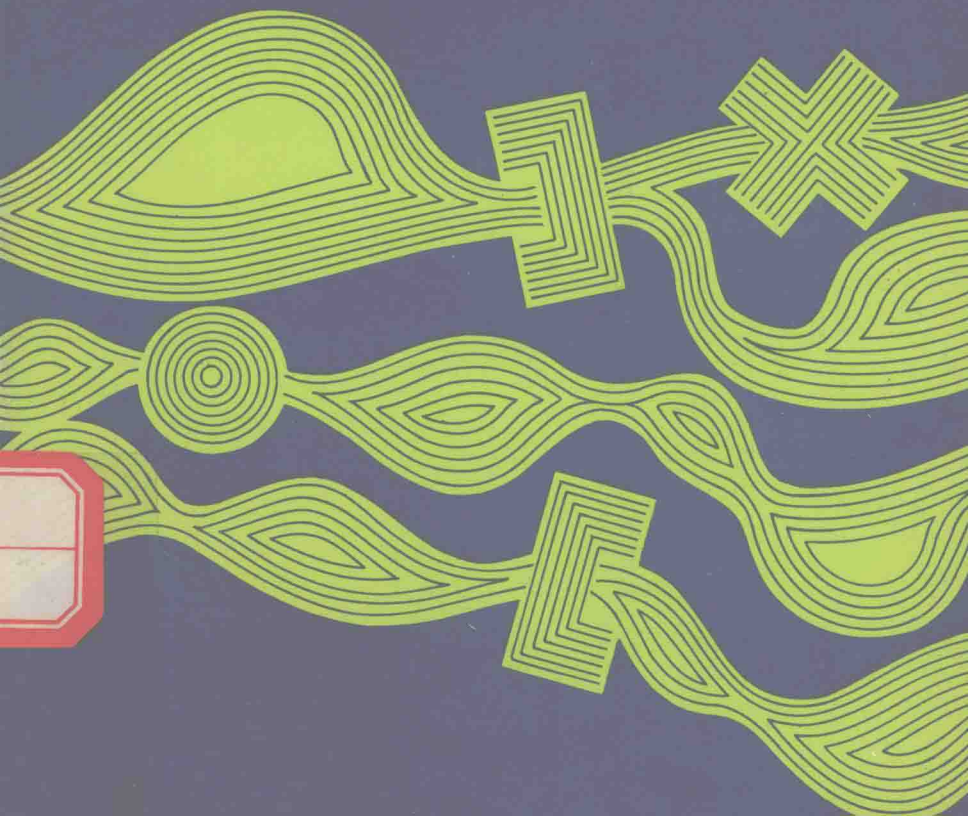
Environmental Issues

Population, Pollution, and Economics

Lawrence G. Hines



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LAWRENCE G. HINES

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Preface

This book has three main objectives: to appraise environmental pressures in the United States, to determine the role of the government and of the market economy in environmental deterioration and its abatement, and to examine the range of corrective actions that are available to check environmental abuse.

Given these objectives, it is not possible to adhere strictly to the jurisdiction of a single discipline. No matter how much the specialists may wince or the angels fear, excursions into the territories of both the social sciences and the natural sciences are necessary to present the complex nature of environmental issues. This does not mean that this work is "interdisciplinary," however—that most dubious of compliments—but that in its pragmatic approach, information is drawn from a variety of sources.

The book is problem-oriented. In the analysis of particular environmental issues, such as air and water pollution, the emphasis is upon the technical arrangements and policy options that are available to correct these conditions. Ways of coping with specific environmental abuses are examined against the background of existing programs and regulatory controls. More generalized approaches to environmental deterioration that have but slight chance of adoption, such as the freezing of economic growth or increased reliance upon the pricing system, are considered largely in terms of the validity of the proposals rather than as likely alternatives or supplements to existing programs.

In the main, this study focuses on the nature of environmental

deterioration in the United States and the question of how it can best be checked. Understanding how we got into this situation, however, and what needs to be done to get out, requires acquaintance with the way decisions affecting the use of natural resources are made in the private and public sectors of the economy. This involves determining not only where the market economy has fallen short in protecting the environment, but also how this deficiency has been carried over to the public sector through the use of market-oriented benefit-cost criteria. A section on decision-making in the private and public sectors of the economy covers these areas. The way in which benefit-cost analysis is employed by federal agencies, such as the Army Corps of Engineers, the Federal Power Commission, and the Bureau of Reclamation, is illustrated by a chapter-length case study of a series of proposed hydroelectric dams in the Hells Canyon reach of the Snake River. This complex Middle Snake case raises a multitude of issues: legal, administrative, and economic questions; the determination of whether the project should be financed by private or public investment; and—finally—the matter of whether it should be undertaken at all.

