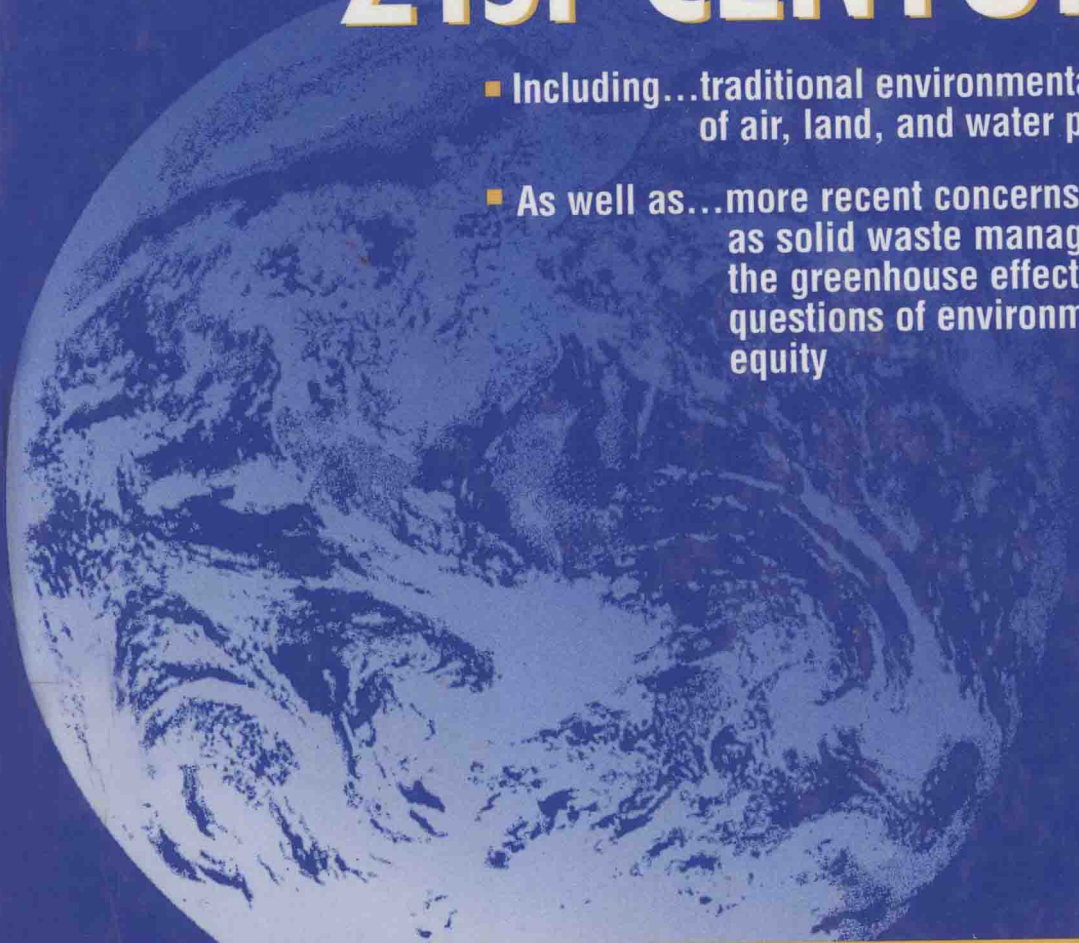
MAJOR ENVIRONMENTAL ISSUES FACING THE 21st CENTURY

- Including...traditional environmental issues of air, land, and water pollution
- As well as...more recent concerns such as solid waste management, the greenhouse effect, and questions of environmental equity



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Major Environmental Issues Facing the 21st Century

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Prentice Hall PTR
Upper Saddle River, NJ 07458

Library of Congress Cataloging-in-Publication Data

Theodore, Louis.
Major environmental issues facing the 21st century / Louis Theodore.
p. cm.
Includes index.
ISBN 0–13–183526–2
1. Environmental responsibility. 2. Environmental protection.
3. Environmental sciences. I. Title.
GE195.7.T48 1996
363.7—dc20 95–38019
CIP

Cover design director: Jerry Votta
Acquisitions editor: Bernard Goodwin
Cover designer: Georgeen A. Theodore
Manufacturing buyer: Alexis R. Heydt
Compositor/Production services: Pine Tree Composition, Inc.

