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Preface

Environment and Society: Human Perspectives on Environmental Issues is intended to provide students and interested readers with an introduction to environmental issues. More specifically, it is about human connections and impacts on the environment—and vice versa. There are many specialized research reports and monographs about particular environmental topics and issues, but I intend this book as an integrative vehicle for many different human and environmental issues.

Stimulated by the enormous growth of interest in environmental issues and problems in higher education, my own classes have a yeasty mix of students from biology, environmental science, the social sciences, and others from education, philosophy, and marketing. I have tried to write a book that is at least understandable to them all. Perceptive readers will note that in some places the book alternates between more elementary and advanced discussion. That is deliberate, because social science students know some things that natural science students do not, and vice versa.

This book discusses blocks of material that incorporate contemporary environmental concerns, controversies, and discourses. The fourth edition has new data and new or updated perspectives in many places that frame issues, for instance about human ecology and world political economy which connect humans to environments and ecosystems, the "human footprint" on the planet, climate change, energy transitions in the coming century, ecological modernization, globalization, the limits of economic growth, environmental movements, and sustainability. A pervasive theme is that disciplinary scholars bring very different intellectual views (*paradigms*) to the understanding of human–environmental issues. I think that these different views are not ultimately irreconcilable, but if you do not like attention given to different points of view, this is probably not the book for you.

Each chapter is followed by some questions and issues (Personal Connections) that attempt to help you make macro–micro links between large-scale

issues and the lives of persons. These are *not* review questions that summarize chapter content, but opportunities for dialogue between the book and its readers and between readers. They may be points of departure for discussion and argumentation.

It is only fair that you have an idea of what kind of book you are going to be reading and how it is organized. It is about about environmental problems themselves, but it has a *social science perspective,* and will be more concerned with how these problems relate to human behavior, culture, and social institutions. The book also examines suggestions for changing the human–environment relationship to a more "sustainable" environment, society, and world order. Finally, it is important for you to know that this book will provide a broad overview that focuses more on the interconnections among a variety of issues rather than on any particular issue in great depth. *Many* other books and research papers provide in-depth coverage of specific topics. (At the end of each chapter, I provide a few suggestions for books and web sites.)

Chapter 1 introduces basic concepts about environments, ecosystems, and human social systems, and various ways that people have understood and interacted with their biophysical environment. It examines how human–environment relations have come to be understood and studied by social scientists, and ends with a summary of the driving forces of human activity that impact the biophysical environment. Chapter 2 is a reading human "footprint" on the planet, that discusses some resources, resource depletion, and pollution issues. Chapter 3 is about climate change and particularly about the contentious issue of global warming. Chapter 4 is about the energy systems that underlie all human economic activity, and the prospects for their transformation in the near future. Chapter 5 is about human population growth with special reference to food issues. Chapter 6 examines globalization and the prospects for more sustainable human–environment relations from several contemporary perspectives. Chapters 7 and 8 continue to examine the prospects for greater sustainability by examining economic markets, politics, policy, and environmental movements.

An important theme that I try to develop with progressive clarity is the importance of *worldviews* and *paradigms* that have implicit basic assumptions about the "way the world works." People in cultures have them, and they shape the scholarship of experts in different fields. These are embedded in our thinking in subtle ways that often make good communication difficult.

I am a sociologist by training, and my outlook on environmental issues is informed by environmental sociology, a subdiscipline that has developed rapidly over the last 30 years. Even so, no single scholarly discipline has a corner on truth about such a multifaceted and important topic. I have therefore attempted to give attention to the work and perspectives of economists, political scientists, anthropologists, geographers, and policy analysts as they address environmental and ecological issues. That makes this book as much

a social science work than a narrow treatise about environmental sociology. But of these fields, the book will draw most heavily on environmental sociology and economics.

SCIENCE, VALUES, AND LANGUAGE

I have tried to write an objective book about the human causes of and reactions to environmental problems and issues. But the book will not ignore scholarly or public controversy and disagreement. It addresses some outrageously difficult and multidimensional issues as reasonably as possible but—obviously—will not do so to everyone's liking. Like all good social science or indeed, all good science of any kind, sooner or later it connects objective "facts" with things that people find important (values), and with criteria for making normative choices among them. As Thomas Dietz put it, speaking about the prospects for a new "human ecology":

> We must become a normative as well as a positive science. I don't mean that human ecologists, as scientists, need continually to be engaged in advocacy. I do mean that we must use our analytical skills to develop arguments for the proper criteria for making decisions. We must help individuals and collectivities make better decisions by offering methods for handling value problems. (1994: 50)

There is, in truth, no completely value-free social science or any other kind of science. So, the book will talk about facts and data, but it also that exhibits my own values, hopes, and fears about the human predicament. It is impossible (and I think undesirable) to eliminate one's own opinions and values from scholarly work. But they should be labeled as such, so I have tried to be careful in putting "I think . . ." statements in front of those places where I am particularly aware that not all would agree.

It's fair to warn you that you will be reading a book that details a lot of bad news about human–environment interactions. Reading sustained fare about problems can be very depressing and can generate fatalism. But it is also important to note that I find some compelling reasons for hope (if not optimism) about the possibilities for a more positive future. Those reasons occur mainly in the later chapters of the book, so if what you read initially depresses you, *read on*. The book moves, after the early chapters, from the more physical to the more social dimensions of environmental issues, and from the more depressing litany of facts and problems to examining some possibilities for positive change. I discovered in writing the book, somewhat to my surprise, that if I am a pessimist, I am a hopeful one.

I should mention one other thing that should be obvious to you by now. As much as possible, this book is written in an informal and, I hope,

unpretentious style. I have often tried to write as if I were carrying on a conversation with you as an individual rather than communicating with an anonymous group of people. It's the way I like to communicate, and I hope it makes the book more engaging to read.

ACKNOWLEDGMENTS

Every intellectual work is in some sense autobiographical. My early college education (of many years ago!) was in biology and the physical sciences. But I subsequently pursued graduate studies in sociology, and for years I have been engaged in a professional life that has dealt only peripherally with environmental and ecological issues. This book attempts to put together the pieces of my education as a coherent whole in a way that addresses some important human and intellectual concerns of our times.

Intellectual works are not just autobiographical. They involve the insights, encouragement, forbearance, and constructive criticisms from many others, and I need to thank them, particularly my colleagues and students at Creighton University. They contributed substantially to this work and tolerated me while I was working on it. Thanks especially to James T. Ault, who had the patience to read and critically comment on many parts of the book. Thanks to a succession of Graduate School Deans at Creighton University who provided modest but important material support.

I also want to thank an amazing network of environmental social scientists at other institutions who encouraged me through various editions. They include Fred Buttel (University of Wisconsin), before his recent untimely death, Eugene Rosa, Thomas Dietz, Robert Brulle, J. Allen Williams, Paul Stern (National Research Council), and Bruce Podobnik. I am especially indebted to William Freudenburg (University of California-Santa Barbara) and Riley Dunlap (Oklahoma State University) for their friendly criticism and encouragement over the years. I do not, of course, hold any of them responsible for errors of comission or omission. Those are mine alone.

I thank anonymous reviewers for their useful comments about this edition at various stages who can now be named. They were Sue Jarnagin, Iowa State University; Robert Wortham, North Carolina Central University; Peter Korsching, Iowa State University; Mariella Squire, University of Maine-Fort Kent; David Tabachnik, Muskingum College; Mike Delaney, Des Moines Area Community College; and Ted Napier, Ohio State University. I owe an enormous debt of gratitude to publisher Nancy Roberts, as well as to sociology editors Chris DeJohn and Jennifer Gilliland, and to several talented and always helpful editorial assistants, the human faces and voices of a large publishing corporation. I thank my copyeditor Tally Morgan, who had the formidable task of making order and sense from sometimes messy prose.

Finally, for her patient and loving support, I thank my wife Anne, to whom this book is dedicated.

If you would like to contact me, I would be happy to hear your comments and reactions to the book and its uses. I look forward to improving it.

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About the Author

Charles Harper is a professor of sociology at Creighton University in Omaha, Nebraska. As a member of the faculty there since 1968, he has developed and taught numerous courses in the sociology department. Dr. Harper's teaching and scholarly interests involve the study of social change, globalization, the sociology of religion, social theory, and environmental sociology. He has published papers in a variety of academic journals.

Along with *Environment and Society*, Dr. Harper is the author of two other textbooks. Coauthored with Kevin Leicht, his book *Exploring Social Change: America and the World* (Prentice Hall, 2007) is now in its fifth edition. Another book, *Food, Society, and Environment* (Prentice Hall, 2003) was coauthored with Bryan F. LeBeau.

As an undergraduate, Dr. Harper studied biology and the natural sciences. He received a bachelor's degree from Central Missouri State University, a master's degree in sociology from the University of Missouri, and a Ph.D. in sociology from the University of Nebraska at Lincoln.

He and his wife, Anne, live close to Creighton's campus near a "clan" of adult children, stepchildren, and grandchildren. He enjoys traveling, bicycling, and reading.

CHAPTER ONE

Environment, Human Systems, and Social Science

The human impact on our environment is so extensive that we live in a "socialized environment."

Industrial societies create a lot of waste and pollution, as seen in Los Angeles cloaked in smog, and a solid waste dump near the New York City skyline.

News about our environment and how humans live within it has not been good in recent decades. Wilderness and soil and water resources are under stress, forests are disappearing, we are awash in pollution and garbage of our own creation, and the earth's climate is warming significantly. Assuming that your parents paid attention to the news, how many of these words or phrases do you think they would have found familiar when they were your age?

> Acid rain, air pollution, smog, thermal inversion, deforestation, global warming/greenhouse effect, carbon sequestration, indoor air pollution, landfill overcrowding, low level nuclear wastes, meltdown, eutrophication, urban sprawl, landfill overcrowding, ozone depletion, global warming, Kyoto treaty, radiation from power lines, species extinction, sustainable development, biodiversity, toxic waste dump, desertification, green politics, green consumerism, NIMBY syndrome

My guess is that they would have been familiar with two or three of them at the most (probably air pollution, smog, and toxic waste dump). You have probably at least heard of many of them. That, I think, is one measure of how rapidly and pervasively environmental issues and problems have entered the popular consciousness and political discourse of our times. This book is about those problems, their human causes, and their implications. The *environment* includes the earth (rocks, soil, water, air, atmophere and living things), but an *ecosystem* means the things that live and interact in parts of the geophysical environment.

ECOCATASTROPHE OR ECOHYPE?

Are all the terms listed about problems just alarmist stuff? How *real* are these problems? Sure, everyone knows that there are environmental problems—pollution and the rainforests, nuclear energy, and the possibility of global warming. But is ecocatastrophe really around the corner, or are the problems greatly exaggerated? Like me, you probably don't spend much time or energy thinking about these problems. The world seems okay: I get up and go to work and enjoy my family life, farmers continue to grow food that is plentiful and normally tasty, and drinking tap water has not made me ill (not yet, anyway). After 2000, and particularly after September 11, 2001, many of us have a sense of unease, for many reasons. Still, to many of us in the richer nations, the biophysical world still seems okay. Perhaps, if you are like me, it is hard to experience directly the environmental devastation depicted here. We are aware, of course, that there *is* human suffering, poverty, disease, and terrorism in the world, and to most of us the economic, political, and individual causes of human problems and misery seem more direct and obvious than the environmental ones. Surely you realize I have been talking about extremely complicated issues and controversies for the human future—if not for you, then certainly for your children and grandchildren. Not "merely"

scientific and academic debates, they have become issues and policy dilemmas that reverberate in the political arenas of the United States and the world, where they compete with more traditional ones.

This chapter is intended to introduce you in broad strokes to (1) ecosystems, (2) human sociocultural systems, (3) some parallels and differences between the evolution of ecosystems and human systems, (4) environmental social sciences, particularly economics and sociology, and (5) some of the human driving forces of environmental and ecosystem change.

ECOSYSTEMS: CONCEPTS AND COMPONENTS

The most fundamental concept for ecological understanding is the notion of a *system* as a network of interconnected and interdependent parts. An *ecosystem* is the most basic unit of ecological analysis, which includes all the varieties and populations of living things that are interdependent in a given environment. Ecosystems are composed of structural units that form a progressively more inclusive hierarchy:

Organism	Any individual form of life, including plants and animals (Felix, Fido, you, and me)
Species	Individual organisms of the same kind (e.g., dolphins, oak trees, corn, humans)
Population	A collection of organisms of the same species living within a particular area
Community	Populations of different organisms living and interacting in an area at a particular time (e.g., the interacting life forms in the Monterey Bay estuary in California)
Ecoysystem	Communities and populations interacting with one another *and* with the chemical and physical factors making up the inorganic environment (e.g., a lake, the Amazon basin rainforest, the High Plains grasslands in the United States)
Biome	Large life and vegetation zones made of many smaller ecosystems (e.g., tropical grasslands or savannas, northern conifer forests)

In addition ecologists speak about the *biosphere* as the entire realm where life is found. It consists of the lower part of the atmosphere, the hydrosphere (all the bodies of water), and the lithosphere (the upper region of rocks and soil). Combined, the biosphere is a relatively thin, 20-kilometer (12-mile) zone of life extending from the deepest ocean floor to the tops of the highest mountains (Miller, 1998: 92).