In an attempt to compensate for my considerable inadequacies in the many areas covered in a book of this kind, I have drawn heavily upon the talents of a variety of specialists. At Dartmouth, I have benefited greatly from the advice and assistance of Edward S. Brown, Thayer School of Engineering; Meredith O. Clement and Martin L. Lindahl, Department of Economics; William A. Reiners, Department of Biological Sciences; and Franklin Smallwood, Department of Government. Robert B. Dishman, Department of Political Science, University of New Hampshire, and Lawrence Goss, Department of Geography, New York State University College at Oswego, have reviewed with a critical eye material in their areas of specialty; and David V. Ragone, College of Engineering, University of Michigan, has given much time and effort to improving my understanding of air pollution. James J. Flannery of the Department of the Interior, Washington, D.C., has read critically much of the book in draft form and has provided information, wisdom, wry humor,

and an endless stream of good conversation. Although he is mentioned last, my indebtedness to him is greatest.

The National Science Foundation, through a curriculum-development grant to Dartmouth's Environmental Studies Program, provided support in the preparation of the Middle Snake case study and the air-pollution material. My students at Dartmouth in Environmental Studies 3 and Economics 12 have served as generally willing and helpful captive audiences in testing earlier drafts of this book. May they all graduate *summa cum laude* for valorous combat with the disjointed sentence.

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Chapter One

How The Environment Became a Problem

Mankind has a long past and an uncertain future.—Abba Eban[1]

Speaking of a turbulent era almost exactly two centuries ago, Charles Dickens said in the opening of *A Tale of Two Cities*, "It was the best of times, it was the worst of times. . . ."

So it is today.

Economic growth is mounting in a large part of the world, but pollution of the environment is more than keeping pace; employment is high and leisure is increasing, but great numbers of people clog our cities and overrun the few remaining wild areas; science and technology have brought man within reach of the stars, but the accomplishments of science, in unexpected misdirection, have also produced the horror of the near extinction of species through poisoning by pesticides and chemical wastes; an abundance and variety of output hitherto unknown has come from industry, but it has been distributed among the world's population with a cruel unevenness, causing some have-not nations to cry out

[1] Israeli delegate to the United Nations Conference on the Human Environment, Stockholm, June 1972.

against efforts to reach international accords for environmental protection as the pastime of the wealthy nations.

The Heritage of Land Abuse

Abuse of the environment is not new. Earlier cultures have mined the soil and deforested the land with little thought for the future. Some find in the opening of the American West to farming, mining, and logging, an era of unparalleled disregard for the environment, but this country has no monopoly on abuse of the resource base. China, though it decries the need for population control and the curtailment of resource exploitation, has a land scarred from the mining of the soil and the deforestation of the countryside. The Yellow River, which flows through an area of great population, rides high on silt from the surrounding lands and periodically floods the region through which it travels. Through the ages, overcutting of forests and exploitative farming practices have reduced China's cultivable land so severely that today the despoiled areas, together with those climatically and physically unsuited to agriculture, constitute 80 percent of its total land—all now useless for farming.

The Mediterranean region, with a civilization younger by far than China's but still respectably mature by Western standards, has suffered the twin scourges of deforestation and overgrazing. Greece retains little more than 5 percent of its land area in productive forest, although originally this constituted 65 percent of the nation's land. Removal of the forest has not simply meant the extension of cultivation; more often, heavy grazing has been followed by land-destroying erosion. On the other side of the Mediterranean, North Africa long ago suffered accelerated deforestation and destructive farming-grazing practices that converted the fertile continental rim into a desert that now supports only nomadic herdsmen. The interior of Africa has fared better, but it has not escaped the marks of man—marks that are likely to be deepened in the years ahead. Tropical soils are fragile; when the forest cover is removed, even without cultivation, destruction may be quite rapid. And when Western cultivation practices are

introduced to grow successive cash crops, such as tobacco, cotton, or coffee, soil depletion and erosion may reach heroic proportions.

Europe used the environment better than many other areas of the world, at least up to the Middle Ages. European agronomy evolved gradually, and cultivation techniques were well adapted to the soil and climate. Although there is ample evidence of large-scale deforestation—England was heavily forested until the Norman Conquest, for example—generally land abuse in the early period was limited, as a result of sparse population and primitive methods of cultivation. Later, abuse of the land accompanied the changes in agricultural technology. The spread of the metal plow throughout Europe and other areas of the world caused a break with past farming practices and sometimes left havoc in its wake. Reaching deep to turn the heavier soils, the iron-moldboard plow was introduced in America and in other parts of the world in the late 1830's; it raised crop output substantially, but often at the cost of accelerated depletion of the soil.

