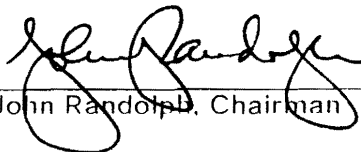


**Sustainable Development: Political/Ideological Aspects and Implications for
Planning**

by
Richard A. Roth

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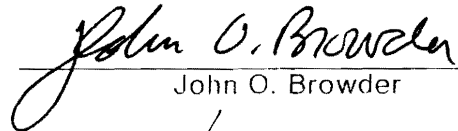
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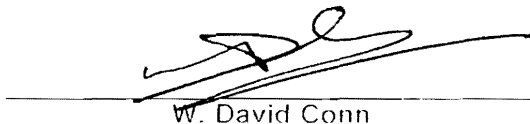
John Randolph, Chairman



Sandra S. Batie



John O. Browder



W. David Conn



William E. Cox

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(ABSTRACT)

Recent evidence of widespread environmental degradation and global changes resulting from human activities have revived a debate about the sustainability of the progress of human welfare that began at least 200 years ago. In this renewed debate, the seriousness and causes of environmental degradation are subject to widely divergent interpretations. There are many conceivable sustainable futures; the most important differences among them are not technical but political and ideological.

The practice of environmental planning is concerned with a wide variety of contexts and situations at the human-environment interface. Because land use is at the root of many of the problems of environmental degradation (e.g., habitat destruction, air pollution, water pollution), land use planning is an appropriate focus for consideration of the role of environmental planning in sustainable development.

Planning as a profession, with its inherent future orientation and focus on public values, is well situated to deal with the kinds of problems raised in the discourse regarding sustainability. Examination of mainstream land use planning practices, however, reveals a reactive, reformist incrementalism that responds to environmental degradation caused by growth, but that addresses neither its causes nor its dynamics. Mainstream land use planning approaches have attempted to resolve conflicts between development and environment through spatial solutions at various scales. The need to plan for ecological sustainability is difficult to reconcile with the democratic ideal of local self-determination.

Many alternative approaches to land use planning for sustainable development focus on design solutions. The requirements of sustainability are not merely technical, however. There are both emancipatory possibilities and their opposite in sustainability. Implementing sustainability offers planners a number of choices. They can act as mediators, demystifiers of technical information, exposers of hidden ideological assumptions, and advocates. They can strengthen existing authority, or work towards an enlightened self-determination at the local level.

Abstract

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Introduction

Is there a “global ecological crisis”? Many scientists, along with citizens throughout the world, believe that a global crisis is either upon us or is imminent. Even those who are not catastrophists acknowledge that the current trajectory of global population, resource use, and technology, if not altered, is likely to end in a world that is significantly less accommodating to human survival and welfare. There is considerable evidence to support the claims of both catastrophists and optimists, but the fact that global catastrophe is even considered to be a real possibility, much less a likelihood, justifies serious concern and consideration. Sustainable development is a term that has gained broad acceptability as a response to the threat of global ecological crisis. What exactly sustainable development means, however, remains unclear.

As a profession that is concerned both with preparing for the future and with development, planning especially must concern itself with the meaning and concrete implementation of sustainable development. Moreover, if sustainability is to be realized, planning must play a role. Much planning thought and most planning practice, however, remains focused on the short-term and the immediate. Especially in land use planning, where the consequences of decisions are long-lasting or even irreversible, such myopia is inexcusable. Planners, both practicing and academic, have only begun to grapple with the implications of and possibilities lying within a transition to sustainability.

Outside of planning thought *per se* there have recently been important developments in philosophy, ethics, and social theory, both in response to the challenge of sustainability and in response to changing social conditions. Planning theory, much less practice, has only begun to recognize the implications of some of this social theorizing and the momentous possibilities for social change that it foresees as a result of global ecological crisis. In particular, the potential for global ecological crisis has important political implications for planners. Sustainable development con-

tains potentialities for both repressive and emancipatory social change, and planners must consider carefully the implications of their practice.

The purpose of this research is to address and where possible answer the following questions:

1. What is the evidence that a global ecological crisis exists or is imminent?
2. What are the roots and dimensions of the concept of sustainable development?
3. What are the claims of alternative paradigms in interpreting the crisis, and how can these alternative paradigms enlarge and enrich an understanding of the nature and dimensions of sustainability?
4. What challenges does environmental planning face, both theoretical and contextual, that are likely to shape its response to sustainable development?
5. What understanding of sustainability, and what implementation strategies, are demonstrated by current land use planning practices?
6. What are the strengths and limitations of such practices and, by implication, of the understanding of sustainability that they imply?
7. What alternative approaches to sustainability have been proposed by planners? How are they related to the alternative paradigms within which sustainability can be interpreted? What are their strengths and limitations?
8. What roles are implied for planners by the transition to sustainability? How must environmental planning change to respond to sustainable development? What are the political/ideological choices involved in adopting a particular approach to sustainability?

The research is exploratory and integrative in nature. My intent is to explore the meaning and dimensions of sustainable development, and then to follow the implications of sustainability to land use planning as a central activity of environmental planning.

A word on terminology may be helpful. The domain of environmental planning is somewhat difficult to differentiate from "urban planning," "regional planning," and "natural resources planning." The differences, though real enough, are more con-

textual than functional. A definition of environmental planning is offered in a later chapter, but it should be said at the outset that this dissertation focuses on the practice of planning at the local/regional level. There, although environmental planners may find themselves dealing with the full range of environmental problems and conflicts, they are primarily concerned with *land use* and its environmental effects. Thus land use planning is the central concern of environmental planners at the local level.

Structure of the Argument

In order to relate environmental planning to sustainability, I have undertaken a thorough review and assessment of concepts of sustainability and development found in the literature. This review begins, in Chapter 1, with a drawing together of the major strands of thought that historically contributed to the emerging concept of sustainable development: Malthusian and neomalthusian arguments, recent global studies including the well-known study by Meadows and others (1972), *Limits to Growth*, the World Conservation Strategy (WCS; IUCN 1980) and the report of the Brundtland Commission (WCED 1987a), as well as the Progressive Conservation movement in the U.S.

The central problem for which sustainable development is presented as a solution is the need to maintain in perpetuity a healthy and sustaining environment while at the same time continuing a process of development to meet human needs. The problem of sustainability has been addressed at a variety of scales from the local to the global, and several of the major currents of thought that contribute to the modern concept of sustainable development arose in response to environment-development conflicts at the local and regional levels. However, it is only in the past three decades that widespread concern has arisen over the possibility of global ecological collapse; it is this concern to which such documents as the WCS and the Brundtland report respond. In order better to assess the basis for claims of potential global collapse, I have reviewed published evidence of global environmental degradation and summarized it in Appendix A.

In the body of the dissertation, however, I have tried to analyze and articulate the interpretations of sustainability and nonsustainability in all their dimensions as they appear in the literature. Actually, it is misleading to speak of "the literature" on sustainable development; rather there are several literatures, within which there is

discourse but between which there is little interchange or cross-fertilization. The examination of these literatures, which in effect represent different paradigms, without a prior ruling any "out of bounds," allows for a richer, more comprehensive understanding of sustainable development in all its dimensions than would be possible within any one of the paradigms. This analysis takes place in Chapter 2.

The second part of the dissertation (Chapters 3 through 7) moves from a more theoretical, conceptual discussion of sustainable development to a focus on the theory and practice of environmental planning in the U.S. In Chapter 3, I describe a preeminent style of planning practice and its theory. By virtue of its conceptual foundations and its context, mainstream environmental planning is situated within the dominant social paradigm. However, both its conceptual foundations and its context are undergoing rapid change. Environmental planning, in the face of such challenges, must respond or risk becoming irrelevant or worse, an obstruction.

In Chapter 4 I look at a more specific manifestation of development: development of the land in the context of the United States as a local phenomenon. Patterns of land development in the U.S. have changed considerably in the decades since World War II, and the current trend toward sprawl is arguably unsustainable. Urban sprawl is the result of a number of factors, and there are competing explanations of why urban development takes the particular form it does. Nonetheless urban sprawl is considered a primary manifestation of a nonsustainable form of development, considered both locally and in the global context. It is also an enduring object of the attention of land use planners. The extension of supply lines from U.S. cities to include the farthest reaches of the planet, in effect turning many less-developed countries into hinterlands, is another aspect of the nonsustainability of U.S. cities.

In Chapter 5, I further elaborate the approaches to land use planning that are emblematic of mainstream environmental planning's strategies for sustainable development. In order to help ground and enrich the analysis, and to depict in greater detail the way sustainability is conceptualized (albeit implicitly) and pursued within mainstream environmental planning, several widely recognized and acclaimed examples of land use planning for sustainability are examined. The major approaches used include compartmentalization and preservation, mitigation, and the imposition of regional and state control of land use practices. These mainstream approaches -- technological "fixes" and increasingly centralized authority over local land use -- tend to respond only to the problem of sustainability as conceptualized within the dominant social paradigm.

It is left for alternative planning approaches (Chapter 6) to attempt a more comprehensive resolution of the problem posed by sustainability -- that is, to address the positive possibilities of the environmental problematic for the enhancement of community and the rejection of an increasingly alienated, dehumanized culture. There are several alternative approaches identifiable in the planning literature, including "regional revisioning," designs for sustainable cities, and the various utopian and ecotopian community designs. While such conceptual and design exercises may not find immediate (or even eventual) implementation, they are still useful in a heuristic sense, to stimulate the imagination and provide a vision of what could be (an important function of planning).

The necessity of far-reaching change, not only in the sphere of production (the more limited sense of sustainability espoused by the dominant social paradigm) but also in the social sphere -- "where people live" -- offers planners a number of functions and choices. The provision of accurate information on ecological issues to not just decisionmakers but the lay public, so that they can fully understand the choices before them and their consequences, is a task well suited to planners. Planners can act as mediators, demystifiers of technical information, exposers of hidden ideological assumptions, and advocates. The implementation of sustainability contains both emancipatory possibilities and their opposite. Planners can function to strengthen existing authority or they can work towards enlightened self-determination at the local level.

Chapter 1: Origins of Sustainable Development

Introduction

That there are natural limits to the growth of populations and economies was originally proposed by Malthus and has recently reappeared as the “limits to growth” debate. This controversy has smoldered since Malthus’ time, occasionally flaring up as some crisis of resource availability is reached. The limits implied by Malthus’ “dismal theorem” have historically been pushed back again and again by human ingenuity. The historical record notwithstanding, there are indications that current trends, documented by mounting evidence and accompanied by a chorus of dire warnings from scientists, may indicate a situation qualitatively different from the local/regional resource shortages and episodes of environmental degradation (e.g., deforestation in the Mediterranean region) that prompted Malthus to write, one that requires a thoroughgoing, fundamental rethinking of development.¹

“Sustainable development” is the term used to indicate the whole breadth of ways of thinking about development in response to the challenge of global environmental degradation. While it is used differently in different contexts and probably conceals more than it reveals, still the basic idea -- appealing in its apparent simplicity -- has stimulated a great deal of discussion. One could almost say that it is revolutionizing the way that the relationship between the environment and development are thought of.²

¹ As well as a rethinking of that theory of economic development, neoclassical economics; see, for example, Daly and Cobb 1989.

² Although sustainable development has frequently been criticized as conceptually vague, I would tend to agree with a comment quoted by Tisdell (1988, p. 382) that “a vague definition is better than spurious precision and much better than ignoring the issue.”