Exchanges (or *cycles*) of energy, chemicals, and nutrients are the interconnections that bind the components of ecosystems and subsystems with the physical environment. See Figure 1.1.

The transfer of food energy from its primary producer sources (green photosynthetic plants) through a series of consumer organisms where eating and being eaten is repeated a number of times is called a *food chain*. The

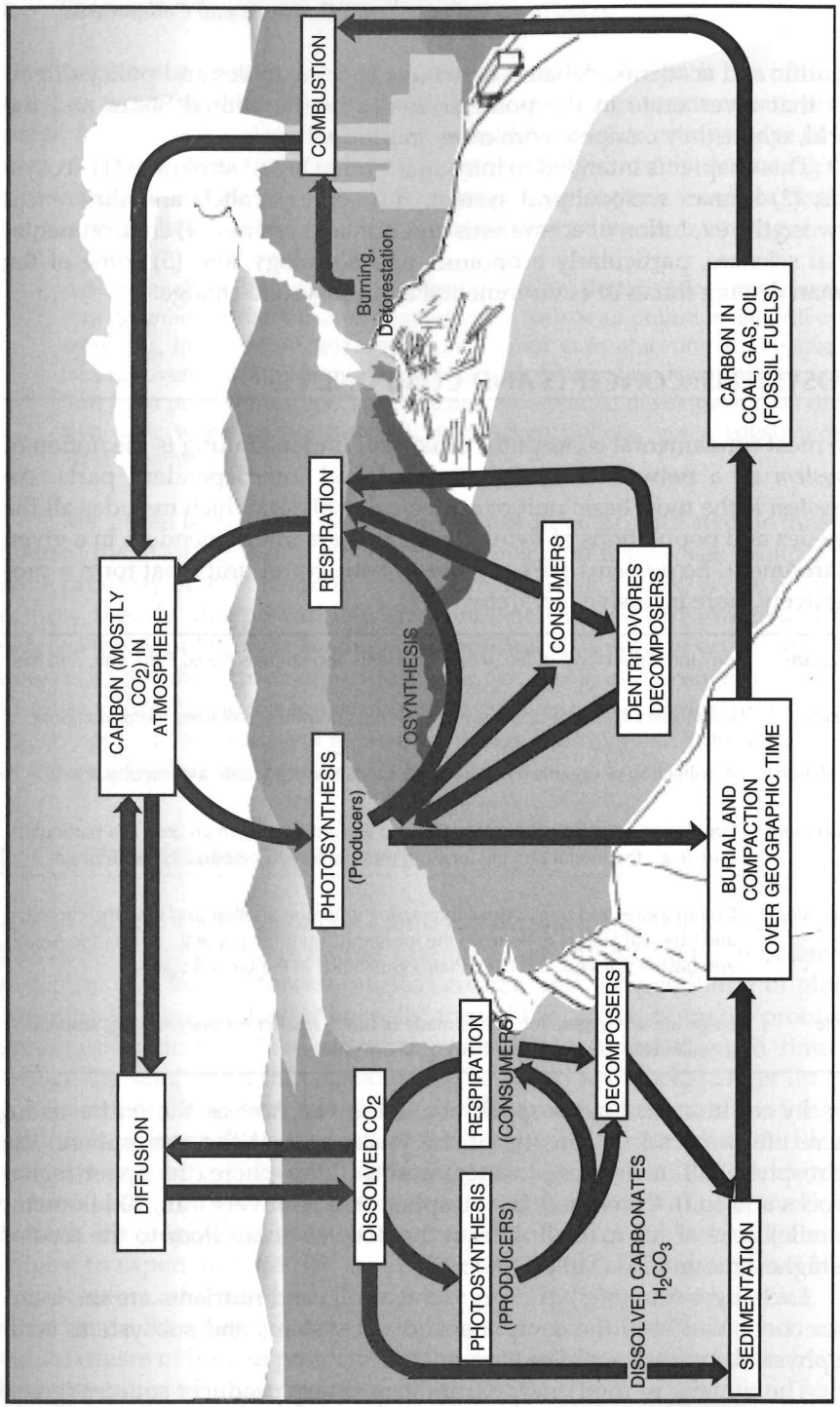


Figure 1.1 The Carbon Cycle
Source: Adapted from T.G. Miller, Jr., 1998: 114–115.

greater the number of feeding (or *trophic*) levels, the greater the cumulative loss of usable energy. That explains why larger populations at lower trophic levels are required to support smaller populations at higher levels, and particularly at the top of food chains. Food chains are thus *food pyramids.* This energy-flow pyramid explains why larger populations of people can be maintained if people eat mostly at lower levels on the food chain (by eating mostly vegetables or grains) than at higher levels (by eating cattle fed on grains) (Bender and Smith, 1997: 14–16).

A *habitat* is the location of an organism within an ecosystem, whereas its *ecological niche* is its role in a community of organisms that comprise an ecosystem. Sometimes niches overlap and two species compete for the same resources. But often different kinds of *resource partitioning* make it possible for different species to share the same habitat without much competition. For instance, species inhabit and feed from different layers of rainforests: Some are ground feeders, some feed on short shrubs, some live and feed in the shady understory, and others live in the high canopy. The droppings of all of these species feed the detritovores that recycle nutrients to the otherwise fragile tropical soil. There are other ways that species "share the wealth" in a given ecosystem. Hawks and owls feed on similar prey, but hawks hunt during the day and owls hunt at night.

Every organism has nutrient needs that the ecosystem and its physical environment must provide for it to thrive. If a population gets too large, the ecosystem is overloaded and cannot provide the basic needs of every organism. If this overload occurs, populations become stressed and may begin dieback. The concept of ecosystem *carrying capacity* and the possibility that population growth can produce an *overshoot* of available resources is illustrated by Clark's analogy of bacteria in a petri dish. When bacteria are introduced into a nutrient-rich petri dish, exuberant growth follows. But in the limited world of the petri dish, such growth is not sustainable forever. "Sooner or later, as the bacterial populations deplete available resources and submerge in their own wastes, their initial blossoming is replaced by stagnation and collapse" (1990: 1). But you don't have to rely on analogies such as this; there are many real cases in which species have outgrown ecosystem carrying capacity, and after such overshoot, population size has collapsed. For example, David Klein's study of reindeer tells of the introduction of 29 animals, minus wolves—their natural predators—to remote Matthew Island off the coast of Alaska. In the next 19 years, they had multiplied to 6,000 animals and then, through starvation, had crashed to 42 in the following three years. When discovered, the 42 reindeer were in miserable condition, all probably sterile (1968: 350–367).

Like other species, humans need space, clean air, water, food, and other essential nutrients to survive and maintain a quality existence. If human population gets too large relative to its environment, however, the carrying capacity of that ecosystem may be overtaxed and human welfare may be threatened (Buchholz, 1993: 34). And like animal species, there are numerous

real cases of human local and regional overshoot disasters and population crashes in various countries throughout history (I will return to some of these cases later). The human consequences have included widespread malnutrition, disease, starvation, all kinds of social stress, outmigration, and sometimes war as people compete for scarce resources.

Ecosystem Change and Evolution

Today most scientists think that biological species evolve, and *that natural selection* and *rare genetic mutations* are important mechanisms for the evolution of species. Ecosystems also change evolve, and have done so since long before humans arrived on the scene. *How so?* Alfred J. Lotka, one of the founders of ecological science, provided important leads to this question beginning in the 1920s. Viewed ecologically, the competition among species is fundamentally about sources of energy. Competition for available energy (nutrients and food) in their environment triggers changing relationships among different species, often causing ecosystems to evolve into more inclusive systems. When energy is available in the environment, the species with the most efficient energy-capturing mechanisms has a survival advantage. Organisms with superior energy-capturing devices will be favored by *natural selection,* increasing their numbers and their total energy consumption throughout the ecosystem (Lotka, 1922; 1945: 172–185). These processes often result in *ecological succession,* whereby species may replace one another in gradual changes.

Over the earth's long 3-billion-year geological history, ecosystems have evolved by (1) *natural selection,* as described earlier, (2) *coevolution,* or the reciprocal natural selection that forms relationships between different species, called *symbiosis,* and (3) *group or community selection,* which produces the maintenance of traits favorable to groups even when disadvantageous to individual genetic carriers within the group. Few ecologists doubt that such group selection occurs, although the process by which it does so is unclear. Symbiosis can be mutually beneficial (*mutualism*), or as host–parasite relations (*parasitism*) are only beneficial to one species but are not mutually beneficial, as when fungi or micro-organisms infect humans and other species. Interestingly, there are micro-organisms that live in human digestive tracts that appear to be in a mutualistic relation with humans by aiding in the digestive process (Odum, 1971: 271–275).

The Relevance of Ecological Theory for Human–Environment Interaction

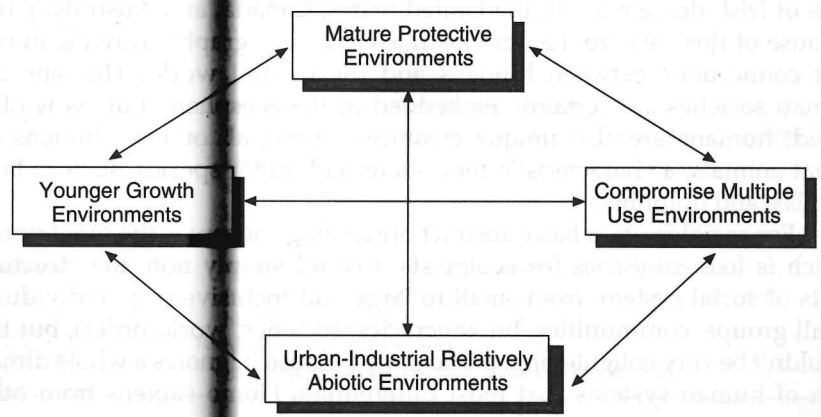
I have relied extensively on the work of renowned ecologist and ecological theorist E. P. Odum, and need to note of some of his ideas about the relevance ecological evolution and human–environment interactions. Odum

understood the relat nships between different kinds of environments and ecosystems as a *comp rtment model* in which four broad types of natural settings are partitioned ccording to their biotic function and life cycle criteria. There are (1) enviro ments with young, relatively immature, and rapidly growing ecosystems; (2) ones with more mature, diverse, or climax ecosystems that tend towa protective equilibrium; (3) compromise or multiple-use environments ar ecosystems that combine both types and functions; and (4) urban-indust al environments that are relatively *abiotic* in relation to the other types. You an see these four types represented schematically in Figure 1.2.

The important oint is that the growth of human settlements and communities obviously c crease the proportion of other types of environments and ecosystems at th expense of the more mature, protective ones. Human activity creates urba -industrial environments, with their vast sprawling growth and their gr at expansion of simplified growth ecosystems. This happens through th cutting of forests, the expansion of land for agriculture and other use and the increase of multiple-use ecosystems that combine some wild ness with fields, towns, or highways, among other factors.

The impact of h man activity usually creates simplified-growth ecosystems by producing v tual *monocultures* (areas where primarily one type of organism grows). Wh ther cutting trees, plowing prairies for crops, or cultivating grass in a la n, humans reduce the biological diversity of living things that exist in "w ild" ecosystems. A field of corn or soy beans is such a monoculture. If you lawn has mainly one kind of grass (blue grass, rye, zoysia, or such), it to is a monoculture. If you have had to maintain such a

Figure 1.2 Compa ment Model of Environments and Ecosystems According to Fun on and Life Cycle Criteria
Source: Adapted from dum, 1971: 269.



monoculture, you know that it takes a great deal of effort in weed pulling and requires herbicides and pesticides to keep other life forms from invading it. The *loss of biodiversity* in monocultures has its price, not only by the addition of chemicals that are very difficult for nature to recycle, but also by the fact that monocultures are much less robust and hardy than more diverse systems. They are notoriously more susceptible to damage by drought and diseases, such as sod webworm that kills blue grass, or the whole range of insect, fungi, and microbe infections that can decimate grain crops and livestock monocultures. The Irish Potato Famine of the 1840s is an example of the devastation that can be caused by the collapse of an agricultural monoculture. A fungus ("blight") infection killed the Irish potato crop for several years, resulting in widespread starvation and civil disorders, and—importantly—triggering massive waves of Irish emigration to countries such as the United States, Canada, and Australia.

