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# Environmental Economics

**A Theoretical Inquiry**

**Karl-Göran Mäler**

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Washington, DC • London

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**ENVIRONMENTAL ECONOMICS:  
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## ACKNOWLEDGMENTS

There are many reasons this book has been written. One is my own interest in the environment and the problems connected with environmental quality. Another is my interest in abstract theory and its application to practical problems. (I expect that some readers will find this book too abstract to be practically useful, but I believe that a theoretical approach is necessary in order to develop a conceptual framework, so that we know what we are trying to approximate in our empirical applications.)

In spite of my own interest, however, I do not believe that I would have undertaken this work if I had not been continuously encouraged by other persons. Professor Erik Dahmén and Professor Assar Lindbeck at the Stockholm School of Economics and the University of Stockholm convinced me that environmental economics is a field worth exploring and initiated a research project that ultimately resulted in this book.

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Although the persons mentioned here in many ways have contributed to improvements in the manuscript, I of course take the whole responsibility for the content of the book and the way it is presented.

Karl-Göran Mäler

Stockholm  
September 1973

**ENVIRONMENTAL ECONOMICS:  
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# 1 INTRODUCTION

## 1. GENERAL BACKGROUND

In the 1960s the general public in most developed countries began to demonstrate increased concern about the quality of the natural environment. They noticed how lakes, rivers, and even seas had become so polluted that they no longer could be used for recreation. They could smell the odors of the gaseous emissions from automobiles and factories. At the same time, scientists were collecting overwhelming evidence that there were great health hazards connected with continued emissions of large volumes of gaseous, waterborne, and solid residuals [1].\* They pointed out the risks for extinction of certain living species and warned of global effects on the climate [2].

Economists also became interested in these problems, and could easily find explanations for these developments. In their view, the natural environment is a public good, a common property. For such a good, there exists no market in which buyers and sellers reveal their preferences, because if one individual is able to buy, for example, better air quality, all other persons in his neighborhood will also benefit from his transaction. Thus, an individual has little incentive to do anything to improve the quality of the environment. (There is also small possibility of effecting such a change because the individual does not have the financial or legal

\* Numbers in brackets in the text refer to notes listed at the end of the chapter.

resources of the firms or municipalities that cause the deterioration of the environment.) But as every individual is motivated by self-interest, no agreements would be reached between those who cause the deterioration and those who suffer from it. The basic cause of environmental degradation is thus the failure of the markets to deal adequately with public goods. In earlier times, when economic activities in the developed countries were less intense than they are today, this market failure did not cause any great problem (although there are many reports in the literature on pollution problems that existed hundreds or thousands of years ago [3]) because the total amount of wastes discharged into the environment was negligible, and direct interference with the environment was on a much smaller scale.

Economic growth means, among other things, that more and more materials are put into circulation, and, as we will show in the next section, this implies an increasing amount of waste that is discharged into the environment until the assimilative capacity of the environment is reached and surpassed.

According to economists, the remedy for this market failure can be found in more active governments, which by a clever environmental policy could give the agents in the economy the proper incentives so that they would regard the environment as a scarce resource. The incentives recommended by economists have mainly been cost-related ones, such as charges on the discharge of wastes into the environment, an idea which goes back to Pigou [4].

In order to determine the proper size of these charges, and to be able to make cost-benefit analyses of the use of the environment, economists have sought methods that can be used to find the consumers' valuation of the quality of the environment. Several methods have been proposed and tried, but it can be stated with some confidence that none has so far proved very successful.

This has been a very brief review of economists' views on environmental problems. The intention of this book is to develop these views somewhat further and to put some of these ideas on a more rigorous basis than currently exists. The discussion, however, will be limited to problems connected with the discharge of residuals. Environmental problems arising from direct intervention in the environment in the form of highway construction, strip mining, hydropower dam construction, will be almost completely neglected. Moreover, except in chapter 3, there is no discussion of the problem of exhaustion of scarce, nonrenewable resources. The rest of this chapter contains a nontechnical, brief, and partial summary of the results obtained in later chapters.



**2. A SIMPLE MATERIALS-BALANCE, GENERAL-EQUILIBRIUM FRAMEWORK**

In order to obtain a better understanding of how a decentralized market-type economy works and should work, a simple model will be constructed which takes the circular flow of materials into account. The idea is to try to follow the flow of raw materials from the exploitation of deposits in the environment via production processes and consumption processes, back to the environment in the form of wastes. This model is set out in figure 1 [5].

In this diagram five boxes are shown which correspond to production, capital accumulation, consumption, environmental management, and the environment. Before we start discussing details, a few words must be

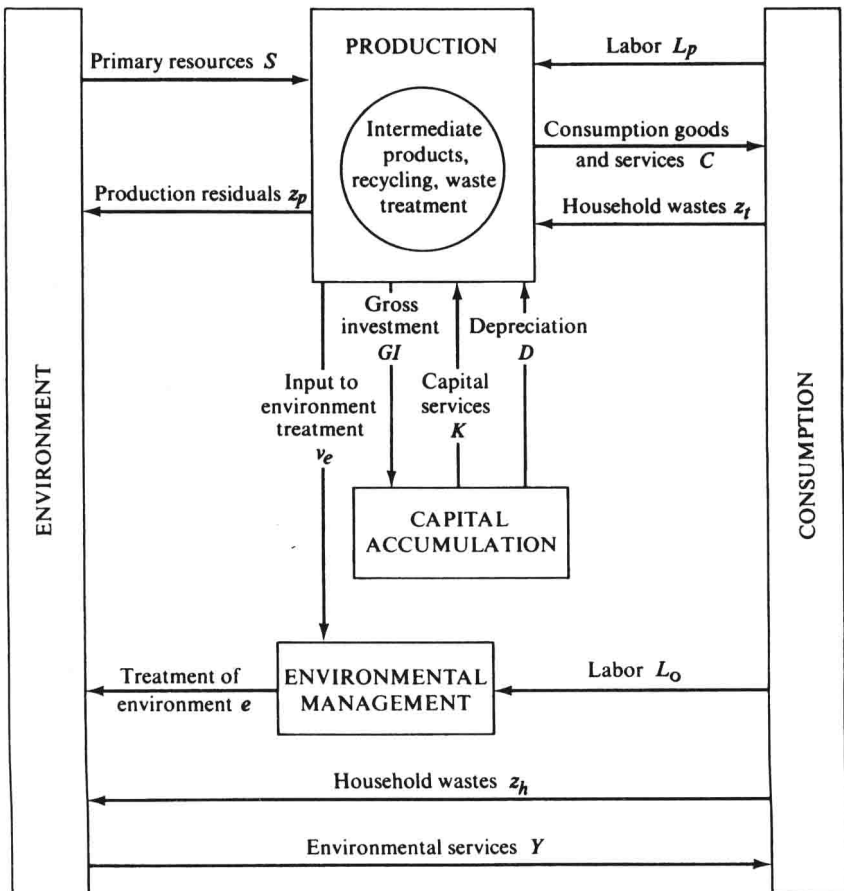


Figure 1