“Sustainable development” weaves together a number of strands of thought, some with very long lineages. The purpose of this chapter is to begin to unravel some of those strands by examining their various origins. I begin by reviewing the intellectual predecessor of the “limits” debate, the controversy in economics started by Malthus. More recent developments that have contributed to the evolution of the concept of sustainable development include global studies, international conservation efforts, the progressive conservation movement in the U.S., and the Brundtland Commission’s work.

Malthus and the “Dismal Theorem”

The name of Thomas Robert Malthus is frequently (though not entirely justly) associated with pessimistic perspectives on the condition and prospects of humankind. It was Malthus’ work, or at least the popular understanding of it, that led to the characterization of economics as “the dismal science.”³

Malthus’ theory of population, as demographics and as economics, has long been argued.⁴ In essence, Malthus proposed that, *obeying a natural law*, populations whether of humans or any other form of life are characterized by an unrelenting fecundity that, in the absence of any constraints, would cause their numbers to increase geometrically *ad infinitum*. They are prevented from doing so “by want of room and nourishment” (Malthus 1890, p. 2) in the case of plants and animals, and in the case of humans by constraints that can be placed into three categories: moral restraint, vice, and misery. Moral restraint and vice (e.g., infanticide) are preventive checks upon human population; in societies where these fail or are absent, popu-

³ As Charbit (1983) points out, interpretations of Malthus’ work have been used as ideological ammunition by both sides of the political spectrum. In general, conservatives and defenders of the existing social order have emphasized his arguments in *Essay on the Principle of Population* (and their later reconstitution as social Darwinism) that charitable and public relief efforts to alleviate poverty can only be self-defeating. Socialists and Marxists targeted Malthus’ casting of his argument in terms of natural law; they insisted that the causes of poverty were social and economic, not natural and inescapable.

⁴ For a collection of mostly economic critiques, see Wood (1986); the collection edited by Dupaquier (1983) contains numerous papers in historical demography aimed at rediscovering and reassessing Malthus’ ideas.

lation will increase -- must increase, according to Malthus -- until it outstrips the means of subsistence and is checked by starvation and misery.

Malthus's theory was developed during a time when there was considerable speculation about the earth's population -- what its absolute size was, whether it was increasing or decreasing, whether it was smaller or larger than it had been, and what its increase or decrease implied for the progress of human welfare. The controversies regarding population had their roots in the so-called Quarrel Between the Ancients and the Moderns, from which the Enlightenment conceptualization of progress discussed in Chapter 2 also emerged. The philosophers of progress were either unconcerned about population or, in some cases, thought that the population problem consisted of shrinking or too-slowly increasing human numbers (Glacken 1967). Only five years before Malthus published his *Essay* (in 1798), the Marquis de Condorcet, writing on the question of population and human progress, gave a cautiously optimistic answer: population might be a problem at some time in the future, but before it was able to cause any diminution of human prosperity, people would limit their reproduction or in some other way successfully deal with it (de Condorcet 1955, p. 188-189; cited in Glacken 1967, p. 635).

Based as they were on the sketchy and unreliable data available, the specifics of Malthus' theory are less interesting than the general idea -- no more palatable in his time than in ours -- that the earth might not be able to provide food for such numbers of people as could conceivably populate it.⁵ Indeed, even his great generalizations regarding population growth and the checks to it, if taken as empirical findings, are patently false; if taken as hypothetical propositions, they are tautological (Davis 1991, p. 3). Population growth is not limited in most instances by lack of food, but by mortality, war, and disease. Furthermore, Malthus' theory discounts the potential held by technological advance, input substitution, and, in general, the unique contribution of culture to the relationship between humans and the biosphere. History has not borne out Malthus' theorem (so far).

⁵ If it could, the world would become unbearably crowded, and Malthus points out, in a passage that among other things seems to anticipate Liebig's Law of the Minimum, that "[a] benevolent Creator then, knowing the wants and necessities of his creatures, under the laws to which he had subjected them, could not, in mercy, have furnished the whole of the necessaries of life [here he refers to food] in the same plenty as air and water." (Malthus 1820, pp. 227-228, quoted in Glacken 1967).

Wilkinson (1973) has developed an updated model of the relationship between population, technological change, and poverty that has been compared to Malthus' by Kenneth Boulding, in his introduction to Wilkinson's book. Boulding, referring to Malthus' theory of population and subsistence as the "dismal theorem," sees Wilkinson as advancing what Boulding refers to as the "'utterly dismal theorem' -- i.e., that, if the only thing that can prevent the growth of population is misery, then any improvement in technology will eventually enable a larger population to be miserable and so will increase the sum of human misery." (p. xv).

This is a fair reading. The thesis of Wilkinson's book is that economic development is a response to conditions of poverty brought about by ecological disequilibrium. Ecological equilibrium is a pattern and rate of resource use which the environment can sustain indefinitely. It is consistent with cultural stability from the point of view of subsistence and production. Using evidence from numerous anthropological and historical studies of both prehistoric and historic cultures, Wilkinson develops the argument that cultural evolution tends towards the development of conditions of ecological equilibrium, in a manner analogous to that in which natural communities develop into stable, "climax" communities in which energy and material cycles are "optimized."⁶ Human societies, at least stable, "preindustrial" ones, tend to limit their populations to a size where income per capita is maximized given existing systems of organization and production.⁷

In natural communities, animals control their numbers through population-limiting mechanisms (e.g., territoriality, which ensures a maximum population density). Human societies have traditionally developed cultural mechanisms to stabilize their populations relative to a given level of production technology and a given natural resource base. It is only when there is environmental change or cultural change that disrupts the balance that innovation occurs. When it does occur, says Wilkinson, it is not to increase efficiency in the production of the necessities of life, but rather to increase the level of environmental exploitation, i.e. the quantity of the means of subsistence from the environment.

⁶ Of course, there are no truly static societies; all societies change, but their rates of change may be vastly different. Some may have been so slow as to approximate rates of biological evolution.

⁷ What this means is that popular conceptions of primitive societies being in a perpetual state of hardship are wrong. The misconception is based upon observations of societies already disrupted by a breakdown of traditional ways, and is perhaps colored by ideology.

Societies most often move out of ecological equilibrium because of a breakdown in cultural restraints on population growth. Under pressure of an increasing population, established techno-economic systems are extended; only when their limits are reached and subsistence is threatened is innovation pursued. In this context, the changes which constitute development (for example, movement from a subsistence agriculture-based economy to an industrial one) are not, as is conventionally held, necessarily a move toward greater welfare, although they may be. On the contrary, such changes are only experienced as improvements in the context of declining living standards brought about by ecological disequilibrium. The mere desire for material accumulation is rarely if ever the stimulus to economic development; indeed the lack of material surpluses and of a nonproductive class, which are usually taken as the hallmark of a regime of scarcity in traditional societies, is argued to be rather an indication of abundance in the means of subsistence in societies in ecological equilibrium. Furthermore, Wilkinson marshals considerable anthropological evidence that any gains in efficiency are, in such stable societies, likely to be used toward more leisure rather than to increase consumption or accumulation.

In industrial societies, continuing technological advances would seem to ensure the end of the "production problem." Wilkinson admits that they might, but only if population could be controlled. In the absence of population control, continuing economic development in industrialized societies becomes less a matter of progress than of adaptation to necessities.

Looking at economic development in its ecological setting effectively removes the idea of progress from the central position it has occupied in our view of the process. Instead of regarding development as a matter of "progress" towards a "better life" motivated by an incurable dissatisfaction with our present lot, we see that it is a process of solving a succession of problems which from time to time threaten the productive system and the sufficiency of our subsistence. In effect, human societies out of ecological equilibrium have to run to keep up: their development does not necessarily imply any longterm improvement in the quality of human life. (pp. 105-106)

There are problems with Wilkinson's argument. His account of the leisure preference of traditional societies seems, at least from the modern western perspective, counter-intuitive. However, there certainly are many examples of nonwestern societies in which accumulation did not seem to be a major motivator of labor or technological advance. Wilkinson's model similarly may be found objectionably far-fetched in its apparent rejection of one of the fundamental beliefs of modern society: that technological change and economic growth together have improved human welfare

over the preindustrial state. But Wilkinson does not insist that technological change is incapable of yielding a net improvement. Indeed, he claims that one could read his argument as an optimistic one, since humans have so far successfully adapted to the challenges brought about by population increase and cultural change.

Despite its unwelcome message, Wilkinson's description of the course of human history as being one of periodic crises of ecological disequilibrium, at first local, then national or regional, and now global, at least makes comprehensible the recurring bouts of malthusianism experienced in the West: "almost each generation seems to rediscover Malthus, to revise the nature of the numerator of concern, and to extend the denominator of population." (Kates and others, 1990, p. 14). Malthus was concerned with the regional population and availability of agricultural land for food in England and Wales; in the late 1800s in the United States a dire shortage of trees for timber and fuelwood was predicted, giving rise to conservation and sustained-yield forestry. Today, the neomalthusian concern is global in scope and includes biodiversity and the maintenance of biospheric life support systems. To place today's concerns in historical perspective is not to denigrate them or to suggest that, because past crises have been overblown or overcome, we need not worry about the types of trends reported in *Limits to Growth* (Meadows and others 1972) and many other places. There is much evidence to suggest that we are currently in the midst of a crisis of unprecedented scope and depth, and past successes offer no guarantees. At the very least, we can expect that changes commensurate with the crisis will be necessary.

While Malthus' model may be deficient as a scientific explanation or description of the relationship between population and resources, the general idea that there are natural or environmental or nonhuman limits to population growth and prosperity has persisted in various forms ever since he proposed it. In the final analysis, debates about whether there are environmental limits to human population growth *in principle* may be pointless; one may reasonably assume that there are, ultimately (one cannot, for example, have infinite expansion in a finite space). Moreover, to conceptualize the problem in the terms in which Malthus originally framed it -- as one of scientific laws relating numbers of human beings to availability of food -- is probably more appropriate to nonhuman populations than people.⁸ Nonetheless, the effort to analyze

⁸ Indeed, Darwin's reading of Malthus provided many of the insights necessary to his theory of natural selection (Glacken 1967, p. 624 n. 6).

human populations in terms of biological or ecological science, and to predict the consequences for human societies based upon population projections and other data, has continued since Malthus' day.

Neomalthusianism

The term *neomalthusian* has been used historically to describe a number of groups and perspectives, including advocates of family planning, population control, birth control. Most recently it has been applied to the authors of *Limits to Growth* as well as a number of other scientists (mostly biologists and ecologists) concerned with ecological limits to the growth of human societies. Like Malthus, these "neomalthusians" are concerned with the size of the human population in relation to the resources needed to sustain it; unlike Malthus, they have access to some powerful theoretical concepts (e.g., cybernetics, general systems theory, ecosystem), vastly improved analytical methods, and huge quantities of data.

Limits to Growth

The publication of the Club of Rome report, *Limits to Growth*, in 1972 (Meadows and others, 1972) spectacularly rekindled the debate begun by Malthus. Its thesis was that if patterns of resource use, population growth, pollution, and capital accumulation and depreciation were not significantly altered, there would be catastrophic consequences on a global scale in the foreseeable future. It is worth quoting its principal conclusions (p. 29):

1. If present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.
2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has an equal opportunity to realize his individual human potential.
3. If the world's people decide to strive for this second outcome rather than the first, the sooner they begin working to attain it, the greater will be their chances of success.