Odum's observations of the 1970s are still relevant: "Until we can determine more precisely how far we may safely go in expanding intensive agriculture and urban sprawl at the expense of the protective landscape, it will be good insurance to hold inviolable as much of the latter as possible" (1971: 270).

Is there a "saturation limit" for what, how, and how much of the biophysical environment can be appropriated for human use and still provide broadly positive conditions for social life for most of humanity? To what extent can we do this and still value and respect for its own sake the earth's rich and diverse genetic inheritance of species and ecosystems that resulted from 3 billion years of evolution? *Tough questions* but important ones.

SOCIOCULTURAL SYSTEMS

Earlier I noted the Irish Potato Famine of the 1840s to illustrate the biotic vulnerability of agricultural monocultures. The fact that a large number of persons of Irish descent are in the United States, Canada, and Australia partly because of this catastrophe demonstrates in a very graphic way the important connections between humans and the natural world. Humans and human societies are certainly embedded in the ecosphere, but, as is often noted, humans are also unique creatures among all others. Humans are social animals, a characteristic they share with other species, such as bees, gorillas, and dolphins.

For sociologists, a basic abstract organizing concept is the *social system*, which is like *ecosystems* for ecologists. I could simply note the structural units of social system, from small to large and inclusive (e.g., individuals, small groups, communities, bureaucracies, societies, world order), but that wouldn't be very enlightening, particularly because it ignores a whole dimension of human systems that most differentiate Homo sapiens from other

species: *culture*. Even though the social animals mentioned live in social systems, they lack a cultural dimension. A *sociocultural system* is a network of interdependent actors (individuals, organizations, subsystems) that are in relatively stable patterns of interaction and intercommunication. They share cultural patterns (both material and symbolic), which are distinguishable from those of other such systems. If you are suspicious that I am not exactly on new ground, you aren't wrong; a human system is another specific version of the general system concept introduced in the previous chapter. A systems perspective is fundamental to both ecology and the social sciences. This is important because it means that for humans as well as other species (1) everything is ultimately connected to everything else, and therefore, (2) you can't ever do *just* one thing without some consequences for other parts of the systems in which you live. Here, in Table 1.1, are the components of human systems, distinguishing some clusters of related elements.

This is a useful and fairly conventional analytical scheme. As will become apparent, however, things are not divided so neatly; others do it a bit differently; see Lenski and Nolan (1999) and Sanderson (1995).

Since the relevance of these human system elements or subsystems may not be quite obvious to you, I need to say a few things about them, particularly as they relate to understanding environmental issues. *First*, you may be wondering how some are different, particularly the difference between a nation state and a society. Today we usually think of them as the same, but they really are not. Real nation states did not even exist much before the 1500s, but *society*, the most inclusive structural unit of human

Table 1.1 Elements of Sociocultural Systems

Culture	worldviews
	paradigms
	ideologies
	knowledge, beliefs, values
	symbols, language
Social structure	world-system
	society
	nation state
	complex organizations (bureaucracies)
	social stratification systems (based on economic class, ethnicity, kinship, or gender)
	small groups
	kinship systems
	status-roles
Material infrastructure	wealth (tokens, wives, cattle, money)
	material culture, subsistence technologies (plows, computers)
	human population (size and characteristics)
	human–environment relations
	biophysical resources (land, forests, minerals, fish)

systems, is as old as are homo sapiens.[1] There are people, such as the Berbers of North Africa, who comprise a coherent society but who live in several North African nation states (Algeria, Mauritania), as do the Mohawks (whose "territory" straddles the U.S.–Canada border). *Second,* these elements are really not an evolutionary or developmental sequence. For the earliest known *Homo sapiens,* and among the few scattered indigenous peoples of the world today, there *is* no operating society beyond the level of families or kinship systems, no larger communities, and no inequality beyond elementary status roles based on age and gender. Furthermore, an authentic world order that has the potential to knit nations and societies into a truly global system of sorts has been emerging for only about the last 500 years, and its features are not yet very clear. *Third,* there are some things left out. There are, obviously, *individual* human organisms, and there are *social networks* that are somewhere in between populations and organized groups in the number and strength of the system bonds between actors.

Culture

Surely the most important distinction between *Homo sapiens* and other species is the extent to which humans are cultural creatures. Nonhuman animal social behavior is more shaped by the behavioral instructions or codes carried in their genetic makeup—which interact with their environments in complex ways. Human behavior and environmental adaptation is more flexible, open-ended, and shaped by learning; in other words, it is cultural. *Culture* is the total learned way of life that people in groups share. You can think of it as a sort of humanly constructed software (to use a computer analogy) for, for instance, what the world is like, how people should relate to each other, and how they ought to adapt and "make a living" in the biophysical environment. Since our genetic equipment gives us very little specification about any of this, it is fair to say that much of our behavior and social patterns are shaped by culture rather than biology. Exactly how much is debatable, and this issue has been at the core of an intense—but not very productive—debate between evolutionary biologists, anthropologists, and sociologists for about a decade.[2] People do not always conform to cultural norms, but we all experience powerful social pressures to conform and often face social sanctions if we don't.

But culture is hard to classify by this three-part scheme (Table 1.1) because it has both symbolic and material dimensions. *Material* technology, for instance, includes the tools, factories, weapons, and computers that relate to economic subsistence. Underlying these "things" are ideas, plans, recipes for doing things, and the innovative processes that are part of *symbolic* culture. To continue the computer analogy, if material culture is the hardware or mainframes, symbolic culture is the software programs of human systems. Thus, subsistence technologies really include all the ideas, formulas, tools,

and gadgets that people use to convert raw biophysical material resources into goods and services that humans find useful. Viewed as part of the material infrastructure, they relate to "making a living" in the elemental sense of providing sufficient food, shelter, and clothing. But they also include a lot of other "stuff" unrelated to basic subsistence like pet rocks, Beanie Babies, toenail clippers, computers, and sociology texts, which have economic utilities that would be quite baffling to most humans who ever lived.

Social Institutions

Social institutions are both left out *and* hard to classify by the foregoing scheme. They are nearly universal sociocultural formations, like families, economies, political systems, judicial systems, healthcare, and so on. Social institutions are both structural and cultural. That is, they include broadly established ideas, values, beliefs, technologies, and structural systems that address some enduring human concern related to collective survival. You can get a sense of the structural *and* cultural sides of institutions by thinking about families (groups organized around kinship). The operative structural units of American families, established by law and custom, are parents and their children (even though other relatives have important legal and cultural standing). On the cultural side, again established by both law and custom, married spouses are two (only two) people of the opposite sex. They ideally exhibit an interaction style shaped by the values of positive affection (love) and trust, rather than by economic utility or relations of domination-submission. Children, normatively now not more than two or three, are to be valued intrinsically, and not as utilities for family economic or sexual exploitation. Does this picture represent the empirical reality of all families in the United States? Of course not. But social institutions are imperative normative "shoulds" that most people find hard to disagree with, supported as they are by powerful cultural customs and laws. Furthermore, this institutional template is very different from that of families in other cultures (as anthropologists have studied extensively). The point is that social institutions are as much cultural as structural.

Social Structure

Elementary structural units of human systems are statuses and roles. Your *status* is the position or "rank" you occupy in a social system. It is linked hierarchically with other statuses (like students and professors). Your social *role* is what you are "expected" to do while you are occupying a status. Professors, for instance, are "expected" to work hard preparing for their classes, do scholarly research, and take an interest in their students. But I'm sure you know that such role expectations vary a lot and are not always enacted

anyway! *Status* is a structural term, and *role* is a behavioral or cultural one. (Again, things are not so neatly categorized.) Status roles exist in social systems of every size and may coalesce into broad structures of social stratification in complex human systems.

The status-role concept is somewhat analogous to the way ecologists use the ideas of ecological habitats and niches—as the structural locations and functioning of organisms within an ecosystem. Furthermore, it is important for you to note that some other social animals, particularly primates, have almost humanlike status-role systems. As our evolutionary cousins, primates (and some other mammals) live not as unorganized mobs but in relatively structured *rank-dominance hierarchies,* usually with the older males in charge of things.

Population Size and Characteristics

The most obvious and elementary components of human systems are individual people and populations of various sizes and characteristics. Populations are *aggregates,* not systems, but their characteristics (such as size and age distribution) have a lot to do with what goes on in human systems and how they come to be structured. For instance, as human systems grow in size, they typically develop complex subsystems and experience problems of communication and coordination. The environmental implication of population size is that, *other things being equal,* larger populations make more demands on the biophysical environment than do smaller systems. But in the actual world things are rarely equal. Technology is a major force that makes the environmental impacts of populations *unequal.* Small populations with powerful subsistence technologies can impact environment far more than larger ones with less powerful technologies. I will have a lot more to say about the environmental implications of the interaction of population and technology in Chapters Five and Seven.

The Duality of Human Life

The cultural uniqueness of human beings has a profound implication. It results in what I take to be an existential dualism that underlies much of the debate about human–environment relationships, including quarrels about the seriousness of environmental problems. This duality, inherent in the human condition, can be stated simply:

> *On the one hand*—humans and human systems are unarguably embedded in the broader webs of life in the biosphere. We are one species among many, both in terms of our biological makeup and our ultimate dependence for food and energy provided by the earth.

> *On the other hand*—humans are the unique creators of technologies and sociocultural environments that have singular power to change, manipulate, destroy, and sometimes transcend natural environmental limits. (Buttel, 1986: 338, 343)

Biologists and ecologists usually emphasize the first part of this duality and social scientists typically place more emphasis on the second part. You probably recognize that *both* statements are true in some complicated and partial sense. Yet it makes a great deal of practical difference which assumption we use as a guide to action, choices, and policies. Since the industrial revolution, the second assumption—*humans as an exceptional species*—has been the dominant assumption and viewpoint. It is important to note that humans act on the basis of such viewpoints rather than on the basis of what the world "really is." This is a subtle but important point that requires some elaboration.

Worldviews and Cognized Environments

There is obviously a reality external to human beings that we live within. But human choices and policies are more directly related to our *definitions* of that reality than to what reality "really" is. In other words, human social behavior is more directly related to symbolic constructions and definitions of situations than by external environments per se. People *exist* in natural environments, but they *live and act* in worlds mediated and constructed by cultural symbols (Berger and Luckmann, 1976; Schutz, 1932/1967; Thomas, 1923).

Yes, there is an external biophysical environment independent of how people think about it, but people act on the basis of what they *think* the environment to be. To differentiate this environment from the "real environment," scholars have invented a rather awkward term, *cognized environment,* to mean their human definitions and interpretations of the biophysical environment. The very notion of nature itself is a way of *cognizing* the environment that didn't exist much before the eighteenth century. As a cultural conception and idea, nature was invented mainly by English intellectuals in the eighteenth century, particularly Romantic artists, writers, poets, and literati (such as Wordsworth and Ruskin). They sought a metaphor to contrast the "good" pristine natural state with the (presumed) evil artificiality of the cities, mines, and factories of the industrial world. Thus the notion of nature that has come down to us was originally part of the Romantic discourse and critique of the invasion and destruction of all that was "natural" by the barbaric machines of the industrial system (Harrison, 1993: 300; Fischer, 1976, chap. 2). "Mother Nature" is a more obviously gendered and anthropomorphized cognition of the biophysical environment (*anthropomorphized* means that something nonhuman is understood in human terms).

The *worldview* that people share is their totality of cultural and beliefs and belief systems about the world and reality. It is a broader concept than their *ideologies,* meaning the parts of worldviews that people purposely use to justify action and political choices about, for example, individualism, nationalism, or environmentalism. *Cognized environments* are also components of worldviews that are obviously related to ideologies about the environment.

ECOSYSTEM AND SOCIOCULTURAL EVOLUTION: HUMAN ECOLOGY

This chapter began by discussing the components of human systems and continued to discuss some distinctive things about human experience of themselves in relation to their biophysical enviroments: their dualistic perception of themselves as a species in nature, and capability of transcending environmental limitations, the importance of worldviews, ideologies, and cognized environments. Continuing the parallel with ecosystems, I turn to the evolution of human systems, and will highlight some similarities and differences between biological and sociocultural evolution. After long neglect, some scholars are reviving evolutionary thinking about human systems that has the potential to link large- and small-scale processes, explain the emergence of complexity, and link social science to biology without misleading reductionism (Dietz et al., 1990: 155; Maryanski, 1998).