Prentice-Hall, Inc.
A Simon & Schuster Company
Upper Saddle River, New Jersey 07458

For more information contact:
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One Lake Street
Upper Saddle River, New Jersey 07458
Phone: 800–382–3419
Fax: 201–236–7141
email: corpsales@cprenhall.com

Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

ISBN 0-13-183526-2

Prentice-Hall International (UK) Limited, *London*
Prentice-Hall of Australia Pty. Limited, *Sydney*
Prentice-Hall Canada, Inc., *Toronto*
Prentice-Hall Hispanoamericana, S.A., *Mexico*
Prentice-Hall of India Private Limited, *New Delhi*
Prentice-Hall of Japan, Inc., *Tokyo*
Simon & Schuster Asia Pte. Ltd., *Singapore*
Editora Prentice Hall do Brasil, Ltda., *Rio de Janeiro*

Preface

In the past few decades there has been an increased awareness of a wide range of environmental issues covering all sources: air, land, and water. More and more people are becoming aware of these environmental concerns, and it is important that professional people, many of whom do not possess an understanding of environmental problems, have the proper information available when involved with environmental issues. All professionals should have a basic understanding of the technical and scientific terms related to these issues as well as the regulations involved. In addition to serving the needs of the professional, this book examines how the consumer, or what has come to be defined as the average citizen, can increase his or her awareness of and help solve the environmental problems facing society.

This book is primarily intended for people who do not have a strong technical background. It is presented in simple, understandable terms for lawyers, news media individuals, business personnel, and the consumer (in particular) who need the basic fundamentals of the many environmental issues that exist and will exist in the future. The authors' objective is to provide both background material on numerous environmental issues and information on what each individual can do to help alleviate some of these problems.

This book is divided into ten Parts. Part I provides an overview that includes information on the environmental movement, regulations, and types of pollutants. Part II deals with issues related to air pollution. This section includes material on how air pollution can be controlled and on indoor air quality (which is an issue in many office buildings today). Part III discusses the problems of pollution in water and its control. The focus of Part IV is solid waste management. This section examines the different types of solid waste and how each is handled. Hazardous, medical, and nuclear waste management are also discussed. This part of the book concludes with the Superfund program and the result of its effort to clean up waste sites.

The book then begins to focus on what can be done by the consumer to help solve environ-

mental problems, and introduces the subject of pollution prevention. The three pollution prevention topic areas reviewed include: health, safety, and accident prevention; energy conservation; and waste reduction. Health, safety, and accident prevention is the focus of Part V; energy conservation is the focus for part VI; and pollution prevention the focus of Part VII. Each of these sections of the book examines the issues not only in relationship to industry, but also at the domestic and office level. By presenting it in this manner, the reader is able to recognize his or her part in contributing to the solutions. Since the concern with many of the environmental issues arises because of the risks involved, Part VIII looks at how risks are perceived and communicated, and how individuals can be educated about these risks. Part IX provides information on other areas of interest in the environmental arena. These include many "popular" topics like greenhouse effect, acid rain, and electromagnetic fields. Finally, Part X examines ethical issues as they relate to the environment.

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Contents

Part I

Overview

Part I of this book is an overview of the fifty major environmental issues facing the 21st century. Eight chapters comprise Part I. In Chapter 1 a brief review of the early history of environmental issues is presented. Chapter 2 is concerned with the environmental movement in modern times. Information on various environmental groups and organizations is contained in Chapter 3. A critical examination of the United States Environmental Protection Agency is provided in Chapter 4, with no punches being pulled. Chapter 5—the longest and most detailed chapter in the book—focuses on the environmental regulations. Multimedia concerns and approaches are treated in Chapter 6, and Chapter 7 contains the sources and classifications of pollutants. Part I concludes with chapter 8, which addresses the general subject of the effects of pollution.