The Club of Rome report electrified the nation and made environmentalists out of many who were previously unaware of the potential consequences of continued growth. The publication of *Limits*, or perhaps the publicity and widespread popular acceptance that followed, occasioned a firestorm of academic criticism. Its conclusions were viewed by many as a reprise of the arguments first made by Thomas Malthus in his *First Essay on Population* nearly two hundred years ago. Economists in particular tended to interpret the report's projections of disastrous possible outcomes in terms of the controversies over Malthus' thesis, which they considered long since settled. Many of the criticisms, especially those pertaining to assumptions and methodology of the report, were valid. Others seemed motivated by outrage and denial, or were essentially ideological. The intense scrutiny of the report was altogether appropriate to the gravity of its subject matter, no matter what the motivation of the reviewer.

Rostow (1979), with the advantage of several years of reflection and observation of the debate that ensued after publication, praises the report "for dramatizing effectively a real set of problems" (p. 9). He sees, however, five "serious weaknesses" in the report: (1) the global terms of the analysis make it both abstract and prone to ignore many important dynamics and variations at a sub-global level; (2) its factual basis is weak (a point conceded by the authors in their response to certain critics (Meadows and others 1973)); (3) the treatment of technological and resource constraints is misleading, especially the assumption of diminishing returns in agriculture and resource use; (4) the lack of a price mechanism means that various compensatory mechanisms existing in markets (i.e., induced innovation, substitution, reduced consumption) are not taken into account; and (5) the authors' prescription -- an end to growth -- is not politically, socially, or psychologically viable. Rostow does not seem particularly perturbed by the methodology -- the use of large computer models to understand issues with important policy implications -- as were some other critics of *Limits* (e.g., Cole and others 1973).

The third and fourth limitations of the model have been found especially egregious by a number of critics (e.g., Cole and others 1973; Kahn 1979; Simon 1981; Kahn and Simon, 1984), and with good reason -- the global model's results might have been quite different had price mechanisms been included. Moreover, the "human factor" -- the effects not merely of incremental technological changes but more importantly of human reflexivity, changes in preferences, attitudes, and values, as well as the irrational or benevolent -- were not and perhaps in principle could not be taken into account.

A retrospective examination of the arguments pro and con reveals considerable misunderstanding and misattribution, as well as many convincing arguments. As Clark (1987, p. 9) put it, “[t]he rhetorical gifts of advocates on both sides of the debate have been so strong as to leave many bystanders... under the spell of whichever has been most recently encountered.” Without repeating all the arguments on both sides of the debate, the differences seem to come down to differences with respect to (1) relative risk aversiveness (or, to put it differently, different evaluations of who and what may be put at risk); (2) faith in technology and markets; and (3) fundamental values concerning humanity and its place in the world. The ideological and value aspects of sustainable development are explored in more detail in the following chapter.

Whatever the ultimate merits of *Limits to Growth*, it is interesting to note that several other global modelling efforts were undertaken since the original Club of Rome study with generally consistent results (Caldwell 1990, citing *Global 2000 Report*, Meadows 1982; OTA 1982; Bremer 1987; and Toth and others, 1989). It may also be interesting to note that several of the principal authors of *Limits to Growth* have recently published an update, using recent data (Meadows and others 1992). In its preface (reprinted in *In Context* No. 32) the authors state that its message is that “the human world is beyond its limits. The present way of doing things is unsustainable. The future, to be viable at all, must be one of drawing back, easing down, healing. Poverty cannot be ended by indefinite material growth; it will have to be addressed while the material human economy contracts.”

Global Change Research

However justly the authors of *Limits to Growth* and such ecologists as Garrett Hardin (e.g., Hardin 1977) and Paul Ehrlich (e.g., Ehrlich and Ehrlich 1990) were tarred with the malthusian brush, their work is part of an ongoing endeavor to take stock of global trends and ascertain the state of the planet. One of the first to make such an effort was George Perkins Marsh, who published *Man and Nature* in 1864. Long celebrated among ecologists and environmentalists, *Man and Nature* was the first attempt at a comprehensive description of the undesirable changes in the natural world that resulted from human intervention. Marsh warned, in the strongest possible terms, of the consequences of human greed and ignorance upon the landscape. Nature was not limitless in abundance, nor could it withstand human abuse for long; irreparable changes, such as desertification, soil erosion, and extirpation of species would result.

Such changes, observed by Marsh around the Mediterranean and as reported by others, formed the basis for his conclusions. Marsh, however, was no deep ecologist; he affirmed that man should subjugate nature, but that he should do so wisely and with great care.

It was almost a century before anyone attempted another look as comprehensive as Marsh's at human impact upon the natural world. The international symposium held in Princeton in 1955, the results of which were published under the title, *Man's Role in Changing the Face of the Earth*, (Thomas, 1956) was, compared to Marsh's work (in honor of which the symposium was organized), remarkably sanguine about human impacts on the natural world. With few exceptions (among them Kenneth Boulding and Lewis Mumford), the participants were optimistic that rationality and the ethics of scientific conservation would ensure the unimpeded march of human progress (Lowenthal 1990).

Since the 1960s, global environmental assessments have been published with increasing frequency. *The Limits to Growth*, whose conclusions were quoted above, is probably the best known. Kates and others (1990, p. 4) list no fewer than "seventeen works published in English since 1956 that meet the following criteria:⁹

1. an emphasis on human-induced change in biosphere, earth, environment, or nature;
2. a global-scale perspective;
3. concern with multiple sectors, areas, states, or flows; and
4. an assessment, inventory, or stocktaking of change."

The more recent of these works (e.g., Clark and Munn, 1987; Turner and others, 1990) take advantage of vast increases in the amount and quality of data available, new analytical methods, and improved theoretical understandings in the natural sciences and, to a lesser degree, in the social sciences. As a group, they point to several

⁹ According to Kates and his fellow authors, one trend of note has been a proliferation of such global assessments issued by 'agencies and institutions committed to positions of advocacy.' (Kates and others, 1990, p. 4). Among these might be included the Worldwatch Institute annual series (Brown and others, various years), as well as the 1984 collection edited by Simon and Kahn (Simon and Kahn, 1984).

developments in the relationship between human societies and “the environment” -- i.e., the biosphere.

- Human interference in biospheric processes at an unprecedented scale, as a result of both population increase and the spread of industrial technologies.
- Vastly increased complexity among the interactions between economic activities and ecosystems, including various components interacting simultaneously and with cascading and feedback effects.
- Recognition that perturbations may be persistent and even irreversible.
- Recognition that the technoeconomic system of production and consumption is rapidly becoming global, and that events such as changes in energy prices or seasonal rainfall in food-producing areas affect deforestation, consumption of biomass for fuel, and the pushing into production (and subsequent degradation) of marginal land.

The convergence of these developments has given rise to new perspectives and a field of inquiry: global change research. So far, however, the work has been primarily descriptive and synthetic, not prescriptive. It has for the most part been driven by scientific methodologies and quasi-scientific theories, most prominently systems theory and ecosystems ecology. The work has addressed itself to identifying trends, modelling relationships, quantifying flows and feedbacks, and predicting likely consequences for system components and for subsystems. For the most part its epistemology has been strongly positivist, its models mechanistic, and its methodologies reductionistic with respect to both natural and social systems. For the most part it has ignored what cannot be readily quantified (e.g., aesthetics) and couched its recommendations, where it has made them, in the flat, technical language of science. Questions of value and of social ends, overarching themes with which politics, ethics, and political economy have traditionally concerned themselves, are avoided where possible. A more serious criticism, which provides a major problem for some environmentalists who use and depend on the information from global change research, is that the ideology of science, its reductionistic, centralizing, decontextualizing tendencies and its view of nature, only perpetuate the kinds of perspectives and social organization (centralization, large-scale, top-down solutions) that some argue (see Chapter 2) have caused or abetted our current predicament in

the first place.¹⁰ The summarizations (and, to a lesser degree, the predictions) of the human environmental predicament provided by global change research, nonetheless, are invaluable.¹¹

The limits to growth controversy, to summarize, is the latest expression of a debate that has recurred periodically throughout modern history. The current reprise is based upon evidence of environmental degradation that is unprecedented in scope, and of levels of human activity that are very high and increasing rapidly (See Appendix for a review of this evidence).

The World Conservation Strategy and the Brundtland Commission

The World Conservation Strategy (IUCN 1980) and the report of the World Commission on Environment and Development (WCED 1987) (also known as the Brundtland Commission after its chair, Gro Harlem Brundtland, and published as *Our Common Future*), represent two major summations of the evolving thinking in the international community with respect to sustainable development. Adams (1990) offers a fairly detailed history of the various influences leading up to the concept of sustainable development elaborated in these documents.

Their origins, he says, lay in several areas. One was the development of concern (mainly by Northerners) over wildlife populations in developing countries, especially in Africa. These concerns led to the eventual establishment of the International Union for the Protection of Nature (IUPN) in 1949. Not surprisingly in the context of

¹⁰ It can be and has been argued that the major insights of ecology, as well as the emergence of new hypotheses such as Gaia (Lovelock 1979), are creating a "new science" that will not be guilty of complicity in the destruction of the earth. This may be true, but science's effect thus far has been "paradoxical and often contradictory" (Caldwell 1990, p. 192).

¹¹ James Westcoat, Jr. (1991, p. 86) has pointed out the striking similarity between what global change researchers do and the role of scientists in the House of Solomon of Bacon's utopian New Atlantis (Bacon 1624, in *New Atlantis*, p. 302). There, the scientific technocrats "...declare natural divinations [i.e., scientific forecasts] of diseases, plagues, swarms of hurtful creatures, scarcity, tempests, earthquakes, great inundations, comets, temperature of the year, and countless other things; and we give counsel thereupon, what the people shall do for the prevention and remedy of them." (emphasis Westcoat's).

colonialism and post-colonialism, the agenda of the IUPN (which became the IUCN -- the International Union for the Conservation of Nature and Natural Resources -- in 1950) was viewed skeptically by governments in the developing nations containing the wildlife. In response to the concerns of the host country governments, some of IUCN's initiatives for wildlife preservation included provisions for development and were thus a precursor of sustainable development (Boardman 1981; cited in Adams 1990). This trend, toward consideration of development by conservation-oriented international organizations, continued throughout the 1950s and 1960s. As Adams (1990, p. 32) puts it, "[c]onservationists within IUCN and organizations such as UNESCO realized increasingly through the 1960s that they could not influence decisions about the use of natural resources in the Third World unless they were prepared at least to talk in the new language of development."

This increasingly integrated approach (at least on a conceptual level) to conservation and development was evidenced in the Man and Biosphere (MAB) program launched under the auspices of the United Nations after the 1968 'Biosphere Conference' held in Paris. MAB's aim was to develop a scientific basis for understanding relations between culture and environment in a global context, and for making more rational decisions regarding conservation and use of natural resources (Gilbert and Christy 1981). A number of projects were launched under MAB to improve understanding and management of human-environment interactions in "special" environments (e.g., island ecosystems, arid lands) or in cases of large-scale development projects. According to Adams (p. 34), at least some of MAB's projects "have a good claim to be the forerunners of 'sustainable development' thinking, linking natural ecosystems and human use in an innovative or wholly research-based structure."