Ecological theorists (Lotka and Odum) argued that ecosystems evolve as different species compete for available energy in the physical environment and selectively survive. If uninterrupted, the result, over time, is a larger, more complex, and inclusive structure of species connected in food chain niches and often in symbiotic relations that range from mutualistic to parasitic. In a parallel way, sociocultural evolution proceeds when humans compete for control over limited natural resources. As they do so, some persons and groups develop more efficient material subsistence infrastructures related to subsistence. Complex relationship systems of statuses and roles emerge that parallel niches in ecosystems. These relationships, and the exchanges of goods, labor, control, loyalty, and symbols on which they are based, parallel, it seems to me, *symbiotic relationships* in the biological world. First, there are social *exchanges of reciprocity,* which produce egalitarian, mutual benefit relationships in nonhierarchical contexts. These exchanges are similar to the phenomenon of mutualism. Second, there are social *exchanges of redistribution,* wherein goods and services are shifted "upward" to persons or centers that reallocate them (like profits, plunder, and taxes). These exchanges result in relationships that are asymmetrical in terms of power and equity, and stratified relationships (Polanyi, cited in Rogers, 1994: 45). Reciprocal

exchanges predominated among hunter-gatherers, whereas redistributive exchanges became more pronounced as human systems evolved in more complex systems (what we called "civilizations"). Redistributive exchange bears some resemblance to the asymmetry of parasitic and predator–prey relationships.

With the emergence of industrialism, a third kind of exchange utterly transformed social systems. Economic production for *use* became progressively eclipsed by production for exchange for other goods and services. To facilitate exchange, money increasingly replaced barter as an abstract, portable, and more convenient medium for the exchange of goods and services. Even human labor became a "commodity for exchange" at a fixed monetary rate. Money came to symbolize the value of more concrete biophysical resources (e.g., land, minerals) and became, as finance capital, the premier material resource of industrial societies. These processes happened within *exchange markets,* a third form of exchange. Unlike the two mentioned earlier (reciprocity and redistribution), in markets social relationships become embedded in the economy instead of vice versa (Polanyi, cited in Rogers, 1994: 45).

Moving from hunter-gatherers to industrialism, the growing complexity of human technological systems exhibit another parallel with the evolution of ecosystems. Large-scale and complex market exchanges, particularly in industrial societies, dramatically increased occupation specialization (the "division of labor") and other kinds of social differentiation. That is analogous to *speciation,* the evolution of different biological species that use different niches of an environment. Social differentiation represents a kind of *quasispeciation.* In this process, we *Homo sapiens,* though remaining a single biological species, use the environment as if we were many species. Different institutions, industries, and occupations use the same biophysical environment in different ways for resources important to their specialized purposes. Thus in a highly complex social order equipped with modern technology, human beings become a *multiniche* species (Hutchinson, 1965; Stephan, 1970; Catton, 1993/94). Why is knowing this important? Because it should enable you to understand why people in modern societies have difficulty cooperating on problems of truly common interest without becoming sidetracked by their "special interests."

I hope you can see some parallels between the evolution of ecosystems and sociocultural evolution, but you can't carry these parallels too far, because there are important differences as well. While all animals communicate—that is, transmit behaviorally relevant information—only humans do so extensively through the use of *cultural symbols. Homo sapiens* share this symbolic capacity with our evolutionary primate cousins, but that of humans is of such greater magnitude that it makes us, in effect, unique among animals. The communication mechanism of other species is largely genetically programmed and innate, unlike the meaning of human symbols,

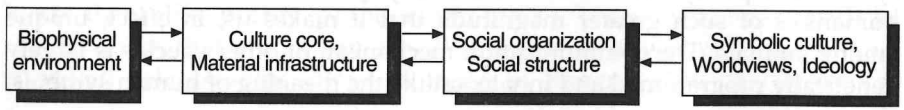
which are *arbitrary* and depend on a consensus of symbol language users (Sanderson, 1995: 32–33).

In biological evolution, the units of transmission and selection are individuals and particular genes that survive (or do not) between generations. In sociocultural evolution, however, the units of transmission and selection may be individuals, a society, or its subsystems. But the generation of sociocultural novelty along with its intergenerational selection and transmission is Lamarckian rather than genetic (Jean Baptiste Larmarck, Darwin's most famous predecessor, argued that animals could inherit learned behaviors and characteristics). Moreover, "symbol systems can blend, and components can be added to or subtracted from culture, thereby making it difficult to predict what is being inherited or transformed" (Maryanski, cited in Freese, 1998: 29). In this sense, Maryanski argues that human systems do not evolve, but they do change and develop. Most scholars retain the idea of sociocultural evolution but emphasize the accumulation of complex contingencies (such as the generation of novel forms, their transmission and selection over time), which is closer to the biological meaning of the term rather than fixed "stages" of development, common in the early history of the idea (Burns and Dietz, 1992).

These considerations led scholars to abandon earlier strongly deterministic approaches to the evolution of human systems in which environmental and material forces were thought to determine everything else. Earlier generations of anthropologists and geographers coined the notion of *environmental possibilism* for more flexible approaches. These models posit that material and biophysical factors are broad limiting factors for particular human systems, but the most immediate and particular causes of many social and cultural changes are *other* social and cultural factors. Anthropologist Julian Steward, who rekindled interest in sociocultural evolution, used the term *culture core* to describe a society's technology and subsistence economy (what I earlier referred to as material infrastructure). The biophysical environment has direct interacting effects solely on this culture core, but only indirectly with other elements of human systems. Relationships are two-way interactive ones with feedback, or *cybernetic* ones (Kormondy and Brown, 1998: 45–47). See Fig. 1.3.

It is important to note that sociocultural evolution is a uniform story of more inclusive and technically complex systems. *Devolution* occurred periodically, when complex systems like early civilizations collapsed and

Figure 1.3 Human Ecology Theory: Relationships between the Biophysical Environment and Sociocultural System Elements



resulted in smaller, simpler systems. This discussion of ecosystem and sociocultural evolution is not a thorough discussion of socicultural development, but it has mentioned hunter-gatherer and industrial societies. In what follows I discuss industrial societies in more depth, both because we live in industrial societies and they are so important in understanding contemporary environmental problems.

Industrial Societies

Industrialization began about 300 years ago in Europe. Like the invention of agriculture, industrialization depended upon some key discoveries and technologies—first in the textile industry in England—that substituted machine production for human and animal labor. Industrial production depended not only on new machines, but on new energy sources to power them—water power, steam engines, hydroelectric power, petroleum, and so forth. Like the agricultural revolution, the *industrial revolution* eventually produced a quantum leap in the power to accumulate economic surpluses, and in the scale and complexity of human societies.

Since the new engines and machines were large and expensive, centralized production in factories began to supplant the decentralized "cottage" craft production of earlier times. People began to migrate to cities in unprecedented numbers, not only because the factory jobs were located there, but because the application of industrial techniques to agriculture—such as the introduction of farm machinery and new inorganic chemical fertilizers—reduced the demand for labor in rural areas. In industrial cities, wealth and power began to be associated not so much with control of land—as in agricultural societies—but with ownership and control of industrial enterprises. A new class system based on industrial wealth rather than the ownership of land began to emerge. Increasingly labor became a cash commodity rather than a subsistence activity, with shares as taxes. Work became increasingly separated from family life and bound up with emerging bureaucratic systems of production. Modern complex organizations (bureaucracies) and nation states were significant new social formations of industrialism.

Like the agricultural revolution before it, industrialism stimulated a whole basket of cultural and economic innovations, in transportation and communication, and in medicine, sanitation, and disease control. Prominent among these innovations was the acceleration of the rate of scientific discovery and the application of science-based technologies to economic production. These developments, particularly improved disease control and the rapid accumulation of foodstocks, allowed unprecedented population growth and an extension of the human life span. Unlike agricultural societies, in which overpopulation, ecological collapse, and plagues kept global population rates modest (up to about the 1600s), in industrial societies rapid improvements in economic technology and disease control resulted in positive

feedback between population growth and accumulating wealth. I will return to population-environment issues in Chapter Five.

However, as with the agricultural revolution, it is arguable whether industrialism improved the life of the twentieth ordinary person, at least until after the turn of the twentieth century. Early industrialism as observed by both Charles Dickens and Karl Marx was, for the vast majority, an uprooting from farm life into a bleak new life of misery, industrial hazards, and exploitation in early industrial sweatshops. Yet in the longer term, improvements in health and living standards diffused from social elites to ordinary people in the large middle and working classes of industrial societies, if not to those at the bottom. Some scholars argue that after the turn of the twentieth century industrial societies became more equalitarian than historic agricultural societies in terms of both political rights and the distribution of material well-being (Lenski and Nolan, 1999). Yet this is a slippery argument. Most people live longer, are materially better off, and have more individual freedoms. But have they traded overt forms of social domination and oppression for more subtle forms of control and pervasive alienation unique to the industrial world? Critics of urban industrial societies argue that they have separated humans from nature, destroyed or weakened the bonds of traditional communities (neighborhood, kin), weakened our sense of civic community, and made us dependent on vast international systems (like market economies and treaty organizations) that elicit neither our loyalty nor comprehension. Critics argue urban industrialism produces fragmented ("autonomous") individuals and families with little connection to community at several levels (Young, 1994).

For some time now, a *world-system* of nations with its connected *world market economy* has been evolving. These developments, along with shared cultural traits and aspirations among people in many parts of the world, constitute what is commonly called *globalization*. The important point is that because a world-system of sorts is emerging, there are few hunter-gatherers or agricultural people anywhere on the earth who remain untouched by the expansion of the industrial societies. Although the diffusion of industrial technologies, consumer goods, and culture has been uneven, it is now found everywhere. For better or worse, Coca-Cola and Marlboro cigarettes are found in every Chinese village. The polar Eskimos (Inuit people)—those that weren't killed off by smallpox and measles—now zoom around the tundra hunting with snowmobiles and repeating rifles. Gone forever are igloos and dogsleds (except for sport), and their children are now plagued by dental caries from refined sugar in their diets, a problem virtually unknown when they were pristine hunter-gatherers.

Human–Environment Relations in Industrial Societies

Like agricultural societies, industrialism dramatically increased human use and withdrawals from the biophysical resource base. The key change in the human–environment relationship was the use of relatively cheap fossil fuels

that supported industrialization, more intensive agriculture, and urbanization. This involved much more extensive exploitation of the physical and biotic resource base. It also produced more, and more difficult, pollution as production gradually shifted from natural materials (wood, paper, cotton), which are environmentally benign compared to synthetic materials that break down slowly in ecosystems and may be toxic to humans and wildlife (such as stainless steel, DDT, dioxin, and plastics—chemicals that Mother Nature never knew!).

No evidence yet exists of the weakening or total collapse of an industrial society—for ecological reasons (abundant such evidence exists for historic agricultural societies). This is because the industrial environmental degradation has so far been more than offset by increased investment and technological inputs. Whether this state of affairs will continue to be true in the future is arguable. It is the big question I return to in Chapter Six. Here I note that it took the Copan Mayans more than 400 years to collapse, and much longer for Mesopotamians. By comparison, industrial societies have only been around for about 300 years, and the growth of world population and technological prowess means that our biophysical impacts are on a much larger scale than in historic agricultural systems.

The Dominant Worldviews of Industrial Societies

If the main cognized environment of agricultural societies was that of a garden to be tended, modified, and dominated by humans, that of industrial societies is a dramatic extension of this concept. It was amplified particularly by cultural developments of the European Enlightenment period (seventeenth and eighteenth centuries), which emphasized empirical reasoning, science, the world as a giant cosmic mechanism, and the ability of humans to rationally control nature through systematic innovation and experimentation. The earth and other species became cognized as a huge *resource base* and facility to be used, developed, and managed for human needs and desires. Unlike agriculturalists, industrial people not only tended the garden, they attempted to remake it.

Many scholars have attempted to describe the dominant worldview (DWV) of industrial societies. Although they differ about the details, they agree that industrial DWVs amplify the second part of the human duality already mentioned: that humans, by virtue of culture and technology, have a unique power to change, manipulate, and sometimes to transcend natural environmental limits. In one way or another, most scholars think that DWVs of industrial societies have the following themes:

- Low evaluation of nature for its own sake.
- Compassion mainly for those near and dear.
- The assumption that maximizing wealth is important and risks are acceptable in doing so.