1

Early History

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INTRODUCTION

More than any other time in history, the 21st century will be a turning point for human civilization. Human beings may be facing ecological disasters that could affect their ability to survive. These crises could force them to reexamine the value system that has governed their lives for the past two million years of existence (Gorden & Suzuki, 1991). At some point during its journey human society lost its feeling of connectedness to nature, resulting in a "we can manage the world" attitude. This attitude might ultimately lead to the destruction of this country and the world. How did it come to this? The answer lies in a knowledge of human history, a surprisingly brief chapter in the chronicle of the planet—how brief can be demonstrated by the use of a standard calendar to mark the passage of time on earth. The origin of the earth, estimated at some 4.6 billion years ago, is placed at midnight January 1, 1995, and the present at midnight December 31, 1995. Each calendar day represents approximately 12 million years of actual history. Using this time scheme, dinosaurs arrived about December 10 and disappeared on Christmas day. The first humans can be placed at 11:45 P.M. on December 31. The recorded history of human achievement takes up only the last minutes of the world (Gorden & Suzuki, 1991).

The remainder of this chapter describes the path that led to this dangerous predicament: a path that is now leading a growing number of individuals to unite in a broad social movement called environmentalism—a movement that is building a potential road out of this predicament.

THE FIRST HUMANS

The earliest humans appear to have inhabited a variety of locales within a tropical and semitropical belt stretching from Ethiopia to southern Africa about 1.9 million years ago. These first humans provided for themselves by a combination of gathering food and hunting animals. Humans, for the

majority of their two million years' existence, lived in this manner. The steady development and dispersion of these early humans was largely due to an increase in their brain size. This led to the ability to think abstractly, which was vital in the development of technology, and to speak, which lead to cooperation and more elaborate social organization (Ponting, 1991). The ability to use and communicate the technology developed to overcome the hostile environment ultimately lead to the expansion of these first human settlements.

With the use of primitive tools and skins of animals for clothes, the first humans moved outside Africa about one and a half million years ago. The migration lead them into the frostfree zones of the Middle East, India, southern China and parts of Indonesia. The humans at this time could only adapt to those ecosystems found in the semitropical areas that contained a wide variety of vegetable material and small, easily hunted animals to supplement their diet. Despite relatively easy access, Europe was not settled for a long period of time due to the deficient ecosystem, which was later overcome by an increase in technology. The first evidence of human settlement in Europe is dated to about 730,000 years ago. The settlement of America was almost the last stage in the movement of humans across the globe about 20,000 years ago. This was made possible by crossing to Alaska in the last glaciation when the reduced sea levels turned the Bering Strait into a land bridge. Once the first human settlers were able to move south through the passes, they found an enormously rich environment that supplied plenty of food. The human population multiplied rapidly and within a few thousand years had spread to the tip of South America.

By about 10,000 years ago humans had spread over every continent, living in small mobile groups. A minority of these groups lived in close harmony with the environment and did minimal damage. Evidence has been found where groups tried to conserve resources in an attempt to maintain subsistence for a long period of time. In some cases totemic restrictions on hunting a particular species at a certain time of the year or only in a certain area every few years helped to maintain population levels of certain animals (Goudie, 1981). The Cree in Canada used a form of rotational hunting, only returning to an area after a considerable length of time, which allowed animal populations to recover. But the majority of these groups exploited the environment and the animals inhabiting it. In Colorado, bison were often hunted by stampeding them off a cliff, ending up with about 200 corpses, most of which could not be used. On Hawaii, within a thousand years of human settlement, thirty-nine species of land birds had become extinct (Ponting, 1991). In Australia, over the last 100,000 years, 86 percent of the large animals have become extinct. The large numbers of species lost was largely due to the tendency for hunters to concentrate on one species to the exclusion of others. The main reason why these groups avoided further damage to nature was the fact that their numbers were so small that the pressure they exerted on the environment was limited.

THE DEVELOPMENT OF AGRICULTURE

A major shift in human evolution took place between 10,000 and 12,000 years ago. Humans learned how to domesticate animals and cultivate plants and in doing so made a transition from nomadic hunter gatherer to rooted agriculturalist. The global population at this time was about four million people, which was about the maximum that could readily be supported by a gathering and hunting way of life (Ponting, 1991). The increasing difficulty in obtaining food is believed to be a major contributor to this sudden change. The farmer changed the landscape of the planet and was

far more destructive then the hunter. While farming fostered the rise of cities and civilizations, it also led to practices that denuded the land of its nutrients and waterholding capacity. Great civilizations flourished and then disappeared as once-fertile land was farmed into desert.