The "biosphere reserves" program was one of the more visible of MAB's initiatives. The biosphere reserve concept was an application of what ecologist Stanley Cain (1970; cited in Gilbert and Christy 1981) called "ecological planning" and described as a kind of regional or landscape planning. While these reserves in developed countries have tended to be amenity-focused, protected wilderness areas, within developing countries there is a deemphasis on amenity and an attempt to balance preservation with productive use. According to Goodland (1985), pressures on biosphere preserves in developing countries, both from the poor and from the rich, are great. Both Adams (1990) and Redclift (1987) point out the limitations of the biosphere reserve approach in developing nations, limitations inherent to "a model derived from the experience of countries in which environmental management is very far from being a livelihood struggle" (Redclift 1987, pp. 142-143). This model, ac-

According to Adams (1990, p. 36), incorporates a vision that reappears in the concept of sustainable development of the WCS: “conservation integrated with and serving some rather vaguely defined human (and hence economic) purpose.” However, even in developed countries, compatibility of human activities with ecosystem preservation goals may be difficult to achieve outside of national parks, as an examination of habitat conservation planning under the U.S. Endangered Species Act (Chapter 4) will show.

The next milestone on the road to the WCS, according to Adams, is the 1972 U.N. Conference on the Human Environment held in Stockholm. This conference focused on the environmental effects of industrialization and hence was of less interest to the developing nations than to the industrial North. Although there were some important developments that resulted from the Stockholm Conference (the creation of the United Nations Environment Program (UNEP) and the publication of the very influential book written for the Conference by Ward and Dubos (1972), *Only One Earth*) still the meeting “stated the need to resolve conflicts between environment and development without demonstrating how.” (Adams 1990, p. 39). It remained for the WCS to begin to spell out how such conservation might be implemented in the global context.

The World Conservation Strategy: The WCS (IUCN 1980) was “the culmination of more than two decades of thinking by conservationists, particularly those at IUCN, about ways to further nature conservation on a global scale.” (Adams 1990, p. 42). It was praised by Caldwell (1984, p. 306) as a “comprehensive, action-oriented program for political change.” The WCS had three objectives: the maintenance of essential ecological processes (or “life support systems”); the preservation of genetic diversity; and the sustainable utilization of natural resources. For each of these objectives, the strategy described a number of priority requirements.

A number of countries adopted national conservation strategies under the auspices of the WCS, and the publicizing of the WCS was effective in spreading the phrase “sustainable development.” Sustainable development is not explicitly defined in the WCS, but development (“the modification of the biosphere and the application of human, financial, and living and nonliving resources to satisfy human needs and improve the quality of human life” (IUCN 1980, paragraph 1.4)) and conservation (“the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations” (IUCN 1980)) are defined in such a way

as to be mutually dependent so that together a definition of sustainable development is implied. The core of the WCS, according to Adams (1990, p. 49) is the integration at every stage of the conservation and development processes (the guiding vision behind environmental impact analysis, properly conceived) and the belief that if this were done, development would be sustainable and the three WCS objectives would be met. The WCS' definition of sustainable development is thoroughly utilitarian, instrumental (i.e., nature exists as resources for human use), not unlike Pinchot's conservation. There is, however, language suggesting an intrinsic value for nature; indeed, the WCS seems comfortable justifying the preservation of species in terms of both value systems (i.e., that of the 'dominant social paradigm' -- the utilitarian -- and that of 'deep ecology') (Adams 1990; Engel 1990; Naess 1990). Its definition of sustainable development speaks to both value systems without attempting to reconcile them or even explicitly recognizing any contradiction.

The WCS has been criticized for not going far enough in breaking new ground. Redcliff (1984) objected to its failure to address the social and political implications of its objectives. Adams (1990, pp. 46-47) sees in it "the clear imprint of... neo-Malthusian concerns... a determinist vision [in which] [e]cology (and environmental systems more generally) are presented as setting limits on human action... [and in which] notions from wildlife management are applied freely to human populations on a global scale." Tisdell (1988) criticizes the WCS for its failure to adequately consider the trade-offs (for example, between agricultural systems and forests as life-support system components) and opportunity costs implicit in its prescriptions. Even the Director of UNEP, Mostafa Tolba, indirectly admitted in a 1982 speech that despite the WCS' provision to decisionmakers of "an overall blueprint for exploiting their interconnected environment in a sustainable way," still "governments have not matched this developing environmental knowledge with deeds." (Tolba 1987, p. 16). The reason for this failure may lie in what Adams (1990) has criticized the WCS for: failing to recognize the essentially political nature of the development process. Redcliff (1987) would certainly agree with this assessment, and would point especially to the structure of the international market and the relations of trade between developed nations and developing nations. The Brundtland Commission's report in some ways redresses this failure, although with problems of its own.

The Brundtland Commission Report: In her foreword to the Report of the World Commission on Environment and Development (WCED 1987), Gro Harlem Brundtland, who chaired the Commission, places the Report in the context, not of the WCS, but rather of three prior U.N. reports dealing primarily with the relations between the rich

nations of the North and the poor nations of the South: Brandt's *North-South: A Programme for Survival* (Brandt 1980) and *Common Crisis North-South: Cooperation for World Recovery* (Brandt 1983) and Palme's *Common Security*. Thus the issues of environment and development are placed firmly in the context of the global economic structure. Rejecting attempts to limit its focus to "environmental issues," the Report reaffirms that environment and development cannot be considered separately: "Environment and development are not separate challenges; they are inexorably linked ...in a complex system of cause and effect" (WCED 1987, p. 37). This complex system includes linkages between different types of environmental degradation; between environmental stresses and patterns of development; between environmental and economic problems and social and political factors including population growth; and both within and among nations. Such aspects of development as poverty and inequality, in particular, are central and causally related to the problems under consideration.

The Report (WCED 1987, p. 43) defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." It goes on to say that the definition contains "two key concepts: [that of] 'needs,' in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."

The language of "essential needs," particularly those of the poor, is borrowed from another strand of sustainable development thinking not prominent in the WCS: that of ecodevelopment. Along with an emphasis on respect for local place, local and especially indigenous culture, and self-sufficiency within local ecosystems, the language of ecodevelopment emphasizes the satisfying of basic needs. "The basic needs approach is much more people-directed than land-directed, with emphasis on removing the causes of poverty and enabling self-help through cooperative endeavour to flourish..." (O'Riordan 1988, p. 37). Crocker (1990, pp. 153-154) contrasts a basic-needs approach with both liberalism (the market approach based on preferences) and social democracy by distinguishing between filling basic needs (clean air, clean water, sufficient food, clothing, shelter, education, medical care, self-determination) and "satisfying mere human preferences."

Adams (1990, pp. 51-56) claims that the term "ecodevelopment" was coined by Maurice Strong, then Secretary-General of the Stockholm Conference. He traces its

development and promotion by UNEP and others, noting that while there are a number of quite distinct approaches to ecodevelopment, the starting-point of ecodevelopment is the basic needs of people (not the conservation of natural ecosystems). Other aspects of ecodevelopment include a “bottom-up” perspective, emphasizing grass-roots participation, as well as ideas of appropriate, indigenous, or intermediate technology. The ideas of ecodevelopment have been developed by Glaeser (1984), Sachs (1979, 1987), and others. As Sachs (1987, p. 29) describes it,

the concept of ecodevelopment was born of a twofold polemic against both the partisans of uncontrolled growth, who propose to remedy the mistakes of misdevelopment by pursuing precisely those policies which led to misdevelopment in the first place, and the supporters of zero growth, who are victims of the temptation to see ecology as the sole and absolute criterion to the point where they lose sight of the anthropocentric vision of the world which is that of all humanist philosophers.

Despite its adoption of the language of basic needs from ecodevelopment, the Brundtland Report’s conclusions place it in uneasy proximity to those “who propose to remedy the mistakes of misdevelopment by pursuing precisely those policies which led to misdevelopment in the first place” -- i.e., the “partisans of uncontrolled growth.” Its list of “critical objectives for environment and development policies that follow from the concept of sustainable development” (WCED 1987, p. 49) begins with “reviving growth.” One reason for the Report’s espousal of continued economic growth, of course, is the objective of eliminating “absolute poverty” in a world in which populations are increasing rapidly, especially in the areas in which poverty is most widespread.¹² The Report estimates that to reach its development objectives for developing nations, overall national income growth rates would need to be from five to six percent per year for developing nations and at least three percent per year for developed nations. Thus, the growth of the global economy countenanced by the WCED in the next three decades is on the order of a fivefold increase at a minimum! If this level of growth were attempted by using existing technologies and patterns of production and consumption, it seems inevitable that the resulting environmental degradation would undermine the economic system.

¹² Projections used by WCED put world population at 6.1 billion by the year 2000, and 8.2 billion by 2025, with 90 percent of the increase coming in the developing nations (WCED 1987, p. 101). These projections assume a reduction in current rates of increase in the period 2000-2025, since “[p]resent rates of population growth cannot continue.” (WCED 1987, p. 95).

The Report's second critical objective, therefore, is that the "quality of growth" must change. The Report sees evidence of the feasibility of such a change in "recent shifts in the content of [the growth in industrialized nations] towards less material- and energy-intensive activities and the improvement of their efficiency in using materials and energy." (WCED 1987, p. 51). It is growth through industrialization that the Commission seems to be calling for: "[m]any essential human needs can be met only through goods and services provided by industry, and the shift to sustainable development *must* be powered by a continuing flow of wealth from industry." (WCED 1987, p. 16, emphasis added).

Besides the two critical objectives dealing with growth, the Report (WCED 1987, p. 49) lists five others:

- meeting essential needs for jobs, food, energy, water, and sanitation;

- ensuring a sustainable level of population;

- conserving and enhancing the resource base;

- reorienting technology and managing risk; and

- merging environment and economics in decision making.

The Report sets out a clear, well-argued global agenda and supporting arguments that make some very important connections: between poverty and environmental degradation, but also between the consumer-oriented lifestyles of the industrialized world and environmental degradation as well as resource depletion; between poverty, environmental degradation and the extinction of species in the developing nations and the structure of the international economic system; between population growth and poverty; and between patterns of production and consumption and technology, on the one hand, and the carrying capacity of the earth, on the other.

There have been (as was inevitable for a highly visible, authoritative document in a vigorously contested intellectual terrain) numerous criticisms of the Report, both practical and conceptual. The Report's policy agenda, while clear, does not contain detailed implementing plans; implementation, rather, is left to individual countries and organizations. The Report has no "teeth." Simon (1989, p. 45) predicted that, as with its predecessors (the Brandt reports), "this report will almost certainly be paid lip-service in many quarters but be followed by little concrete action." The Report

certainly has been widely cited, and steps have been taken in some countries to begin implementing at least some of the Report's recommendations. Canada, for example, has prepared a *Green Plan* for the implementation of sustainable development (Canada 1990). *Agenda 21* (UNCED 1992), an "action plan" for the implementation of most if not all of Brundtland's policy recommendations, was adopted at the U.N. Conference on Environment and Development in Rio de Janeiro in 1992. Together with the agreements signed on various specific issues, *Agenda 21* commit countries to specific policies and actions aimed at promoting sustainability in the terms described in the WCED Report. However, while the agreements and declarations signed at Rio were widely hailed, it is fair to say that the Conference demonstrated the difficulties of moving governments beyond the jealous protection of national interests, narrowly conceived. In particular, the industrialized nations and especially the United States were criticized for lack of commitment to concrete actions (for example carbon dioxide emissions reductions) and aid to the developing nations.