BOX 1.1 ENVIRONMENTAL DEGRADATION AND SOCIAL CHANGE

Many people who understand human social evolution as a story of continual progress fail to appreciate the role that environmental degradation has played. Commonly, people believe that the change from food foraging to horticulture and then to agriculture happened because people traded a precarious and insecure way of life for one that was more secure and satisfying. Little evidence exists to support this view. Rather, climate changes that "shrank" livable environments, human population growth, the exhaustion of edible plant and large animal populations, and the discoveries and innovations that made dependence on agriculture possible *all* combined to cause that transformation. Furthermore, fossil record and archaeological evidence confirm that hunter-gatherers did not abandon their lifestyle until forced to do so by these problems, and did so at different times and in widely scattered areas around the world (Lenski and Nolan, 1999: 119; Sanderson, 1995). A similar combination of environmental problems, scarcities, and technological possibilities caused decline of ancient empires (like the Mayans, Mesopotamians, and Romans) and stimulated emergence of industrial societies. The growth of innovations and technologies produced more complex and inclusive human systems having ever-larger productive capacities to support human populations. Elites may have benefited from an enhanced ability to extend their control and powers of taxation across larger systems. Non-elites, however, often did not change their lifestyles from positive attractions but rather to survive when they had no other choices. In the nineteenth and twentieth centuries established farmers often did not *willingly* give up their farms and move to cities seeking urban employment. There were certainly "bright lights," and jobs in urban cities, but the story of rural to urban migration is also one of progressive rural poverty, bankruptcy, and foreclosed farm mortgages.

- The assumption of no physical ("real") limits to growth that can't be overcome by technological inventiveness.
- The assumption that modern society, culture, and politics are basically okay.

(Milbrath, 1989: 119). For other versions see Dunlap (1983, 2000a); Harman (1979); Olsen, Lodwick, and Dunlap (1992: 18); and Pirages (1977)

Some described this worldview as the DWV of free-market or capitalist industrial societies. But it is obvious that the former communist nations

of Eastern Europe and the USSR damaged their environments to a much greater degree than did Western market economies. Most now believe that it applies generically to industrial societies. In view of the emergence of the world-system of nations and world market economy, it is also fair to note that this DWV does not affect only the more developed countries of the northern hemisphere. Hardly anyone in the world today is immune from it. People in the less developed countries want the things of industrialism (TV, autos, vaccinations, Coca-Cola, and cigarettes). The industrial DWV is diffusing rapidly around the world, where the *desire* for progress is defined largely in terms of increasing material consumption, security, and well-being. This is true even in the poorest less developed countries, where material and health standards are now very low and misery is widespread.

But, it is also important to recognize diversity and change. The DWV does not control everything—there are competing worldviews—and now it is obviously in some kind of flux and transition. Since the beginning of the twentieth century, there *was* concern in the United States about maintaining natural environments (for both utilitarian and intrinsic reasons), which produced turn-of-the-century conservation movements. These movements led to the establishment of protected public lands, national forests, and parks. Similarly, there was concern among agricultural agencies about soil preservation and erosion, which continues today. But increasing popular environmental and ecological awareness was stimulated most directly from environmental problems and *environmental social movements* beginning in the 1960s, in the United States as well as other nations.

I will return in more depth to environmental social movements in Chapter Seven. They are connected with a rise in ecological thinking and a change in the DWV just described. Dunlap and colleagues proposed an alternative paradigm for "seeing the world ecologically" (the New Ecological Paradigm, or NEP). Dunlap and Van Liere concretized the question for empirical research (1978, 1984) by developing a 12-item NEP scale that contained such items as (1) the importance of maintaining the balance of nature, (2) the reality of limits to growth, (3) the need for population control, (4) the seriousness of anthropogenic environmental degradation, and (5) the need to control industrial growth. They found the general public tended to accept the context of the emerging NEP much more than they had expected (1978), and that this acceptance has grown since then, providing evidence of change (Dunlap et al., 2000). Subsequently, other researchers found support for the NEP and similar concepts in a variety of public samples in the United States and Canada (e.g., Caron, 1989; Cooper, et al., 2004; Edgell and Nowell, 1989; Pierce, Dalton, and Zaitsev, 1999). This evidence involves the rise of environmental social sciences, to which I now turn.

ENVIRONMENTAL SOCIAL SCIENCES

Ecology has been a part of biology since the 1930s, but environmental and ecological social sciences are newer. Their contemporary forms grew mainly in the 1960s and 1970s as scholarly responses to the environmental problems, conflicts, movements, and popular consciousness of those decades. But in fact the social sciences have a long and ambivalent intellectual history in how they think about the environmental embeddedness of human systems. Today almost all social science fields deal meaningfully with environmental issues, almost all contribute to "environmental social science," including anthropology (for example, in this chapter and Chapter Four), demography and human geography (e.g., in Chapters Four and Six), social psychology and behavioral science (e.g., in Chapter Four and Six), political science (e.g., in Chapter Seven). Here I discuss only two, beginning with economics, because economic analysis is so central to contemporary discourses, and then sociology, which has important integrating perspectives to frame human-environmental issues.

Economic Thought

The founders of the field of economics all assumed that the earth's biophysical resources (land, minerals, living things) were the necessary basis for the economic production of useful goods and services. But, beginning with *Adam Smith* (1723–1790), they argued that *labor,* not nature, was the major source of economic value. Smith argued that the operation of private unregulated *markets* were the best natural mechanism to determine the *economic value* of goods and services, and wages. Smith distinguished between market value and moral or social value, separating the latter from economics and thereby initiating the tendency of economic thought to treat the economy in abstraction from the rest of the sociocultural world.

Smith argued that the desire for profits and the "unseen hand" of unregulated markets would produce the best possible economic and social world. It would create a system that reflected "real" economic values and encourage the use of investment, labor, and technology in ways that increase production in response to consumer desires. Smith's view was buoyant and optimistic, reflecting a bustling and successful nation of English traders, shopkeepers, and merchants on the eve of the real industrial expansion that was to come. In the next decades, that optimism would fade. *David Ricardo* (1772–1823), for instance, argued that economic growth and the desire for profits would lead people to bring even marginal resources, such as poor and infertile land, into production. As population grew, it would "become necessary to push the margin of cultivation further" (Heilbroner, 1985: 95). His message was ecological but also moral, for he argued that in the long term only the fortunate landlords stood to gain as their holdings rose in value—not workers struggling to make a living or enterprising capitalists laboring to maintain profits.

Thomas Malthus (1776–1834) argued that increasing production and improved living conditions would lead to population growth. But he argued that population grows exponentially, while material resources such as food supplies increase in an arithmetic way.[3] Malthus predicted that after the bloom of initial growth would come the inexorable regression to scarcity, bringing with it the "population checks" of misery, famine, pestilence, war, and social chaos. Malthus not only was an influential figure in economics but also provided an early link among economic, demographic, and ecological thinking.

Karl Marx (1818–1883), like others, argued that nature was an important factor in production but that social factors, in particular, the "ownership of the means of production" (land, capital, factories) was more important. Like Ricardo and Malthus, he saw chaos at the end of the capitalist era. But he argued that its sources were to be found not in the demographic-economic calculus of Malthus, but in inherent and eventually unmanageable conflicting material interests between economic classes of workers and the owners of the means of production. He believed that their struggle over wages and profits would eventually be resolved in the apocalyptic and revolutionary transition to socialism. The creative intellectual accomplishment of these classic thinkers was to move from anecdote to science, to comprehend economic markets as law-abiding systems whose dynamics could be understood and—perhaps someday—predicted. In this quest, they were only partly successful.[4]

But as prophets, one has to admit that they were all a bust: We have not realized the capitalist paradise of Smith; Ricardo's landowners do not dominate the industrial world (certainly not at the expense of finance capital); capitalism has been able to politically contain the apocalyptic demise that Marx predicted (which ironically happened to state socialism in our time); Malthus certainly underestimated the amount of food that could be produced and the number of people who could be supported. But the greatest irony of all was that even though their views gave shape to modern economic thought, they all failed to comprehend the expansionary dynamic of industrial capitalism. They all thought that the growth they were witnessing would be short lived and that a "dull" steady state economy or systemwide collapse was only a few decades away (Heilbroner, 1985: 305–306). In that assumption they were dead wrong.

More than the classic thinkers, contemporary economists emphasize the second part of the human-environmental dualism previously described. *Neoclassical theory,* the dominant perspective, views the economy as a circular flow of investment, production, distribution, and consumption, understood in abstraction from the natural environment and rest of social life as

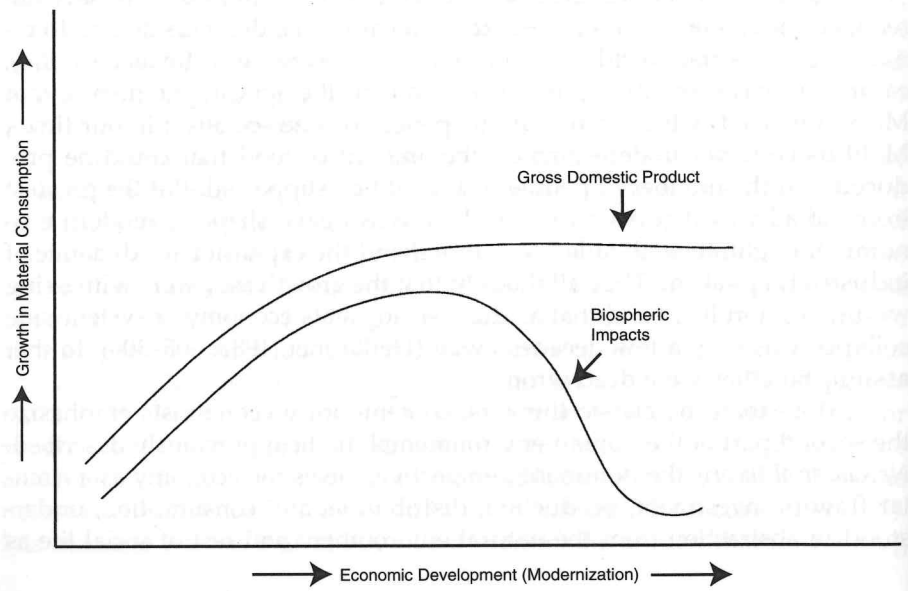
well. To put it starkly, in the neoclassical view the economy contains the ecosystem (as resource bases and pollution sinks). Surely a natural scientist would put it the other way around—that the ecosystem contains the economy as well as other human institutions. Neoclassical theory implies that environmental and resource problems cannot be very important ones because the economy is a closed system with a pendulum-like movement between production and consumption. This model is abstracted from the environment: within which the money economy is actually embedded, and there are no connections between money flows and biophysical reality (Geogescu-Roegen, 1971; Reese 2002: 254). See Figure 1.4.

This prevailing economic model relies on the mechanics of free and open markets to ensure environmental sustainability. The late professor Julian Simon was the most ebullient proponent of the doctrine of "near-perfect substitability," whereby

> Technology exists now to produce in virtually inexhaustible quantities just about all the products made by nature . . . We have in our hand now . . . the technology to feed, clothe, and supply energy to an ever-growing population for the next seven billion years. (1996: 342)

They maintain that the technological advance will outpace resource scarcity over the long run and ecological services can be replaced by new

Figure 1.4 Neoclassical Economics: Growth and Resources
Source: Kuznets, 1955 "Economic Growth and Income Inequality," *American Economic Review,* 45, 1–28.



technologies. Economic markets work the same to make money and determine prices whether resources are plentiful or scarce. Nor do social values or questions of justice intrude: Markets work whether you are growing corn, producing health services, selling heroin, cleaning up toxic wastes, or selling slaves. Neoclassical economics deals extensively with "efficient" allocation, secondarily with distribution, and not at all with matters of scale. Though construing the world in narrow and abstract terms, neoclassical economics has become enormously influential in industrial societies in shaping debates about social, political, and environmental policy. This is true partly, I think, because the theory appears more objective by deliberately ignoring questions of human values and political and ethical considerations. But these, I argue, are important human questions and considerations that really ought not to be "ruled out of court" (Costanza et al., 1995: 60, 80; Daly and Townsend, 1993: 3–6).

Some economists were concerned with environmental resources issues for several decades without recasting the neoclassical theory significantly;

BOX 1.2 NEOCLASSICAL ECONOMICS AND RESOURCES

Even with its limitations, conventional neoclassical economic analysis is perfectly adequate to shed light on any number of human-resource-environment problems. For example, it has been used to explain the collapse of complex agrarian societies through ecological degradation, such as that of the Mayans, discussed earlier. After detailed investigation of the collapse of the Mayans, the Chaco Canyon societies of the American Southwest, and the western Roman Empire, Tainter concluded that problems began when there were "declining marginal returns on investment." At some point each society was investing more in maintaining essential institutions (e.g., temples, cities, armies) than it was able to benefit from them. Once the point of diminishing returns was reached, it required constantly increasing investment just to maintain the status quo. At some point the economy and social system began to collapse (1988: 187–195).

But there are important problems outside the scope of Tainter's insight. What, for example, led the Mayans to migrate to the Copan catchment area in large numbers rather than maintaining scattered plots of land and villages with (probably) sustainable agricultural practices? Why did they need cities, temples, and armies anyway? It is when you ask such broad and longer-range questions that the limits of mainstream economic analysis appear. Many important issues are simply outside the framework of conventional economic analysis.