If by world standards European agriculture has been protective of the land, that of the Western Hemisphere—especially South and Central America—appears largely indifferent to the destruction of the soil in its early history. The vast areas of virgin land in the Americas, fertile but unprotected by land-use traditions such as those of Europe, provided a necessary precondition for highly exploitative agriculture. Whether in fact the Maya Empire, an early Central American civilization that disappeared by the tenth century, suffered the backlash of exploitative slash-and-burn agriculture is an intriguing question that probably will never be answered with certainty. But clearing land by burning and planting in the ashes was a common practice in the Americas when virgin land was brought under cultivation. Unfortunately, the rich yields of the early plantings quickly gave way to lowered output once leaching and erosion of the tropical soil occurred in the absence of protective vegetation.

In the early extension of farming westward, the slash-and-burn method of clearing the land was also used in North America, but fortunately the soils were generally less fragile. However, the combination of a limited population and an abun-

dance of land encouraged depletion of the soil. Land was virtually a free good to be had by preemption—if not close at hand, then on the way west. The austerity of frontier life and the seemingly unlimited expanse of land and profusion of wildlife made depletion of resources by the early settlers inevitable. Land, timber, minerals, and wildlife were abundant to the point of encumbrance, and the emergence of a "land ethic" not only had to await a later age, but it had to come from those who did not struggle in the shadow of the forest or with a backdrop of grasslands reaching to the horizon.

The buffalo, the passenger pigeon, the heath hen, and the plains antelope were early victims of the frontier men's indifference—either totally exterminated or so severely reduced in numbers that they survive now only as protected remnants. The list of endangered species continues to grow. Today, encroachment upon habitats and the indiscriminate use of pesticides have brought new candidates to the point of extinction, but the early extermination of species was more direct. It was brought about by hunting—unthinking at times, callous at others, and frequently undertaken in disbelief that the largess would ever run low.

The Passing of the Frontier Philosophy

The frontier reached the Pacific well in advance of a change in the American attitude toward exploitation of natural resources. Indeed, holdovers of the early attitude still show up in some commercial developments. However, by the turn of the twentieth century there was growing evidence of a break with the past. The establishment of Yellowstone National Park in 1872, although possibly reflecting a greater interest in the bizarre than in the preservation of nature, represented an innovative approach that later spread to other segments of wild America. In the early 1900's, President Theodore Roosevelt and his chief forester, Gifford Pinchot, worked effectively for the adoption of the sustained-yield approach in forest management and for recognition of the danger of natural-resource depletion, although the Roose-

velt-Pinchot conception of conservation was narrowly commercial by today's standards.

It was the early 1930's, however, the years of drought and dust storms, that shocked the nation into taking stock of its depleting resource base. With faith in the market system already suffering severely from the collapse of the economy, evidence of its further failure to protect natural resources led to the establishment of the Soil Conservation Service, the Civilian Conservation Corps, and other federal agencies to cope with resource damage. This was a period in which natural-resource policy was extensively examined, but the issues raised were largely confined to questions of depletion and scarcity.

In the meantime, the shock of the development of a dust bowl in the Midwest and the south-central United States and of severe erosion of the land in other parts of the country lessened as the drought lifted and the shifting soil was brought under control. Actually, the ravaging of a large area of the Midwest had not so much resulted from a failure of the market economy, as from its excessively short-run, private orientation. In the high-price era of the 1920's, the farmers in the Plains states who had done so well in cattle raising during World War I turned to the dry farming of wheat. The return was satisfactory, if not impressive; the yield per acre was less than farther east, but so was the investment per acre. The stress upon the land from dry farming was entirely different from grazing, however, in the western areas of short buffalo grass. With a cover of undisturbed grass, the prairies could wait out the drought phase of the irregular rainfall cycle. When it rained, the prairie bloomed, and without rain, the thick-matted buffalo grass held the soil together until the cycle turned again to moisture. But wheat farming broke the hold of the buffalo grass on the soil, and the collapse of wheat prices in the late 1920's left the submarginal lands uncultivated, vulnerable to the winds that swept across the prairie.