On a conceptual level, the Brundtland Commission's Report received a great deal of criticism. Before sketching the main points of criticism, however, it should be noted that the Commission's basic vision of sustainable development has been widely lauded and adopted more or less uncritically as definitive by a vast number of organizations worldwide. For example, the president of Resources for the Future, Robert Fri (1991, p. 2) reported that "it seems to me the vision of the Brundtland Report is inescapably correct." The authors of *Canada's Green Plan* (Canada 1990, p.4) report that "The Brundtland report quickly captured the world's imagination with the concept of sustainable development, a concept that would enable the world to find solutions to poverty, population growth and limited environmental resources."

Despite (or in some cases, perhaps, because of) the very broad exposure and acceptance of the Report's definition of the problem and concept of sustainable development (the solution), the Brundtland Commission has certainly not had the last word on the subject. Critics of various schools have taken aim at different pieces of the Report. The prescription for a five- to tenfold expansion of the world's industrially-based economy is perhaps the most visible target, and accordingly has drawn a great deal of fire. Adams (1990, p. 60), on the Report's prescription of growth as the solution to the pressures of population, poverty, and environmental degradation, asks, "But what of the pressures of that growth itself? What about demands for energy and raw materials, about pollution? *Our Common Future* hopes to have its cake and eat it: 'The Commission's overall assessment is that the international economy must

speed up world growth while respecting environmental constraints' (Brundtland 1987, p. 89). It does not say how this balancing trick is to be achieved."

The Report's assumption that developing countries should or must industrialize, according to Simon (1989, p. 45) "limits the debate to how to industrialize sustainably rather than posing both fundamental and pragmatic questions about whether all countries should, or indeed can, industrialize." According to Ekins (1989, p. 5), "one of the analytical foundations of *Our Common Future* is that the expansion of industrial activity has hitherto been the major cause of the 'ecological' problem, and continues to be so." He is right; nonetheless the Commission is explicit about the nature of the growth that it is espousing: "In practical terms, this means more rapid economic growth in both industrial and developing countries, freer market access for the products of developing countries, lower interest rates, greater technology transfer, and significantly larger capital flows, both concessional and commercial" (WCED 1987, p. 89). "But," continues Ekin, "rather than question this ethic of expansionism, the Commission builds its entire edifice of sustainability -- its hopes, in its own words, for 'the security, well-being, and very survival of the planet' -- on the frail and recent evidence of less-intensive resource use by industrial countries since the oil shocks of the 1970s, and on the rapid dissemination in capital-poor developing countries of expensive and complex modern technologies of productive efficiency and pollution control."

While it is true that the Commission in effect rejected both population control and fundamental (as opposed to marginal) redistribution of wealth as politically impossible, one does not have to be as pessimistic as Ekin with regard to the possibilities of technological advance in advancing economic welfare. Daly and Costanza (1992) point out that the Report's use of the word "growth" masks an important distinction between growth and development, although it is true that the Commission does state that what it means by growth is to be a "different kind of growth." For Daly and Costanza, growth and development both are paths to enhancements in human welfare. Growth means "pushing more matter-energy through the economy" and development is "squeezing more human want satisfaction out of each unit of matter-energy that passes through" (Daly and Costanza 1992, p. 43). It is clear that something like development is what the Commission means by this "different kind of growth"; a five- to tenfold increase in the energy-material throughput of the economy without completely undermining the life support system would be difficult to imagine under any conceivable technological regimen. Of course, the Commission could not spell out or foresee the technologies and institutional/managerial arrange-

ments that will be invented to bring this new kind of growth about; but its faith that such inventiveness will be forthcoming would seem to place it firmly in the camp of the technological optimists. Another possible interpretation is that this faith is not a reflection of optimism, although it may be couched in optimistic terms, but rather of despair -- like Kierkegaard's Christian, who is forced to place his faith in an absurdity, because he can do no other (i.e., there is no other path available).

The Brundtland Commission, in summary, performed an important service in placing the problem of global environmental degradation firmly in the context of international development. Its espousal of vigorous and continued industrialization and economic growth in order to deal with rapidly growing populations, especially in the poor countries, as well as with environmental degradation, may have been motivated as much by the need to maintain some minimum degree of political palatability as by any real assurance that what it sees as necessary is indeed possible. The Report states the problem and a solution, but, as they say, "the Devil is in the details."

Conservation in the U.S.

The concept of sustainable development, particularly in the U.S., has been powerfully shaped by notions borrowed from resource management, in particular the concept of sustained yield but more generally the idea that particular resources -- forests, soils, fisheries, wildlife, aquifers -- could and should be scientifically managed to provide maximum yields in perpetuity for the benefit of present and future generations. This ideal is central to the missions of a number of U.S. institutions, such as the U.S. Forest Service and the Soil and Water Conservation Service. It stems from the Progressive Conservation movement and from the ideas espoused by Gifford Pinchot. This movement arose from widespread concerns over the perceived squandering of the nation's natural resources in the latter decades of the last century. The untrammled market system, a prevailing ethic of "cut and run" in the exploitation of natural resources, and federal policies favoring disposition of public lands and expansion of European settlements had resulted in such spectacles as the wholesale slaughter of the buffalo, the exhaustion and abandonment of soils, the wasting of lands and waters to extract gold, silver, coal and other minerals, and the complete destruction of entire forests. Entrepreneurs were mining every resource they could get their hands on as if there were no tomorrow.

It was not merely the waste and destruction of resources at the hands of exploiters that aroused the reaction that led to conservation's "scientific management." There was also wastage occurring that was not a result of human greed and rapacity, but rather was a consequence of nature's apparently irrational disposition of its resources: namely, rivers that ran in muddy floods in the spring, wreaking havoc before pouring their waters into the ocean, and then going dry during the growing season when they were most needed. Although uncoordinated private interests succeeded in capturing and conserving the waters of some small streams, the big ones -- the Colorado, the Missouri, the Columbia -- as well as a host of lesser but still good-sized rivers were beyond the ability of local entrepreneurs to control. Large-scale capital projects -- big dams, canals stretching hundreds of miles through the desert -- could only be accomplished through rational planning, scientific management, and federal government money.

Nor was the conservationist concern with wastage merely an expression of moral indignation over waste, greed, and rapacity. According to Barnett (1960), beliefs in the existence of limits, in the scarcity of natural resources, in ecological concepts such as equilibrium and a balance of nature, in the ability of man to damage nature, and in the aggravation of scarcity by waste -- all these informed conservation. And yet the spirit of the conservation movement, which finds its present expression in the resource management paradigm, is not one of a humble subservience to natural limits, but rather a determination to overcome them through technical management. The possibilities of applied science and intensive management "filled conservation leaders with intense optimism. They emphasized expansion, not retrenchment; possibilities, not limitations. ...They bitterly opposed those who sought to withdraw resources from commercial development" (Hays 1959, p. 2).

The conservationist ethic is not opposed to the use of nature's resources for human comfort and convenience; quite the contrary. Compared to the ethic of exploitation which it superseded, "in a sense, not much was new in this Progressive conservation; nature was still valued chiefly as a commodity to be used for man's economic success. But old attitudes were given vastly more effective means for their implementation." (Worster 1977, p. 262). Thus it represents what Wilkinson (1973) would call intensification.¹³

¹³ Wilkinson says (p. 90) that "[i]n its broadest ecological context economic development is the development of more intensive ways of exploiting the natural environment."

There are two salient values that, more than any other, defined the conservationist ethic. First, a concern for future generations that implied that the present generation has a moral obligation toward them. As one of the founders of Progressive Conservation exclaimed, “what *right* has any generation to wholly consume, much less to waste, those sources of life without which the children or the children’s children must starve or freeze?” (McGee, 1910, p. 376, his emphasis). Second, the application of science and technology to the manipulation and management of nature, ostensibly for human betterment, defined in the end as economic growth. As the historian Daniel Worster (1985, p. 155) put it, “Conservation meant, to a great extent, the pursuit of technological dominance over nature. It means putting rivers, and eventually their entire watersheds, to work in the most efficient way possible for the purpose of maximizing production and wealth.” Worster neglects to note an important element of progressive conservationism, however: populism. Dick (1989) describes the context in which public hydroelectric projects were undertaken in the 1930s as one in which the monied elites who financed electric utilities were the object of fierce opposition by the supporters of publicly owned and financed hydropower. That the fruits of this generous and democratic movement eventually fell prey to (or, rather, created) special interests, iron triangles, “hierarchy, concentration of wealth and power, rule by expertise, dependency on government and bureaucracy” (Worster 1992, p. 31; see also Reisner 1990, 1986; Gottlieb and FitzSimmons 1991; McCool, *Rivers of Empire*) does not negate the populist impulse that was so much a part of it. It may, however, argue for caution in looking to technocratic environmental management as a model for sustainable development.

Summary

In this chapter I have tried to tease out some of the strands of thought that historically have contributed to present definitions of sustainable development. The question of the sustainability of the progress of human welfare has been debated for nearly two centuries. This debate was rekindled in the 1970s by the publication of *Limits to Growth*, which seemed to resonate with the contemporary popular mood. Recent evidence of widespread environmental degradation and global changes resulting from human activities -- the deterioration of the stratospheric ozone layer and the accumulation of greenhouse gases, for example, as well as the well-publicized¹⁴

¹⁴ And perhaps overstated: see Skole and Tucker 1993).

deforestation of the tropics -- have once again brought sustainability into question. The simple dichotomy of growth-no growth has been superseded, however, by the introduction of the concept of sustainable development. The apparent simplicity of the concept conceals many different possible interpretations, however, which will be explored more fully in the following chapter.

Chapter 2: Interpreting Sustainable Development: Three Paradigms

Introduction

In the preceding chapter, I traced the evolution of several lines of thought that historically contributed to the concept of sustainable development. These included the debate over the limits to growth, global change research, and international conservation and development thinking. In this chapter I argue that the most important and most fundamental distinctions in the literature on sustainable development, like that on environmental issues in general, are political and ideological.

The literature on every individual aspect of global environmental change is voluminous and rapidly expanding.¹⁵ However, while the steady accretion of such evidence may be sufficient to convince a reasonable person that a clear danger exists, it is not conclusive in a scientific sense and perhaps can only be so *ex post facto*. Certainly a large number of individuals, organizations, and even governments have accepted that there is a risk of global catastrophe. For example, the document, *Caring for the Earth*, jointly prepared by the United Nations Environment Programme, IUCN - The World Conservation Union, and the World Wildlife Fund, is based on the premise that “[b]ecause we have been failing to care for the Earth properly and living unsustainably, that risk [of human needs going unmet] has become dangerously high. We are now gambling with the survival of civilization” (IUCN/UNEP/WWF 1991, p. 4). In 1992, the Union of Concerned Scientists (UCS 1992) published a statement signed by 1,575 scientists from 69 countries, including almost one hundred Nobel laureates

¹⁵ In an effort to establish the existence of an imminent threat to the global environment -- the basis for life itself, human and nonhuman -- I undertook a broad review of evidence on trends and conditions in the major biogeochemical systems that comprise the environment. This review is presented in Appendix A.

and many other eminent scientists. The statement warned of accelerating environmental degradation that was permanent or reversible only on a scale of centuries. The human race, they concluded, is on a collision course with environmental catastrophe unless major changes in the way it deals with the biosphere are made, and soon.