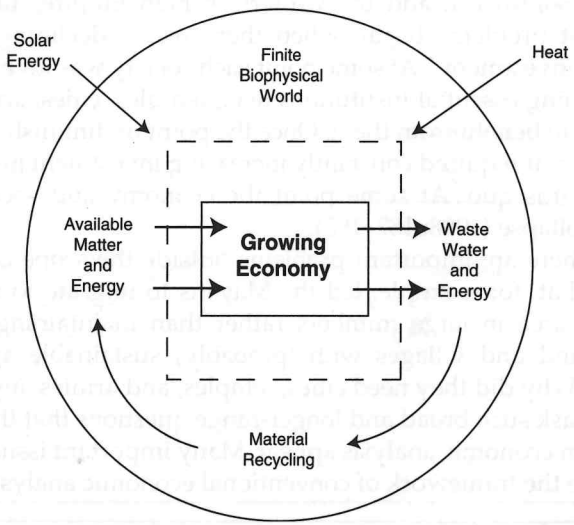
see Dorfman and Dorfman, 1972. But by the 1970s, a small and growing band of economists were trying to recast economic theory by finding ways of incorporating both *nature* and *human values* into their economic calculus. They began by viewing the economy not as a separate isolated system but, rather, as an inextricably integrated, completely contained, and wholly dependent subsystem of the ecosphere (Daly, 1992). In contrast to neoclassical economics, ecological economics sees the economy as an open, growing, wholly dependent subsystem of a materially closed, not-growing, finite ecosphere.

> The biophysical fact is that through the technology-driven expansions of the economy, human beings have become the dominant consumer organism in the world's major ecosystems . . . This poses a serious challenge to the mainstream belief that economic activity is not seriously limited by biophysical constraints. (Reese, 2002: 259)

See Figure 1.5.

Ecological economists have addressed a new set of problems and dilemmas that are outside the boundaries of conventional economic analyses. Here are three illustrations: (1) How can values ("prices") be assigned to goods that are held in common (the "commons") that are used by many and owned by none, such as the atmosphere, rivers, oceans, and public space? They cannot be privately owned in small pieces that can be meaningfully bought or sold. Hence, there *is* no "market" other than an invented

Figure 1.5 Ecological Economics: Growth in a Finite World



or imagined one, and therefore no prices to limit use. The widely recognized problem is that we tend to overuse common as opposed to privately held goods (Hardin, 1968, 1993). (2) How can economic analysis incorporate and assign responsibility for the variety of environmental and social *externalities*, that is, the real overhead costs incurred in the production process that are borne not by particular producers or consumers but by third parties, the larger social community, or the environment? (3) How can we calculate the value of using nonrenewable resources at the present time as opposed to reserving them for future use or for future generations? We tend to value present consumption higher and discount future values. These are problems you cannot really address with the neoclassical model (Clark, 1991: 404).

You need to understand that this view represents a frontal assault on the abstracted tidiness of the neoclassical model. Ecological economics challenges the article of faith of mainstream economists that human ingenuity and technology will always overcome environmental limits and ecosystem capacities. It also recognizes important matters of value that can't be reduced to price efficiency: "A good distribution is one that is *just* or *fair*, or at least one in which the degree of inequality is limited within some acceptable range" (Costanza et al., 1995: 80). How much inequality is just? As you can see, not only nature but human values and culture have been reintroduced center stage.

Ecological economists are busy tinkering with ways to "price" social and esthetic externalities, finding ways of circumventing "commons problems" and producing measures of human well-being broader than those that simply measure how much money a nation produces (e.g., gross national product figures). They are also rethinking tax and subsidy policy to reverse their historically damaging environmental impacts and ways of avoiding onerous regulation.

Beyond these efforts economists have contributed two major ideas. First, *emissions trading schemes* are useful for making policy. Producers of wastes and emissions are assigned tradable "credits" for less environmentally damaging production. These can then be traded or auctioned (for money) to greater polluters (per unit of product). Emissions trading systems try to reverse the usual economic benefits that go to polluting firms, which make money by dumping pollutants into the environment. Such schemes have significantly induced producers to reduce the production of some toxic wastes, and it is under discussion as a possible method to address global warming by rewarding nations for reducing their production of greenhouse gases (Tietenberg, 2002). Second, *ecological modernization* is a broad theory arguing that while modernizing, firms could become more efficient by mimicking an ecosystem with lots of feedback systems and recycling, for instance by using wastes from one process to supply or fuel another economic process, rather than only extracting raw materials, consuming them, and throwing them away. Such efficiencies would generate profits, and the costs of

recycling could be incorporated in cost accounting and pricing. Ecological modernization, originating in neoclassical economists, and elaborated by ecological economists and environmental sociologists, is now an important framework for research and policy (Mol, 2001; Mol and Sonnenfeld, 2000). I will return to this in some depth in Chapters Seven and Eight.

Sociological Thought

By the 1880s sociological thinking was taking shape across the English Channel in France and Germany. In vast oversimplification, the classic formulations in sociology can be understood in the work of three paramount figures: Karl Marx, Emile Durkheim, and Max Weber. Like the classical thinkers of economics, they sought to establish social analysis by *dissociating* it from the fashionable biological determinism of the day that used biological analogies to understand social phenomena (Buttel, 1986: 340). Classic sociological thinkers did not totally ignore natural and environmental factors, but were ambivalent and cautious about their influence on social structure and processes.

As sociology developed most sociologists came to share a distinctive but taken-for-granted view about social structure and processes. This "lens" assumed that social and cultural phenomena were caused by other social and cultural factors, and avoided biological or environmental "determinism." But when the environment became a widely recognized American problem in the 1960s and '70s (such as with with air and water quality, urban pollution, and toxic wastes), some analysts turned to the sociology of environmental issues, and about how people perceived and related to them. Some wondered why sociologists were so reluctant to treat physical and environmental variables as important influences on society and culture. In a series of groundbreaking papers Dunlap and Catton maintained that sociologists had unwittingly adopted a scientific paradigm that prevented them from doing so.

Philosopher of science Thomas Kuhn developed the notion of *scientific paradigms* to describe the mental image of scientists that guided their theory and research in particular fields (1970). A paradigm is a set of implicit assumptions about the "way the world works" or a "lens" through which scholars view their subject and practice their craft. It is not a theory (about relationships between variables) but rather a "fundamental image of the subject matter representing a broad consensus within a discipline"(Ritzer, 1975: 7). Catton and Dunlap suggested that the dominant paradigm in sociology was shaped—not surprisingly—by classical theory and also the dominant worldview of industrial and Western society (Catton and Dunlap, 1978; Dunlap and Catton, 2002: 332). They called it the *Human Exemptionalism Paradigm* (HEP) because it assumed that humans are unique among species and that we are exempt from the power of environmental forces.

- Humans are unique among the earth's creatures, for they have culture.
- Culture can vary almost infinitely and can change much more rapidly than biological traits.
- Thus, many human differences are socially induced rather than inborn; they can be socially altered, and inconvenient differences can be eliminated.
- Thus, also, cultural accumulation means that progress can continue without limit, making all social problems ultimately solvable.

(Catton and Dunlap, 1978: 42–43)

Critical of the notion of human exemptionalism, Catton and Dunlap urged sociologists to "get over it" and move toward another paradigm that would facilitate taking environmental variables seriously in their studies, which they termed the *New Ecological Paradigm* (NEP), with the assumptions contrary to HEP:

- Humans have exceptional characteristics, but they remain one among many species that are interdependent in ecosystems.
- Humans are shaped not only by social and cultural forces, but by cause, effect, and feedback linkages in the web of nature.
- Humans live in a finite biophysical environment that imposes potent restraints on human affairs.
- Although the powers derived from human inventiveness may seem to extend carrying capacity limits, ecological laws cannot be repealed.

When sociologists began to create an environmental sociology, they "mined" the ideas of their classical thinkers (where else could they begin?). Classic sociological theorists, even though underemphasizing the role of natural world as potent in the shaping and containing of social phenomena, nonetheless created perspectives that had seminal ideas for environmental sociology. For Marx, there was a materialist rather than an idealist ontology (view of reality), and the notion of a nature–society "metabolism" (Foster, 1991). Durkheim used biological analogies to understand societies, even though he rejected the biological and psychological determinism of social phenomena. Weber conducted research about natural-resource (or "environmental") factors that shaped differences in power among social groups and classes. All three used Darwinian and evolutionary models to understand social change (Buttel, 2002: 39; Buttel, 1986: 340–343). How did environmental sociology develop?

The Greening of Social Theory and Sociology

Karl Marx was an influential scholar whose ideas are today claimed—or *disclaimed*, as the case may be—by scholars in many fields. Among his multiple critiques of early capitalism, Marx noted that pervasive social conflict

processes resulted in growing concentration of ownership of land and productive resources (including money), as well as classes of wealthy and poor, with decisive political control by the wealthy. In his view, the dominant ideas and values, laws, philosophies, and worldviews—in other words *culture*—simply represent the material interests of the dominant economic classes. It is fair to mention again that, like the other early political-economic thinkers discussed, Marx was a failure as a prophet. His notion of the impending utopia through triumphant proletarian revolutions was in obvious error, given the events of our times. Even so, his ideas about the nature and dynamics of human societies retain considerable appeal.

Shorn of utopian prophecies, the contemporary heirs of Marxian thought typically identify their perspectives as *conflict theories*, which argue that the most important societal dynamics are diverse of processes by which the subsystems and classes in society come into conflict over control of limited material resources *and* the symbolic rewards of society. In many developing societies material resources still mean biophysical resources like land and minerals, but in industrial societies, they become *money* as an abstract indicator of economic value. Moreover, as Max Weber pointed out in his critique of Marx, conflict can be about control of the symbols of prestige and social honor (who wins Academy Awards, Olympic Gold, or Nobel Prizes?), as well as material interests.

Through various forms of conflict and power struggles, society's subsystems attempt to protect or enhance their control of resources and values. These processes periodically exhibit visible tensions and conflict, resulting in inequalities of power and resources that biologists would call a *dominance hierarchy* and social scientists would call a *social stratification system*. Even so, the ability of one part to dominate the system is limited by the others with which they must contend, and society itself is likely to be controlled by a coalition of the most powerful subunits. Both social stability and change derive from such ongoing competition and conflict (Collins, 1975; Olsen, 1968: 151).

Observing that large corporate organizations are important features of modern free market societies, Allan Schnaiberg and his colleagues developed a conflict theory of human–environment interaction. They argue that many social analyses of environmental problems have paid too much attention to consumption and too little to the dynamic of production. Competition makes higher profitability a key to corporate survival, and firms must continually grow to produce profits and attract investments. This imperative for continual growth becomes a *treadmill of production* in which each new level of growth requires future growth, and growth in production requires the stimulation of growth in consumption. The contradiction is that *economic expansion is socially desirable, but ecological disruption is its necessary consequence.* Environmental disruption limits further economic expansion. New technology may introduce efficiencies that reduce the environmental impacts

per unit produced, but continued increase in total consumption offsets this effect. The deeper threat of the treadmill may not lie in technologies that pollute, but in the competitive logic of the maximization of market share values without limit (Schnaiberg and Gould, 1994: 53). Governments are in the ambivalent situation of being expected to encourage economic growth, pay the costs of environmental disruption, and regulate environmental abuse. The first of these outcomes is of overwhelming *political* importance.

Schnaiberg and colleagues propose a *societal-environmental dialectic* as the most likely pattern of change:

1. *The economic synthesis:* The system of addressing the contradiction between economic expansion and environmental disruption in favor of maximizing growth without addressing ecological problems.
2. *The managed scarcity synthesis:* In which there is an attempt to control only the most pernicious environmental problems that threaten health or further production by regulation; governments appear to be doing more than they really are (the situation of U.S. environmental regulation policies since the 1970s).
3. *The ecological synthesis:* Major efforts to reduce environmental degradation through specific controls over treadmill production and consumption institutions directed specifically to that end. Curtailment would produce an economy so that production and consumption would be sustainable from the use of renewable resources. This is a hypothetical case with no known examples; it would only emerge when the disruption of the environment is so severe that the political forces would emerge to support it. (Cited in Buttel, 1986: 346–347; Buttel, 2002; see also Schnaiberg, 1980; Schnaiberg and Gould, 1994)

Conflict-based processes that result in such agreements or syntheses may result in different outcomes: (1) the most powerful entities perpetuate the status quo and enhance their domination, (2) a prolonged stalemate occurs between dominant and contending parts of the system, or (3) significant change takes place that redistributes power, wealth, and privilege. *In most historic moments, the first outcome is most likely.*

You can see the relevance of this, as a NEP-oriented conflict theory of human-environment relations. There are others. See, for instance, Roberts and Grimes (1999) and Goldfrank, Goodman, and Szaz (1999). The titles are telling; for instance, the paper by Roberts and Grimes is entitled "Extending the World-System to the Whole System: Toward a Political Economy of the Biosphere."