The adoption of agriculture, combined with its two major consequences, settled communities and a steadily rising population, placed an increasing strain on the environment. The strain was localized at first, but as agriculture spread so did its effects. Agriculture involved removing the natural habitat to create an artificial habitat where humans could grow the plants and stock the animals they would need. The natural balance and inherent stability of the original ecosystem were thereby destroyed. Instead of a variety of plants and permanent natural ground cover, a small number of crops made only parttime use of the space available. The soil was exposed to the wind and rain to a far greater extent then before, particularly where fields were left bare for part of the year, leading to more accelerated rates of soil erosion than under natural ecosystems. Nutrient recycling processes were also disrupted and extra inputs in the form of manures and fertilizers were therefore required if soil fertility was to be maintained. The adoption of irrigation was even more disruptive since it created an environment that was even more artificial. Adding large amounts of water to a poor soil would allow the farmer to grow his preferred crop, but it would have catastrophic long term effects. The extra water would drain into the underlying water table, sometimes leading to rising water levels which caused the soil to become waterlogged. This additional water also altered the mineral content of the soil: It increased the amount of salt and would eventually—especially in hot areas with high evaporation rates—produce a thick layer of salt on the surface that made agriculture impossible. The emergence of villages and towns meant that the demand for resources was now more concentrated. These early societies were dependent on the production of a food surplus in order to feed and support the growing number of priests, rulers, bureaucrats, soldiers, and craftsmen. Forests suffered the most as the demand grew for wood to build houses, heat homes, and cook. Local deforestation around settled areas added to the increase of soil erosion. Soil erosion then led to badly damaged landscape, declining crop yields, and eventually an inability to grow a surplus of food. The first signs of widespread damage emerged in Mesopotamia, the area where the most extensive modifications to the natural environment were first made.

Both domestication of animals and the cultivation of plants had dramatic impacts on the environment. The nomadic hunters and gatherers were aware that they shared the earth with other living things. The animals and humans could live in the same area since the hunters and gatherers did not destroy the ecosystem to a great extent. The agriculturalist, on the other hand, deliberately transformed nature in an attempt to simplify the world's ecosystem. As an example, by ploughing and seeding a grassland, a farmer would eliminate a hundred species of native herbs and grasses, which would then be replaced with pure strands of wheat, corn, or alfalfa. This simplification reduced the stability of the ecosystem, making it inhabitable for most animals, and slowly drained it to near nonexistence.

COLONIZATION OF THE NEW WORLD

Only five hundred years, a mere second on the geological clock, have passed since Columbus' discovery opened a fresh and verdant new world to the Europeans—a land with few indications of human occupation except for a few thin plumes of smoke rising from cooking fires in small clear-

ings in the woods. These clearings belonged to the Native Americans, which numbered about four million at this time. Over the centuries these people had created their own complex culture. Their means of sustaining themselves did not rely on scaring or subduing the earth, but on using what it offered. Native American society was not separate from nature but part of it. Geography, as well as history, began to change when Christopher Columbus anchored his little fleet off the island of San Salvador. Like most of those who freely followed, Columbus and his company risked the voyage to the New World for what they could take from it. They came for gold, a trade route to the spices of India and other riches of Asia, land, goods to sell, glory, adventure, religious and personal freedom, and to convert the heathen to Christianity (Shabecoff, 1993). Although the explorers, adventurers, and settlers came to seize whatever riches and opportunities the land had to offer, it was what they brought with them, far from what they took, that changed the face of the continent forever. What they brought was Europe's two thousand or more years of western history, customs, prejudices, and methodology. They brought European technology, philosophy, religion, aesthetics, a market economy, and a talent for political organization. They brought European diseases that decimated the native people. They also brought with them European ideas of what the New World was and visions of what it should be. As a result, the continent, the mountains, the great rivers, and the plains are much as they were in the fifteenth century. But virtually all the landscape has been dramatically altered by human activity.

In the beginning the explorers and first settlers were faced by a dark forbidding line of forest behind which was a vast, unmapped continent, inhabited, they thought, by savages and filled with ferocious wild beasts. Mere survival meant conquering the wilderness. The forest had to be cleared to make living space and to provide wood for shelters and fires (Shabecoff, 1993). Behind the trees lurked the Indians, ready, the settlers suspected, to commit unspeakable atrocities. The forest was filled with wolves, bears, and panthers that would pounce on their children and domestic animals, or so they feared. The greater the destruction of the forest, the greater the safety for the tiny communities clinging to the edge of the hostile continent. Removing the trees also opened land for crops and cattle. Killing the wild animals not only filled the pot with meat but eliminated the deer and other grazing animals that stole the settlers' corn (Shabecoff, 1993).