The important question is not whether there is evidence of environmental change (there is), but what it means.

This question is at bottom the same one that has been debated off and on for centuries: are there limits to the growth of human societies? If the answer to this theoretical question is "yes," one must immediately ask the further question, "what are these limits, and how near are they?" Dryzek (1987) makes the point that empirical evidence can be mustered to support either of two contradictory views: that of the technological optimists, or possibilists (Clark 1989), and that of the neomalthusians. He argues that there is no indicator or set of indicators that could possibly tell us conclusively whether the global environment is at serious risk in the foreseeable future.

When one takes a more holistic perspective, taking into account other important aspects of the global situation, whether the global environment is at risk becomes less reasonably questionable. When these other aspects -- projected population increases, the need to improve the lives of the world's many poor -- are included, the problem of environmental degradation appears as a *problematique* -- i.e., an interrelated and interlocking series of problems, each aggravating the other and blocking solutions. If population could be held constant, the problem of meeting the needs of the poor might be manageable. But with the increases in human numbers that are predicted and which seem virtually assured,¹⁶ it seems likely (in the absence of very rapid development and adoption of new, more efficient technologies as well as shifts in consumer preferences and perhaps fundamental redistributions of the world's wealth) that economic activity -- use of raw materials, agriculture, energy consumption, and pollution -- will increase even faster, putting a even greater strain on the biosphere. MacNeill and others (1991, p. 5) state that "[i]f human numbers do double again, a five- to tenfold increase in economic activity would be required to enable

¹⁶ For example, the rate of population growth in Kenya is 4.2 percent. At that rate, the country's population will double in 17 years (Pimentel 1991). The United States has a rate of increase that gives it a population doubling time of about one century.

them to meet their basic needs and minimal aspirations. ...A five- to ten-fold increase translates into a colossal new burden on the ecosphere and raises the question of sustainability.” If economic development in the form of resource exploitation and export agriculture were not occurring in many parts of the world, marginalization of indigenous agriculturalists and social breakdown resulting in overpopulation (Wilkinson 1973) and environmental degradation (Blaikie 1985) might not be the serious problem that they are. The crisis is a political one as well, with governments all over the world committed to economic growth (as increasing GNP or GNP/capita) as a basic policy priority.

Dryzek (1987) has pointed to one reason why the apparent manageability of at least some “environmental problems” might be illusory: displacement, either spatial, temporal, or from one medium to another. Waste disposal is more often than not an example of *spatial displacement*. The use of taller and taller smokestacks to disperse air pollutants is an example of this strategy. Hazardous wastes produced in the developed nations are shipped to the Third World or are moved to supposedly permanent repositories in areas characterized by rural poverty. Although the strategy of diluting wastes as a solution has fallen into disrepute, it is still widely used, and essentially is a spatial displacement technique except where biotransformation of the waste renders it harmless. Spatial displacement is consistent with the “hinterland” concept in human ecology, in which cities require the services of extra-urban areas for food production, drinking water, waste disposal, air purification, outdoor recreational opportunities, and the like. Thus, environmental problems associated with resource extraction can be displaced spatially, as in the deforestation and attendant land, water, and ecosystem degradation that occurs in the tropics to supply hardwoods to the developed nations.

Another type of displacement can be seen in the transfer of a problem from one environmental medium to another. Incineration of solid wastes reduces the quantity, especially the volume, of waste to be buried, but it creates an air pollution problem and a hazardous waste disposal problem. The use of scrubbers to reduce air pollution creates a chemical sludge, in some cases toxic, to be land disposed. Acid rain is an example of a problem displacement that is both spatial (in the use of tall stacks to disperse the pollution) and cross-medium, if scrubbers are used.

Finally, environmental problems can be displaced temporally. The generation of electric power that is consumed now and benefits the current generation has costs that are being displaced to the future. Power generated through the use of nuclear

technology imposes upon generations far into the future a very difficult waste storage problem. If fossil fuels are used, especially coal, future costs may include global warming, sea level rise, and depauperized ecosystems.

From another point of view, each of Dryzek's categories of displacement -- spatial, intermedium, and temporal -- can be seen as social displacements. That temporal displacement represents the displacement of social costs by one social group (the present generation) to another (future generations) is uncontroversial. However, in a world in which there are very few places devoid of human populations or human interest (Daly's "full world", Daly 1992) spatial displacement may often be seen as the displacement of social costs from one group to another. In economics this problem has been analyzed in terms of economic externalities, which Martinez-Alier (1991, p. 134) describes as "the shifting of uncertain social costs (or possibly benefits) to other social groups (whether 'foreigners' or not), or to future generations." There are many problems with conventional economic analyses of externalities, arising primarily from uncertainty and risk and problems of valuation. Moreover, the distribution of environmental costs and risks is uneven. For example, Bullard (1991) assembles evidence demonstrating that in the United States, blacks and other racial minorities are likely to suffer disproportionately from various facilities siting decisions. Martinez-Alier (1991, p. 134) argues that "because of big, diachronic, invaluable 'externalities,' economic commensurability does not exist separately from a social distribution of moral values regarding the rights of other social groups"; he concludes that problems of sustainability are fundamentally political, rather than ecological or economic, problems.

Despite the high level of concern in some quarters, there is very little agreement over the nature of the global environmental situation and therefore over what to do about it. The literature on sustainable development has fairly erupted since 1987, when the Brundtland Commission published its report (WCED 1987a). However, as a number of writers have observed (e.g., Adams 1990; O'Riordan 1988; Redcliff 1987), sustainable development is a slippery concept indeed. Having no coherent theoretical core (Adams 1990, p. 3), "sustainable development" is subject to inconsistent use: "On the one hand the label is used by environmentalists to try to demonstrate the relevance of their ideas about proper management of natural ecosystems. ...On the other hand the phrase 'sustainable development' is attractive to development agencies and theorists looking for new labels for liberal and participatory approaches to development planning" (Adams 1990, pp. 3-4).

Ultimately, although the global *problematique* has implications for localities in the industrialized nations, it is not necessary to refer to global problems to have local issues of sustainable development. That is, quite apart from the global scale, there can be local crises of resource use, environmental degradation, erosion of community and thus local meanings of sustainability. These local meanings have to do not with nature and the environment defined in abstract scientific terms but rather with the environment as the life-space, which is apprehended instrumentally but also aesthetically and emotionally (see Spaargaren and Mol 1992 for further elaboration on the distinction between nature as described by science and nature as experienced subjectively).

On the face of it, the concept of sustainable development is simple: it means development that is capable of being continued indefinitely. The sustainability of current models of development and the development practices they describe is very much in question. *Therefore, the meaning of sustainable development turns almost entirely on what is meant by development itself, a question that is fundamentally political and ideological.*

Meanings of Development: In this chapter, the meanings of “development” are subjected to critical scrutiny. One might ask whether it is important to do so; after all, it might be argued, everyone knows what development is. But the developmentalist consensus (Aseniero 1985) can no longer be taken for granted. The meaning of “development” is one of the things that is most at issue in the debate over what sustainable development might come to mean. A second reason for this close attention to words and meanings as well as theories is connected with the role of planners. Communicating is a major part of what planners do. As Forester (1988, p. 18) puts it, planning analysts “are not apolitical problem-solvers or social engineers. Instead, they are actually pragmatic critics who must make selective arguments and therefore influence what other people learn about, not by technically calculating means to ends or error signals, but by *organizing attention* carefully to project possibilities, organizing for practical political purposes and organizational ends.” The words we use organize attention by carrying meanings through associations, whether these meanings are intended or not. They direct and constrain our thinking, and therefore we had better be conscious of what these words mean and “where they’ve been.”

The word “develop” means, etymologically, to unwrap or unfold (the opposite of envelop). The original usages were transitive (as in photography, “developing

pictures"). From the beginning, "develop" was strongly associated with the word "growth" and had the organic connotations of plant growth. It came to mean a process of bringing forth what was potentially contained in something, e.g., a seed. Applied to natural resources, development seems to carry the implication that the resource will be in a more advanced or better state after whatever manipulation is planned is carried out; hence land (or any other natural resource) in an undeveloped state is never at its "highest and best use".¹⁷

Later in the nineteenth century an intransitive form of the term came into the language, an abbreviation for 'develop itself' for those cases in which the object and the agent of development are one and the same. According to the Oxford English Dictionary (quoted in Rosenthal 1984) this intransitive "develop" contained a further meaning of growth into a "fuller, higher, or maturer condition." Later, and especially through the works of Herbert Spencer and Darwin, development came to be closely associated with the concepts of organic (and social) evolution and progress. Thus, "growth," "progress," "development," and "evolution" came to be associated as a highly positively charged "word set" (Rosenthal 1984).¹⁸ Indeed, as Rosenthal (pp. 54-55) points out,

[b]y the late nineteenth century, ...*develop* carried the concepts of Hegelian history and of Darwinian evolution, both of which drew on the organic metaphor and its *growth-organic-maturity* language; both of which carried the positive value of *science* and of scientific *law*; and both of which assumed (though Darwin himself hadn't) that with development inevitably came *progress*. This complex of terms and concepts carried by *develop* was carried by it wherever it went.

Development means change, but change as progress, i.e., in a positive direction, moving toward some good end or at least some better state. As Rosenthal (p. 101) points out, the application of 'development' to any proposition puts a positive spin on it: "A rose by any other name might smell as sweet, but a plan to tear down a

¹⁷ Lynn White (1968) is probably most closely associated with the view that Judeo-Christian dogma, in particular the idea that humanity transcends and rightfully has dominion over nature, is at the root of the environmental crisis. Although one may take issue with much of White's interpretation of Judeo-Christian thought, the implication that developed resources have reached a "higher" state is certainly consistent with an attitude of rightful dominance over nature.

¹⁸ A word set, as Rosenthal uses the expression, refers to a group of words closely associated with one another in use, though not necessarily synonymous, such that the use of one causes the associated meanings to "resonate."

block of houses doesn't sound nearly as good (and therefore probably won't get carried out) if called 'neighborhood wreckage' rather than 'urban development'."

Agazzi (1988) contrasts 'progress' and 'development.' The former, he says, "expresses a process of accumulation and growth with no pre-established direction" (p. 16). Such a process is consistent with evolution according to Darwin (i.e., nonteleological). It is a result of "spontaneous forces, mechanisms and energies acting at random and capable of either helping or destroying one another" (p. 16). By contrast, development, strictly speaking, implies an organic whole fulfilling itself according to a plan. Thus "the concept of development represents a particular case of the idea of progress, that is, progress that is not content to proceed at random but seeks to fulfil a plan, a pattern, a design" (p. 17).¹⁹

The Dominant Social Paradigm (DSP)

The rise of industrial civilization and capitalism coincided with a set of ideas of development and progress that can be seen as ideological, as can many of the ideas advanced by those critical of them. This set of ideas and beliefs I call the Dominant Social Paradigm (DSP).

Although it is not my purpose here to review, even briefly, the history of thought on the idea of development, it will nonetheless be useful in order to better understand the legitimating associations of progress with growth and development to outline some of the main features of the historical process by which human progress came, in the first place, to be seen as possible, and in the second place, to be identified with material progress. The positive evaluation of development and its association with progress legitimates, within the DSP, both economic growth and the technological change, as well as the destruction of nature and of traditional communities.