Unlike Marx, *Emile Durkheim* (1858–1917) was engaged in establishing sociology as a distinct academic field. The distinctive element of Durkheim's sociology was his emphasis on culture and cultural values (that he came to call "collective representations") as the basic integrative and binding moral force in human societies. He was greatly influenced by the evolutionary thinking of Darwin and the used analogies between biological system and social systems to understand social relations, but, as noted earlier, he

vehemently rejected the fashionable "biolologism" of his day (which alleged that biological factors determined everything else), as well as geographic and other environmental determinisms. Durkheim also rejected "great man" theories of history, arguing that society and culture were "sui generis," that is, self-generating systems with their own structure and dynamics. In doing so, he undoubtedly contributed to the dominance of the HEP among later sociologists.

For Durkheim, culture was the most basic force for solidarity in the social world, and he understood human social evolution abstractly as a transition from simple and homogenous systems with powerfully binding cultural rules (*mechanical solidarity*) to complex and heterogeneous systems with weaker and less binding cultural rules (*organic solidarity*). You can get a concrete sense of this by considering the long evolutionary history of the transition from hunter-gatherers to agricultural "empires," and then to complex industrial societies.

Yet there is a germ of ecological thinking in Durkheim's ideas. Writing at a time when the apocalyptic ideas of Malthus and Marx were in fashion driven either by demography or class conflict, Durkheim rejected both of their predictions. Durkheim argued, to the contrary, that increased population density and the intensification of the struggle over scarce resources were important antecedents to industrialism and the complex division of labor in industrial societies. This increasingly complex division of labor would, he thought, increase the adaptability of more populous and dense societies to their environments by decreasing direct competition over resources and causing cultural innovation—such as science and bureaucracies—that would redefine and effectively expand resources. "The oculist does not struggle with the psychiatrist, nor the shoemaker with the hatter or the cabinet maker, nor the physicist with the chemist, etc." (1893/1964: 262). Occupational specialization in industrial capitalism would produce a "quasi-speciation" much like bottom dwellers and canopy dwellers in tropical rainforest ecosystems, which would not directly compete for the same resources. He thought, in contrast to Marx, that industrialism would mitigate class conflict by reducing scarcity. In his view, the major problems of industrialism would stem from the weakening (cultural) bonds between groups in an increasingly complex division of labor—resulting in rootlessness and cultural confusion (anomie).

Sociologist William Catton contends that Durkheim misread both Darwin and contemporary ecology. The result of the growth of social complexity Durkheim could observe in his time was not a "mutualism of interdependent specialists," but rather a web of unequal power-dependent class relations more akin to "parasitism" that Marx observed (Catton, 1997: 89–138). I'm not sure how devastating this critique is to Durkheimian thought. Though class relations in modern capitalist societies are vastly unequal, they are more equalitarian with regard to both resources and rights than

preindustrial ones, as in the empires of the ancient world. Perhaps the point is moot: Predator–prey and host–parasite relations can be symbiotically stable, even if not equitable. Well-adapted predators do not decimate their populations of prey, and a well-adapted parasite doesn't quickly kill its host.

Functionalist theories are the descendents of Durkheimian thought. They assume that humans live in sociocultural *systems* that, like all systems, have parts or *subsystems* that work or *function* to keep the entire system going (as the complex division of labor sustains industrial capitalism). To get a sense of this, try a mental experiment: What kinds of processes (functions) are critical to the viability and survival of *any* social system? Some are obvious: (1) producing enough individual people through reproduction, immigration, or organizational recruitment, (2) socializing individuals well enough to be able to live in particular systems, (3) producing enough goods and services to maintain individuals and organizations, (4) maintaining sufficient order and authority to resolve conflicts and allocate goods, and (5) generating enough shared culture to facilitate communication and consensus (see Mack and Bradford, 1979; Parsons, 1951). The particular ways in which such functions are accomplished differ greatly among human societies. Further, note that a sustainable relation between humans and their biophysical environment was *not* a part of this list of functional processes (as understood in the 1950s). Nature is only implied to be "out there" as a resource for economic functioning.

Dunlap and Catton described the functions of the environment differently by suggesting *three functions of the environment* for human society (as well as other species). Ecosystems function as a *supply depot* for human material sustenance. Ecosystems and environmental sinks (like rivers and the atmosphere) function as *waste repositories* for wastes and pollution. In addition, ecosystems provide *living space* for all activities, and overuse of this function produces crowding, congestion, and the destruction of habitats for other species. Moreover, Dunlap and Catton argue that overusing the environment for one function may impair the other functions (as when a waste site makes a neighborhood undesirable for living, or pollutes groundwater resources). Human impacts may become so large that they threaten to be *dysfunctional*, threatening human social viability on a global scale. This impairment may be of such magnitude as to impair the environment's ability to fulfill all three functions, for humans or other species (Catton and Dunlap, 1986; Dunlap and Catton, 2002). See Figure 1.6.

Max Weber (1864–1920) is hardly ever regarded as an ecological thinker, but he was an important early sociological theorist whose ideas have influenced environmental sociology. In contrast to Marx, Weber thought the basic force in society was power itself (not simply the control of wealth). In modern societies, Weber observed, power is increasingly wielded by large-scale organizations and bureaucracies. But, unlike Marx, Weber gave considerable weight to the role of ideas, legitimating ideologies, and myths (broadly,

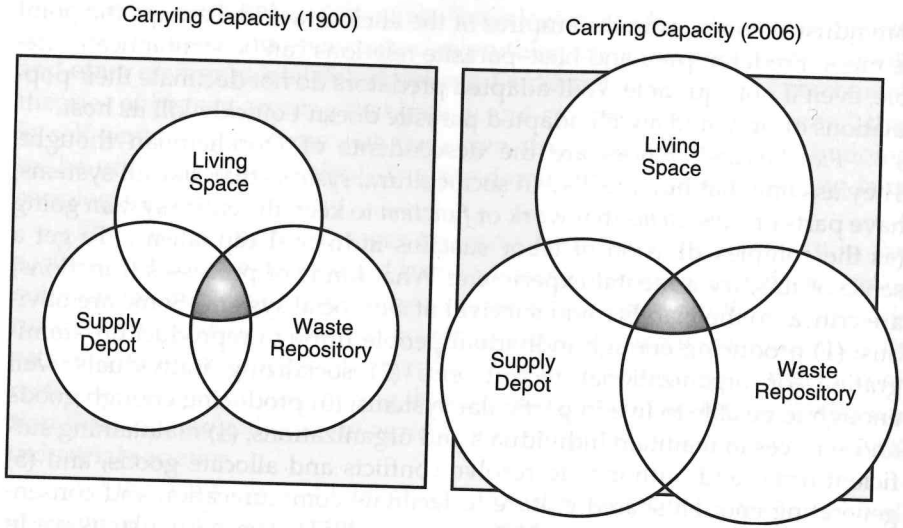


Figure 1.6 The Social Functions of the Environment
Source: Adapted from Dunlap and Catton, 2002, "Which Functions of the Environment Do We Study?" *Society and Natural Resources,* 15, 245. Used with permission of Taylor and Francis Group, L.L.C., http://www.taylorandfrancis.com.

"culture") in historical change and development (Humphrey, Lewis, and Buttel, 2002: 45). More argued that the main thrust of Western social development could be understood as the progressive elaboration and diffusion of the cultural complex of *"rationality"*—about linking means and end efficiently—in Western societies, which underlies the development of capitalism, as well as bureaucracy, and empirical science.

Weber's ideas have been extended to environmental sociology in two different ways. One focuses on managers of bureaucratic organizations. Environmental protection involves the government managers and administrators in the process of exercising their power to carry out the intent of environmental protection legislation. Ken Gould, for instance, studied this process by examining the ability of municipalities to enforce water pollution regulations in Canada and the United States. Municipalities differ in size, access to environmental organizations, and dependence on a single local employer—for instance, a paper mill or nuclear fuel processing facility. If single industry communities also lack access to active environmental organizations, or municipal or state regulators, they will have more limited ability to enforce or manage pollution regulations.

Gould found that communities with a more diverse employment base had more political autonomy and, thus, greater managerial control capacity. This was especially true of communities that gained employment from summer and fall tourism. Greater control capacity meant that regulatory agency

managers had more political legitimacy in the community and more effective authority to exercise in environmental management (1991).

In a similar environmental extension of Weber's ideas, Canadian sociologist Raymond Murphy's *Rationality and Nature* examined the other side of the coin: why environmental movements pressure bureaucratic organizations (including transnational corporations) in a wide variety of settings to develop new accounting procedures that reflect the NEP. In doing so, they often target state managerial agencies, because only the state has the resources necessary to force information out of private companies and to set and enforce the rule needed to ensure that knowledge (about risks) is not concealed (1994: 143). Given that states depend considerably on the money and influence provided by large corporations, whether or not the state has the power to act independently is an important question.

The second kind of extension of Weber's ideas is that they helped stimulate *interpretive perspectives* emphasizing the role of symbols, culture, and ideas. One version of this is most familiar to Americans. It is *symbolic interactionism,* a social psychological perspective that emphasizes that self concepts and behavior are critically shaped by language, symbols, and people's "definitions of the situations." As humans interact, they constantly create, defend, rearrange, and negotiate their identities, social relationships, and cultural meanings (Mead, 1934). An implication of this is that social and cultural reality are, in fact, social constructions, and this has given rise to *social constructionist* perspectives (Alfred Schutz, 1967; Berger and Luckmann, 1976).

Let me illustrate what that means. What we take as "things" like organizations, society, culture, social institutions, and even "nature," are really a shorthand ways of describing particular historical outcomes of interaction episodes between real human actors. Social construction is a form of social action in which competing groups seek to define issues in terms that support their material interest and thereby reshape underlying material and social processes. The most common application of these perspectives by environmental sociologists is in the study of environmental movements. Robert Brulle, for instance, has extensively analyzed the American variety of environmental (and antienvironmental) movements in terms of how they embody different kind of "discourses" in American culture about the human–environment relationship (Brulle, 2000). I will return to his work extensively when discussing environmentalism in Chapter Eight.

Seeing the world, and even the environment ("nature"), as a social construction is a subtle but important point. To clarify, there *is,* of course, an external biophysical world that exists quite apart from human awareness and perceptions of it. Humans live within this world and its constraints, but importantly, they do so in terms of how they understand and define it. Furthermore, as noted earlier, people *cognize* the natural world and environment in very different ways, and I have described in some depth the ways that

people have cognized and constructed the environment variously at different stages of human development. It should be obvious that the *culture of nature*—that is, the ways we think, teach, talk about, and construct the natural world—is as important a terrain for action as nature itself (Ciccantell, 1999: 294–295; Hannigan, 1995; Wilson, 1992: 87).

CONCLUSION: ENVIRONMENT, ECOSYSTEMS, AND HUMAN SYSTEMS

This chapter ends by summarizing how environments/ecosystems and human systems impact each other, and by emphasizing what I just suggested, that every environmental problem is also a social issue.

The Human Driving Forces of Environmental and Ecological Change

Instead of a balance of nature or a "static equilibrium," ecological theory now emphasizes that some change and flux is the normal state of affairs (Lewis, 1994: A56; Miller, 1998). But environmental and ecological changes today differ from those of the past in at least two ways. The pace of global environmental change has dramatically accelerated, and the most significant environmental changes are now *anthropogenic,* caused by human impacts (Southwick, 1996: 345–348; Stern et al., 1992: 27). Indeed, everywhere you look there are signs of human modifications of the natural world: buildings, roads, farms, human-modified lakes, rivers, and oceans. Even the gaseous envelope surrounding the earth is becoming littered with human refuse—bits and pieces of satellite "junk" now in orbit. As nature recedes into the interstices of the planet, pristine wilderness is becoming so rare that there is concern with preserving the last natural refuges unmodified by human civilizations.

Four types of human variables are *proximate causes* or *driving forces* of environmental and ecosystem change: (1) population change; (2) institutions, particularly political economies that stimulate economic growth; (3) culture, attitudes, and beliefs—including social constructions and environmental problems; and (4) technological change (Stern et al., 1992: 75). Chapter Seven discusses another way of understanding environmental impact, as a joint product of population, the level of affluence, and technology (the $I = PAT$ model).