The dust that darkened the skies of the nation's capital in the early days of the Great Depression was the result of 150 years of soil abuse in the Midwest. The productivity of more than 280 million acres of farmland had been seriously impaired and much

of the topsoil of another 775 million acres had been lost by the time the Franklin Roosevelt administration took stock in the early 1930's. Destructive sheet erosion, which leaches away the soil's minerals, and gully erosion, which carries away the soil itself, had greatly reduced agricultural productivity, and reforestation had gone forward at too leisurely a pace. But these were abuses that could be corrected, and gradually the miscues of the market system were brought under control. During World War II, however, the preoccupation with maximum industrial and agricultural output for national survival pushed aside questions of resource abuse, and if the air over Pittsburgh and Gary was polluted from the steel mills' round-the-clock operation, so much the worse for the enemy.

After the war, fear of a return to the mass unemployment of the Great Depression period from economic dislocation in converting to peace reduced the concern with natural-resource policy to occasional congressional hearings and department memoranda. And although World War II had drawn voraciously upon raw materials, the resource base appeared to survive in remarkably good shape. Innovations such as high-nitrogen fertilizers, long-lived pesticides, and disposable containers were viewed benignly as improvements in the lot of mankind; their harmful environmental side effects were to show only over time, with increased use. As late as 1952, an exhaustive study by President Truman's Materials Policy Commission examined natural-resource policy mainly in terms of the adequacy of domestic resources. The Commission found the United States reasonably well off.

The Emergence of Broad Environmental Deterioration

Side effects of industrial output and overall environmental deterioration were still largely unnoticed in the 1950's, but changes were at work that would surface later. Population growth in the postwar period had turned sharply upward, and much of this increase was concentrated in the already congested

metropolitan areas. Technology had poured forth a welter of new materials and processes, and with increased output, affluence and leisure had grown. By the late 1960's, what had previously been random cases of localized environmental damage, such as the air pollution from smelters in Donora, Pennsylvania, that caused twenty deaths in October, 1948, and the heavy industrial use of some segments of the Ohio River, became a matter of more widespread complaint.

Seemingly overnight the air had become befouled and the rivers contaminated. Actually, of course, environmental deterioration had not taken place so rapidly, nor was it so universal as it sometimes appeared, but once the recuperative power of our rivers and streams had been exceeded and the air above our cities overburdened, the change in air and water quality from acceptable to intolerable was rapid. The pollution buildup in a stream can go largely unnoticed until its capacity to degrade wastes is overrun; at this point the stream's debasement is likely to be quite apparent to all. The case of air pollution is similar. By dilution, large amounts of airborne waste can be dissipated under favorable atmospheric conditions, but a continued increase in emissions, or an atmospheric change such as a temperature inversion, may trap the pollutants, producing near-lethal conditions overnight. Moreover, the threshold point at which pollution of air and water endangers man is not the same for plants and other animal species; some are less resistant to environmental deterioration and others more. In short, man is an unsatisfactory indicator of environmental stress.

The Habitat Issue

In earlier times, environmental blight, such as erosion of the land by wind and water, could generally be traced to a specific set of causes—the clear-cutting of timber, the overgrazing of livestock, or inappropriate farming practices. By contrast, the environmental abuses that seemed to emerge so suddenly in the early 1970's were largely the product of broader common causes —advances in technology, growth in population, and increased

output—that represented a new and potentially greater threat to mankind. At stake was the basic question of whether the earth as a habitat for plants and animals—including man—could be effectively insulated against the destructive by-products of a rapidly expanding industrial system and a growing population. The traditional conservation problem—how to minimize natural-resource depletion and provide for the future—still occupied men's minds, but was now subordinated to the broader habitat consideration.

The Controversy Over Causes

In the early 1970's, there was almost universal agreement on the need for environmental protection. But there was less than general accord on what the basic causes of environmental abuse were—too many people, rising industrial output, new products and processes, or industrial and metropolitan concentration. Some found our habitat threatened primarily by rapid population growth and emphasized the need to bring the birthrate under control. Others considered economic growth and high living standards to be the basic cause of environmental damage and urged a no-growth "stationary state." Still others pointed out the sharp increase in new products and production techniques that had taken place in the late 1960's and recommended that technological innovation be somehow channeled away from environmentally harmful avenues.

Because environmental damage can be traced to a number of contributing causes, sharp disagreement has developed among those examining this problem. Two leaders of the environmental movement, Barry Commoner and Paul Ehrlich, have emphasized different factors—the former, technology, and the latter, population growth—in explaining the deterioration in our environment.[2] In itself, the difference of opinion between these two

[2] See the review of Barry Commoner's *The Closing Circle* (New York: Alfred A. Knopf, 1971) by Paul R. Ehrlich and John P. Holdren in *Environment*, XIV (April 1972), p. 24; and the rejoinder by Barry Commoner, *ibid.*, p. 25.