The Roots of the Idea of Progress: Progress has been called a "secular religion" (Lasch 1991) and one of the most important single ideas in Western Civilization (Nisbet 1980). The Enlightenment philosophers Adam Ferguson, Saint-Pierre, Turgot, and Condorcet are generally associated with the articulation of Progress as an un-

¹⁹ Agazzi goes on to point out that the pattern or design that has been uncritically (and, in his view, unfortunately) accepted by the South (the "less developed" or "developing" nations) is that of the industrialized North.

ambiguously optimistic interpretation of history and as a conviction for the future (Almond, Chodorow, and Pearce 1982). Nisbet (1980) has traced the idea of progress, or at least some of its elements, back to the ancient Greeks. Condorcet (1955, cited in Keohane 1982) is often credited with the fullest exposition of the idea of progress -- at once material and moral -- as the result of the historical accumulation of knowledge through science and technology spreading through a population that grows in numbers as it grows in health and affluence.

The idea of progress lay, during the Enlightenment as it does today, close to the heart of modernity. The philosophers of the French Enlightenment conceived of progress as the inevitable movement of humanity toward a postulated future golden age (Keohane 1982). Progress, however, contains several constituent ideas that date back considerably further. One is the distinctly Judeo-Christian idea that humankind is divinely appointed to a special position *vis a vis* earth and its creatures. Various, this position has been articulated as transcendence (O'Connor and Oakley 1969); dominion (White 1968); or completion (Glacken 1967). Accordingly, "artifice ...as counterposed to raw nature, was [the] core" of the eighteenth-century version of progress (Keohane 1982 p. 24); to a great extent this is true of the late twentieth century progressive perspective ("technological optimism") as well.

Another element of the modern idea of progress is the view of history as linear, rather than, for example, cyclical, and not just linear but with a meaningful progression. This view, according to Nisbet (1980), can be found in the writings of both Greek and Roman thinkers, but is more commonly associated with the Judeo-Christian heritage (Eliade 1959). Keohane (1982) adds to these elements a Classical one as well: the idea that knowledge begets right action; i.e., that an increase in knowledge must bring with it an improvement in society.²⁰ It was these basic constituents upon which the Enlightenment philosophers, much impressed with the rapid increase in scientific knowledge, technique, and (in some cases) material comforts, built the idea of progress that we are familiar with today. However, they added two new elements to those received from Classical and Judeo-Christian thought: first, the notion that progress in science and technology would be the motor of the progress of humanity in general; and second, that material progress -- that is, the steady increase of wealth

²⁰ He correctly points out, however, that the knowledge that Socrates associated with morality was very different from the scientific/technical meanings we associate with knowledge now.

-- was conducive to progress in morals, politics, and science itself. The French Enlightenment emphasized the former; the Anglo-Scottish the latter.

Progress as Scientific/Technical Advance: Nearly a century earlier, Francis Bacon, in *New Atlantis*, had envisioned a utopian future based upon scientific/technological advance and material abundance. According to Leiss (1972, p. 48), "Bacon's great achievement was to formulate the concept of human mastery over nature much more clearly than had been done previously and to assign it a prominent place among men's concerns." Bacon argued that science and technology were a means by which humans could regain the dominion over nature lost when Adam and Eve were expelled from Paradise. Repeatedly, Bacon stresses that both scientific progress and social progress (in a sense, the conquest of *inner* nature) are advanced by treating nature aggressively, conquering "her."²¹

Descartes and Locke had both approvingly seen the potential in scientific knowledge and its application for material well-being and human leisure, comfort, and convenience (Aseniero 1985). Later, Turgot pointed to four spheres in which progress could be discerned and expected to continue: the scientific, the technological, the moral, and the artistic (Manuel 1962, cited in Germino 1972).

The relentless advance of science, the steady and apparently limitless accumulation of scientific knowledge, was for Condorcet and other eighteenth-century French philosophers of progress the very prototype of the progress of society. Their progeny elaborated the vision. Saint-Simon predicted that the future society would be an industrial technocracy based on positive knowledge. His pupil, August Comte, saw the march of civilization progressing inevitably to a positive and industrial stage through the accumulation of scientific knowledge (Friberg and Hettne 1985; Germino 1972).

The clarity and validity of science as the epitome of reason, sweeping away ignorance and superstition, set the stage for the march of progress. Progress came to be synonymous with the rise of industrial technologies and their spread throughout the world. For Marx, for example, as for his targets the capitalists, progress meant the conquest of nature, "the development of the productive power of man and the

²¹ The social and psychological significance of Bacon's terminology has been discussed by Leiss (1972) and Merchant (1980).

transformation of material production into a scientific domination of natural agencies" (Arndt 1987, p. 36).²²

The cultural anthropologist John W. Bennett (1976) refers to the rise of this new relationship between human society and nature as the "ecological transition." He defines it as "the development of an anthropocentric orientation toward the natural world that emerged in the Western Renaissance" (1976, p. 5). The ecological transition has many facets, depending on the disciplinary lens through which it is examined. Ecologically, the transition involves "the growing incorporation of Nature into Culture and ...the breakdown of local self-sufficiency" (Bennett 1976, p. 6).²³ Technologically, it involves what Bennett calls the "tendency to seek ever-larger quantities of energy in order to satisfy the demands of human existence, comfort, and wealth" (p. 6).

To a much greater degree than the French philosophers of progress, those on the other side of the Channel saw progress in terms of wealth. Adam Smith is concerned throughout *The Wealth of Nations* with *material* progress ("the progress of opulence") and how best to achieve it. Moreover, Smith and the other classical economists believed that the economic welfare of a society is much more effectively promoted through economic growth than by redistribution. It is at this point that the association of economic *growth* with progress first becomes evident.

Progress as Economic Growth: In his book, *The Rise and Fall of Economic Growth*, H. W. Arndt (1984, p. 5) points out that "the idea of material progress as a possible or desirable condition" is an essentially modern idea, one which goes back no further than roughly the beginning of the eighteenth century. It hardly needs to be pointed out that it is also, like modernity itself, a quintessentially Western idea. Arndt's interpretation, like that of many other economists, is that the reason "material progress" (p. 5) appears only at that point in history is that it was only then that the "new age of rational and scientific enquiry" allowed people to even imagine that they

²² According to Schmidt (1971, p. 55, quoted in Worster 1985, p. 341 fn. 6), the mature Marx's view on the relationship between man and nature was that "[n]ature is to be mastered with gigantic technological aids, and the smallest expenditure of time and labor."

²³ We will examine the question of nature and culture in subsequent chapters in more detail; apropos of Bennett's statement quoted here, however, it is interesting to compare it with McKibben's (1989) thesis on the death of nature.

might escape from their poverty. Indeed, before that time, the weight of authoritative opinion in the West was more likely to condemn affluence as a hindrance to man's moral development than to see it as a positive influence.

Lasch (1991, p. 54), unlike many historians of progress who see in the French Enlightenment philosophers the original and best articulation of that "secular religion," states that "it is to Adam Smith and his immediate predecessors ...that we should look for the inner meaning of progressive ideology." With Smith, Mandeville, and Hume, according to Lasch (1991, p. 52), came the "decisive break with older ways of thinking" in which "human needs began to be seen not as natural but as historical, hence insatiable." Moreover, the foundations of a permanently progressive human society was in their work built not upon divine providence or a transcendent reality but rather upon the most ordinary, not even admirable, of human qualities: "ambition, vanity, greed" (Lasch 1991, p. 55).

Economic growth and the possibilities of continued improvements in the material condition of society preoccupied the Classical economists, but, as Arndt (1984, p. 13) points out, after John Stuart Mill (roughly from the mid-1800s to after the First World War), economists' interest in economic growth as an object of theorizing and as a policy objective waned, probably because the policies advocated by the Classical economists had been adopted, with "spectacular success" (Arndt 1984, p. 14).²⁴ It was not until much later that economic growth *per se* again became a major, if not the preeminent, preoccupation of policymakers throughout much of the world. Arndt (1984) describes how the widespread unemployment and idling of productive capacity during the Depression of the 1930s shifted the attention of economists and policymakers alike from economic growth to stability and security. But a number of factors following World War II, including the belief that stability required growth, combined to produce by the mid-50s a chorus of voices calling for expansion, a chorus that was to be answered with action at the highest (and the lowest) levels of government.

The arguments for the elevation of economic growth *per se* to its current exalted position as a high priority for public policy are straightforward and familiar. First, the increase of per capita wealth is widely agreed to be good in and of itself. Even in the rich countries, the argument goes, more is better because most people are very far

²⁴ This claim of spectacular success is highly debatable in view of the periodic economic crises seen in the history of capitalism.

from satiety; *a fortiori* the poorer nations. A related argument is sometimes made that the existence of poverty, both in the developed nations and in the Third World, justifies continued expansion of the world economy. Second, there is the firm belief that aggregate growth in a nation's economy benefits everyone, or at least everyone that counts. Third, economic growth allows a nation or a community more painlessly to deal with such social problems as poverty (if it chooses to do so) and better to provide for such social goods as education. It simply makes the hard policy choices less difficult. This political escapism is criticized by Wolfe (1981, p. 10), who argued that the political process in the United States has abdicated making real choices in favor of concentrating on economic growth in recent years. "[U]nlike political choice, economic growth offered a smooth and potentially harmonious future -- instead of divisive, possibly ugly, and certainly disruptive struggles over redistributive issues." Growth "defuse[s] the class struggle" (Arndt 1984, p. 46). A similar argument is advanced in the environmental policy arena, which in effect says that continued economic growth is necessary if we are to pay for the environmental amenities we desire, like purchases of open space, sewage treatment plants, and scrubbers for air pollution control. The Brundtland Commission (WCED 1987a) takes a similar point of view. Fourth, it has been an article of widely accepted theory since the 1940s that full employment in a capitalist economy is only possible under conditions of growth. Finally, international competition requires economic growth. This argument was especially compelling during the Cold War years, when it seemed quite plausible that the Soviet economic system would outperform that of the United States. The innovation of regular and reliable statistics of aggregate domestic economic production also provided an index of apparent comparability that probably fed competitive impulses and invidious comparisons among the capitalist countries.

These, then, are the main arguments for the pursuit of economic growth, at least at the national level. It is not difficult to see that the same, or similar, arguments are advanced (and widely accepted) at the local level in many if not most areas. In general, economic growth is seen as either synonymous with development or at least essential to it.

The DSP is the basic value system that has informed the industrial capitalist Western societies. Market capitalism and political liberalism are both based on a psychology

of possessive individualism.²⁵ Instrumental rationality²⁶ is the basis for both market-oriented and planned decisionmaking. The prevailing ideology of development tends to equate progress with Western-style industrial development and both with economic growth, although there are many variants. But a politics of pluralism and a psychology of possessive individualism tends to favor growth as a solution to social unrest.

Whether or not development according to the modern capitalist model is a freely chosen project of society or whether it proceeds of necessity, either through the action of exogenous forces (such as colonialism) or under the pressure of social disintegration, resource depletion and population increase, no discussion would be complete without mention of the benefits of development as progress. Here I refer not to mere economic growth but to the "modern project" as a whole.²⁷ The advance of technology, the accumulation of scientific knowledge, have given us²⁸ powerful tools. Although these tools can be used wantonly and destructively, they also vastly extend our power for healing, renewal, regeneration. The fruits of progress, and very real fruits they are, are to be found in the very open-endedness and freedom, both

²⁵ Possessive individualism is a view of human nature with a long intellectual pedigree that goes back at least to John Locke and Thomas Hobbes, although Atkinson (1991, pp. 153-162) traces its roots back to the Reformation and its radical religious individualism. Hardin's (1966) herdsmen are seen by Eckersley (1992, p. 15) as having the same essential characteristics as the typical Americans described by Ophuls (1977) and Heilbroner (1974): "selfish hedonists rationally seeking private gain."