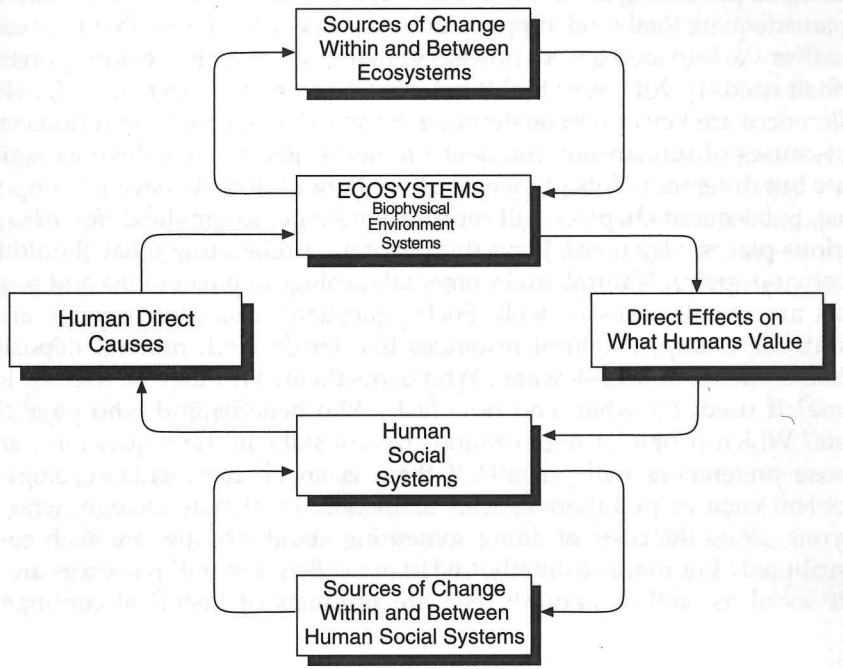
System Connections

These human "causes" of environmental change are themselves a complex system that not only produce changes in global ecosystems, but cause changes in each other through complex feedback mechanisms. They are

distinct but interdependent, and I am unwilling to argue that any is a "more basic" cause, as some scholars do.[5] It seems to me that given their interdependent character, doing so raises a number of chicken-and-egg arguments (which came first?) that are not very productive. I *do* think it is important to distinguish between more proximate causes (such as a particular technology or social forces that produce hunger or civil war) and more distant or underlying levels of causation (such as population pressure or global climate change). Which is more important depends on the time horizons and purposes of analysis.

Within the physical environment, ecosystems and human social systems are interconnected and interdependent, and the scope of human activity is now so vast and powerful that hardly any ecosystem in the world is free from human impacts. But each ecosystem has its own internal dynamics of equilibrium and change quite apart from human systems. Similarly, each human system has its own sources of change apart from being embedded in ecosystems. The important thing is to understand the connections by which the dynamics of human societies become the proximate causes of ecosystem change, and the parallel connections between ecosystem change and the things that humans depend on and value. These relationships are summarized in Figure 1.7.

Figure 1.7 Interactions Between Ecosystems and Human Social Systems
Source: Adapted from Stern et al., 1992: 34.



Intellectual Paradigms about Human–Environment Relations

Scholars from different disciplinary backgrounds have different assumptions about the "way the world works" and thus pose questions a bit differently. Here are three main scholarly paradigms about human–environment issues.

1. Natural scientists emphasize the implications of continuing *growth in scale in a finite world.*
2. Neoclassical economists "frame" the causes of human–environment problems in terms of more proximate causes of *market failure and resource allocation problems.*
3. Other scholars, including some economists, sociologists, and political scientists, frame human–environment problems broadly in terms of other proximate causes, seen as *social inequality and maldistribution.* These include, for instance, national and global patterns involving the vastly unequal distribution of wealth, political power, information, technology, and so forth.

Illustratively, the problem of hunger in the world can be broadly framed as (1) too many people making demands on limited natural and agricultural resources, (2) the overregulation and failure of free markets that make producing food unprofitable compared to other investments, or (3) an adequate total food supply, but hungry people so poor that they cannot afford to buy food and so powerless that governments are unresponsive to their needs (I will return to this issue in Chapter Five). Such paradigmatic differences are keys to understanding many debates about the seriousness and causes of human–environment problems. Reconciling them as legitimate but different points of view is difficult, but I don't believe it is impossible. Subsequent chapters will return to these paradigmatic differences in various places. *Stay tuned.* I end this chapter by reiterating what should be an obvious point. Natural environmental/ecological phenomena and problems are social issues as well. Social questions and controversies arise about, for example, natural resources like fertile land, mineral deposits, pristine forests, and fresh water. Who owns them? Will they be used or left alone? If used, for what, and how fast? Who benefits and who pays the costs? Which people or organizations have a stake in these questions, and whose preferences will prevail? If there is an environmental/ecological problem such as pollution, species extinction, or climate change, who, if anyone, bears the costs of doing something about it? How are such costs distributed? Put more abstractly, "what are called 'natural' resources are in fact social as well as natural; they are products of historical contingent

sociocultural definitions just as much as they are products of biochemical processes" (Freudenburg and Frickel, 1995: 8). Now, most scholars are aware that environmental problems and change cannot be understood, much less dealt with, in the absence of substantial contributions of the social sciences (Stern et al., 1992: 24).

PERSONAL CONNECTIONS

Consequences and Questions

1. What are some of the layers of culture and civilization that tend to insulate you from the natural world? How do they illustrate your embeddedness in nature? Think, for instance, about buying food in a supermarket: That which you normally understand as a consumer actually makes you a participant in vast food chains, energy, and resource transfers that nature never knew. What are some other examples?

2. When do you think about the natural world—when you see it on TV or in books (you know, breathtaking pictures of distant mountains)? Does your daily routine include being in the natural world? Do you normally experience nature with aesthetic appreciation, as a resource to be used, or as an instrusion to be minimized in an otherwise comfortable life?

3. The notion of worldviews is abstract. But look again at the description of the worldview of Western industrial societies in this chapter. Can you see any connection between it and you or your friends' perceptions about "the way the world works," or values about what is good and bad? How might this be reflected in the behavior of those around you?

4. What kinds of personal inducements are there to keep you or your friends consuming? Pressures from the expectations of others? Time? The media and advertising? What kinds of forces are there that inhibit you and others from adopting more environmentally frugal behavior? What's the connection among recreation, consumption, and waste in your life? How do you "have a good time"?

What You Can Do

"Think globally, act locally" has become a slogan (mantra?) of the environmental movement. If you are concerned about environmental problems, you do need to think globally about them. You also need to act locally, in your own corner of the world. But, you also need to act in ways that have

larger-scale relevance. Including a list of things you can do to "walk lighter on the earth" is common in books about environmental issues, and I mention some of these ideas in later chapters. Changing individual lifestyles is important, but not sufficient to address the environmental problems that beset us; powerful institutions and organizations operate beyond individual behaviors. But it does not follow that the actions or attitudes of individuals are irrelevant for larger-scale change. For now, I want to leave you with the notion that the individual matters. This was well put in the novel *Middlemarch,* by the famous British writer George Eliot: "The growing good of the world is dependent on individual acts." Renown anthropologist Margaret Mead had similar thoughts: "Never doubt that small groups of thoughtful, committed citizens can change the world; Indeed, it is the only thing that ever has." Think about how your life does, or could, embody this environmental ethos.

Real Goods

Let me tell you about something I have lately come to value, although I didn't for years: *Anne's garden.* My wife, Anne, likes to grow things. We live in an ordinary, older urban neighborhood, with brick and wood-frame houses and big established trees. The trees that shade the backyard are not fancy ones; in fact, a landscaper would call them "weed trees." There's an alanthus (sometimes called the tree of heaven), a mulberry tree, several Chinese elms, and a big cottonwood. I cut the grass—whatever grows, some blue grass and rye grass, but also a variety of weeds and clover that have taken root. By contrast, some of my neighbors spend lots of money having their lawns regularly doused with fertilizer, herbicides, and pesticides, and they have beautifully manicured bluegrass and zoysia moncultures.

Since we first lived there, Anne kept planting and tending flowers and vegetables. There are irises, day lillies, roses, crocuses, and tulips and other flowers, and in various years a mixture of green beans, snow peas, cabbage, brocolli, peppers, and tomatoes. The yard has attracted a variety of creatures: a tribe of entertaining and contentious squirrels, a multitude of bees and pollinators, summer cicadas and other bugs, garter snakes that nest under an upturned corner of an old driveway slab, a variety of birds that nest and feed, bats that hunt bugs on summer evenings. Sometimes—if you are very quiet after dusk—a family of hoot owls show up on their nocturnal prowl through the city. Oh yes, there's Jake, a feisty Jack Russell Terrier, who has pretensions to becoming a vicious top carnivore (but not as good at climbing trees as the squirrels).

What's the point? For a long time I just thought it was weird. But more recently it dawned on me that our whole backyard has become a mini-ecosubsystem of its own. A green leafy, vibrant, buggy urban polyculture (compared to the backyard of some neighbors) where something is always blooming and dying. I have come to appreciate why the English word *paradise* derives from a world in an ancient Mideastern language meaning "a small green garden." It is a small corner of the world that I have come to cherish as beautiful in its own right. Every winter I wait for its return.

Can you think of a place you know about that people experience similarly?

MORE RESOURCES

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ELECTRONIC RESOURCES

www.wri.org

Lots of data about environmental issues, problems, and programs

www.socio.ch/evo/index_evo.htm

Social and cultural evolution, links to many classical and contemporary dimensions (Sociology in Switzerland)

ENDNOTES

1. There were, of course, kings and political empires throughout much of human history. But these were different from modern nation states—with their greatly expanded social functions (e.g., economy subsidy and regulation, public education, and social welfare). Perhaps as important, modern nation states emphasize

sovereignty as involving the right, not just the coercive power, to rule. Similarly, organizations in the bureaucratic sense are relatively new social inventions that arose at about the same time as nation states. The major difference between modern organizations and those of antiquity is that in modern bureaucratic organizations, accountability and authority are vested in organizational statuses and structures rather than in persons. The importance is that modern organizations have greatly enhanced stability and continuity. The army of Attila the Hun and the pyramid-building crews of the Egyptian pharaohs were both personal empires that did not long survive their founders (the classic formulation of the features of bureaucratic organizations can be found in Weber, 1922/1958.)

2. While you should not overdraw the similarities between *Homo sapiens* and other animal species, it would be an equal error to dismiss human rootedness in the biotic world. The relative weights given to biological/genetic programming versus cultural learning as causes of the behavior of humans and other species is a perennial debate that surfaces about every decade in new guises. But this is surely a matter of degrees of difference rather than sharp differences of kind. It is, I think, a matter of "both–and" rather than "either–or." To say that, of course, only concedes an abstract principle and gives no help in knowing specifically how much of which to emphasize in what circumstances. New versions of this heredity–environment debate have been shaped in the subdiscipline of biology that has come to be called *sociobiology.* For more about this see Barash (1979), Maryanski (1998), Van den Berghe (1977–1978), and Wilson (1975).
3. Linear (arithmetic) growth is additive (1,2,3,4,5,6,7 . . .), while exponential growth squares each new number (2,4,8,16,32,64 . . .). If Malthus was correct about this, then you can see his point about the inexorable tendency for population to outstrip supply.
4. For instance, the ability to consume "more" (with environmental consequences) is taken as a measure of growth, progress, and social status. Indeed, the notion that consuming "more" is always preferable to stopping growth of consumption is so deeply embedded in American culture that the question "How much is enough?" appears unnatural. Materialism as a value (or temptation) is, of course not new or unique to modern societies. Indeed *all* of world religions that emerged in preindustrial agrarian societies, whatever their disagreements about religious world views agree in denouncing the elevation of material consumption into a paramount principle of life. Here are some citations from sacred texts of world religions that illustrate the point:

   - Christian: "It is easier for a camel to go through the eye of a needle than for a rich man to enter the kingdom of God." (Matthew 19:23–24)
   - Jewish: "Give me neither poverty nor riches." (Proverbs 30:8)
   - Islamic: "Poverty is my pride." (Muhammad)
   - Hindu: "That person who lives completely free from desires, with longing . . . attains peace." (Bhagavad-Gita, 11.71)
   - Buddhist: "Whoever in the world overcomes his selfish cravings, his sorrows fall away from him, like drops of water from a lotus flower." (Dhammapada, 336)
   - Confucian: "Excess and deficiency are equally at fault." (Confucius, XI.15)

   Source: Durning (1992)

5. In what has come to be called the Ehrlich–Commoner debates among environmental scientists, biologist Paul Ehrlich has argued that population growth is the most important driving force for environmental change and problems (1974, 1992), while zoologist Barry Commoner has argued that advanced industrial technology is a more important and powerful cause (1971). Among many others, sociologist Alan Schnaiberg emphasizes the importance of the institutional arrangements, and in particular the political economy (1980). Other analysts, including social theorist Talcott Parsons, view culture, values, and paradigms as the most basic forces that sanction and limit the other variables.