that a continuous reexamination of materials policy was needed

V. Kerry Smith and John V. Krutilla are Senior Fellows in the quality of the environment division, Resources for the Future. A number of individuals have generously commented on earlier drafts of this paper. We would especially like to thank K. J. Arrow, H. J. Barnett, W. J. Baumol, E. N. Castle, R. C. d'Arge, R. Day, B. C. Field, A. C. Fisher, F. M. Fisher, G. Heal, A. V. Kneese, C. Morse, P. Portney, V. Ruttan, T. Sandler, T. W. Schultz, W. D. Schulze, M. Sharefkin, R. M. Solow, J. Sonstelie, and W. Spofford. Thanks are also due the conference participants since many of their remarks have influenced our thinking on these issues. Smith's research was partially supported by the John Simon Guggenheim Memorial Foundation.

¹ This concern is to be distinguished from that of the early conservation era's reaction to the wanton disregard for land manifested in the extraction activities of the times.