The European population quickly grew beyond the carrying capacity of the land. Cropland was frequently exhausted by permanent cultivation; cattle, swine, and sheep introduced by immigrants made far heavier demands on field and forest than wild animals. As each new field was harvested, the chemical, mineral, and biological nature of the soil itself was depleted. The Europeans also brought technology that contributed to the heavy impact they had on the land. Horses and oxen enabled the settlers to open and cultivate much broader acres. Plows could dig deeply into the soil, exposing far more loam. With draft animals, the Europeans could harvest heavier loads and transport them to markets. Sailing ships could then transport those loads along the coast or across the ocean.

Whereas the Native Americans would take from the land only what they could consume, the colonist and their successors sought to grow surplus that they could sell for cash or trade for manufactured goods and other commodities. The production of surplus led to the accumulation of capital and the creation of wealthy, largely in the towns that served as marketplaces. That meant clearing more land, cutting more timber, planting more crops, and raising more cattle, all at a rate that could be sustained only at a cost of permanent damage to the land. The deforestation of New Eng-

land and the disappearance of the beaver in the East are but two dramatic examples of how the demands of the market could deplete abundant resources in short order.

By the time of the American Revolution, the wilderness along the eastern seaboard had been pretty much tamed. While some pockets of forest remained, the thirteen colonies were largely covered with farms, dotted with villages, and punctuated by a few substantial cities, notably Boston, New York, Philadelphia, and Charleston.

THE INDUSTRIAL REVOLUTION

Early in the nineteenth century, an awesome new force was gathering strength in Europe—the term "industrial revolution" was coined by the French as a metaphor of the affinity between technology and the great political revolution of modern times. Soon exported to the United States, the industrial revolution swept away any visions of America being an agrarian society. The steam engine, the railroad, the mechanical thresher, and hundreds of other ingenious artifacts that increased man's ability to transform the natural world and put it to use would soon be puffing and clattering and roaring in all corners of the land. The new machines swiftly accelerated the consumption of raw materials from the nation's farms, forests, and mines.

Lumbering became the nation's most important industry in the late eighteenth century. Wood was the most widely used raw material for heating, houses, barns, and shops; the same can be said for ships, furniture, railroad ties, and for factories and papermaking. The supply seemed inexhaustible since the forest still darkened huge parts of the country. The forest melted away before the axes of the advancing Americans. The settlers never thought of their ax work as deforestation, but as the progress of civilization. Soon after the tree cover was removed, the forest soil began to lose nutrients such as organic matter and materials. The soil began washing away, turning clear streams into slow, muddy ditches, filling lakes, and killing fish.

Meanwhile, the big cities and growing wealth of the East were creating a more rapidly expanding market for wheat, corn, beef, and other cash crops. New roads and canals, the steamboat and the locomotive, made domestic and foreign markets increasingly accessible to farms in the center of the continent. Eli Whitney's cotton gin, Cyrus McCormick's reaper, Benjamin Holt's combine and other ingenious inventions encouraged the development of a highly productive, efficient agriculture that sharply reduced the biological diversity of the land. Mining both preceded and quickly followed settlement of the interior, and left deep and permanent scars on the continent's land and waters. Gold in California, copper in Montana, coal and oil in Pennsylvania, iron ore in Minnesota, and lead in Illinois attracted fortune hunters and job seekers. Reports of a strike would draw thousands of prospectors and workers as well as those who lived off them. Mines operated without care for the surrounding countryside. The picks and shovels, the hoses and dredges, and the smaller fires of the miners created the nation's first widespread pollution and environmental health problems. Mining left behind gutted mountains, dredged-out streams, despoiled vegetation, open pits, polluted creeks, barren hillsides and meadows, a littered landscape, and abandoned camps. Mining contributed to deforestation of the countryside. Woodlands were often cleared for mining operations; enormous amounts of timber were needed for the posts and beams that supported the mine shafts and fueled smelter operations (Shabecoff, 1993).