²⁶ Eckersley (1992, p. 98) defines this as "that branch of human reason that is concerned with determining the most efficient means of realizing pre-given goals and which accordingly apprehends only the instrumental (i.e., use) value of phenomena" Hence natural *resources*, human *capital*. Gorz (1989, p. 5) describes instrumental rationality as consisting of the categories "efficiency, productivity, performance."

²⁷ As used by Friberg and Hettne (1985, p. 231), this phrase refers to the modern world-system, dominated by capitalism, the state, and the 'scientific-educational system.' According to Adams (1990, p. 72), the modern project originated in Western Europe and "was imposed upon the periphery through geographical expansion and socio-economic penetration. That penetration implies the decline and disintegration of 'natural communities,' and theoretically the modern project will eventually eradicate all pre-capitalist social formations." On the positive side, however, the modern project includes scientific advances, universal education and human rights, and democratic self-determination, at least as ideals.

²⁸ Who exactly this "us" refers to is questioned by many. This question is explored in the section of this chapter on the Radical/Critical Paradigm and in Chapter 3.

individual and social, that science and technology have made possible. Many of the benefits of progress can be seen as the “flip side” of the qualities of modern technoindustrial society that are most objectionable to its critics. The disenchantment of the world has brought with it freedom from the sort of superstition that made it possible to burn women as witches. Many people live at a level of comfort and convenience scarcely imaginable a few centuries ago. In the developed countries, and to a degree in the less-developed nations, people have unprecedented mobility, freedom to choose among places and life paths, and access to a bewildering variety of goods and entertainments. At least in the rich countries, democratization of opportunity and wealth has provided very real benefits to many who were not party to the earlier social contracts upon which the existing democracies were founded: women, people of color, minorities of every kind. If religion and the bonds of community and family no longer have the hold they once did on many people, perhaps it is because individuals do not choose them. In the developed countries, our lives are longer and healthier. We are so well-fed that overweight is the malnourishment of the developed countries (although in the United States, there are still many poor people who are undernourished). We have access to the accumulated knowledge, technology, and art of all cultures. With the further development of technology and expansion of economic production, these benefits could be extended to the poor and ignorant of the world. Whether such an expansion is possible (quite apart from the question of whether it would be desirable) remains to be seen.

The human/nature relationship in the DSP is conceived of almost exclusively in instrumental terms (that is, nature, including both inanimate features such as rivers as well as nonhuman life forms and ecosystems, exists in order to be used to satisfy any and all human needs and wants). The relationship is characterized by domination (Schroyer 1973), enclosure (e.g., Goldsmith and others 1992), and control (the strategies of scientific management).

There are many radical dichotomies in the DSP: between humans and nature, between self and others, between the civilized world and the noncivilized (undeveloped) world. Technological change is generally seen as either an unqualified good or at least value-neutral.

Within the DSP, there are various competing or complementary perceptions of the nature of the “global crisis.” Market failures, overpopulation (especially in the Third World), and social traps such as that described by Hardin (1968) are fingered as the cause of the problem. The problem itself may be seen as an imminent global catas-

trophe or as a series of disconnected, essentially technical problems to be resolved through new and better means of production.

Lynton Caldwell (1990) classifies the causal models of environmental degradation that have informed environmental planning over the past 20 to 30 years in terms of three levels of comprehension of environmental degradation. They range from the view of environmental impairment as incidental or accidental; through the second level which sees it as operational, that is, resulting from errors in policy, planning, poor information, market failures, etc.; to the third level, which (he argues) is just now emerging (his model is intended to be understood as evolutionary). This third level sees environmental degradation as systemic, inherent in the design of our technoeconomic systems. Obviously, the remedies that flow from the perceived causes at the different levels are quite different. At the third level, basic changes in technical and behavioral systems and redesign of institutions become necessary if environmental degradation is to be avoided, stopped, or reversed.²⁹

Caldwell, like many others (e.g., the contributors to Clark and Munn 1987) writing within the DSP who are concerned with problems of sustainability, adopts the language of systems theory. A systems approach to global environmental problems, with its tendencies towards mechanistic and deterministic perspectives on both culture and nature, its value-neutrality, and its emphasis on control (management), is emblematic of the DSP. The collection of articles in the special issue of *Scientific American* (September 1989) on “managing planet earth” is typical of this “managerialist” approach.

Orr (1992) distinguishes between “technological sustainability” and “ecological sustainability.” Technological sustainability ranges from positions articulated by Julian Simon and other “cornucopians” at one extreme to “Gifford Pinchot with high technology” (Orr 1992, p. 25) at the other. Advocates of technological sustainability argue that there is nothing in the current global situation that is so different from past episodes of resource scarcity. Therefore, technological changes and resource sub-

²⁹ In terms of Caldwell’s scheme, most environmental planning practice addresses the causes of environmental degradation perceived at the first two levels of comprehension. Thus, corrective laws and regulations, disclosure laws, impact statements, technology assessments, and review of development proposals are viewed as adequate responses. If, however, the causes of environmental degradation are perceived at the third level of comprehension, new approaches may be called for, not merely in practice, but in theory as well, if environmental planning is to help in the transition to a sustainable society.

stitutions -- solutions that worked in the past -- are expected to be up to any challenge. According to Orr, technological sustainability rests upon several beliefs:

- that humans ought to control nature for the satisfaction of their wants, using ever-better scientific management to do so;
- that human beings are “best described by the model of economic man” (Orr 1992, p. 25); i.e., that humans are, at least in those aspects of their being relevant to material and social choices, amoral, rational maximizers of self-interest;
- that economic growth is essential and/or inevitable; and
- that the causes of unsustainability have to do with “inaccurate pricing and poor technology” (p. 28).

Thus, according to Orr, the technological sustainability path involves continuing economic growth but with more efficient, more ecologically sound technologies brought about by policies that aim to “get the prices right.”³⁰ According to Orr, for adherents of technological sustainability “[s]ustainability merely means finding and using the right policy levers, adjusting prices to reflect true scarcity and real costs, and developing greater efficiency in the use of energy and resources.”

Orr’s description of technological sustainability is more or less consistent with what Colby (1991) refers to as the Resource Management Paradigm. Both Orr and Colby identify the Brundtland Commission’s report (WCED 1987) with this perspective. Colby (1991, pp. 202-203) describes it as an evolutionary progression from current practice: “the basic idea is to incorporate all types of capital and resources -- biophysical, human, infrastructural, and monetary -- into calculations of national accounts, productivity, and policies for development and investment planning.” Another way to look at it might be the extension of selected conservation ideas -- basically scientific management for maximum sustained productivity minus the socially progressive, redistributive ideology of early Progressive Conservation -- from smaller-scale resources (e.g., a forest, a river, a population of game animals) to the global

³⁰ By getting the prices right, Orr refers to making corrections through taxes, incentives, or other policies to prices so that they reflect the “true” costs, social and/or ecological, involved in production. With correct prices, resource allocation decisions will (according to market theory) be made efficiently and socially optimality will result.

scale. In this paradigm, according to Colby, sustainability is a constraint on economic growth, which remains the primary goal of development.

Many other sustainable development thinkers within the DSP have made important contributions, exploring and elaborating the concept and in the process stretching the limits of their respective disciplines. Ecological economics is an increasingly coherent, well-developed school of thought that represents an attempt to extend and (to some extent) combine in formal models the concepts of conventional economic analysis with those of ecology.³¹ As described by Costanza, Daly and Bartholomew (1991, p. 3), ecological economics “sees the human economy as part of a larger whole. Its domain is the entire web of interactions between economic and ecological sectors.” According to this account, ecological economics seeks to distinguish between growth (as an increase of throughput through the economy) and development, which has to do with enhanced quality of life. As Herman Daly has pointed out on many occasions, growth is not sustainable, while development may be. Ecological economics sees natural and manmade capital as fundamentally complementary, not as substitutes. Therefore, either factor can be limiting to growth. Sustainability is defined by Costanza, Daly, and Bartholomew as “a relationship between dynamic human economic systems and larger dynamic, but normally slower-changing ecological systems, in which (1) human life can continue indefinitely, (2) human individuals can flourish, and (3) human cultures can develop: but in which the effect of human activities remain within bounds, so as not to destroy diversity, complexity, and function of the ecological life support system” (pp. 8-9).

Costanza and Daly (1992) distinguish strong sustainability (SS) from weak sustainability (WS). The latter requires holding constant the sum of manmade capital plus natural capital, while SS requires the maintenance of the natural capital stock at or above current levels. SS is concerned with optimal overall scale of economic activity, while conventional economic analysis is only concerned with scale at the margin of economic activity. They have listed four “principles of strong sustainability.”

- The scale of human activities must be limited so that it is within the carrying capacity of the remaining natural capital.
- Technological progress should increase efficiency, not throughput.

³¹ In some cases this has meant substantial revision of those concepts.

- Renewable resources should be exploited at a profit-maximizing, sustained yield rate; extinction should not be allowed.
- Nonrenewable resource should be exploited at the rate of creation of renewable substitutes.

Although conventional economic concepts, strongly rooted in the basic anthropocentric, individualist, instrumental assumptions of the DSP, permeate ecological economics (e.g., “human capital” and “natural capital”), the contemplation of the environmental problematic leads some ecological economists to see sustainability issues as fundamentally political. For example, Boulding (1991) puts his finger on a major defect of much sustainability thinking within the DSP: it minimizes or ignores the role of power. Documents like the Brundtland Commission Report (WCED 1987a) and *Caring for the Earth* (IUCN/UNEP/WWF 1991) tend to limit themselves to preaching what “we” ought to do, “we” tending to be policy and intellectual elites. Boulding points to what he calls “integrative power” (distinguished from economic power and threat power) as being in many ways the most fundamental form of power. This is the power of legitimacy and related values, without which neither economic power nor threat power is particularly effective. This integrative power, he says, can be created through a learning process. Norgaard and Howarth (1991) also emphasize the centrality of equity and politics in sustainable development. The discount rate, which is fundamental to conventional economic analyses involving future costs and benefits, is, they say, a function of the distribution of wealth, not (as is usually supposed) the other way around. “Economists are well aware that their theory assumes a distribution of income and that they have almost no basis for deciding between alternative distributions of income” (p. 99) between generations. Martinez-Alier (1991), writing in the same volume, argues that the methodological individualism of conventional economic analysis cannot cope with intertemporal transfers and allocation because allocations are made without the future generations being party to them.

Spaargaren and Mol (1992) have distinguished three “political programs” corresponding to different approaches to sustainable development. The first, which focuses on compensation for environmental damage and the use of technological add-ons and mitigation techniques to counteract the effects of growing economic production and consumption, is similar to what Colby (1991) would call the Environmental Protection paradigm of environmental management. Another corresponds roughly to some Green political programs (about which I will have much more to say

in the section on the Radical/Critical Paradigm later in this chapter). It calls for “the progressive dismantling or deindustrialization of the economy and the transformation of today’s production structure into small-scale, or smaller-scale than at present, units representing a closer and more direct link between production and consumption” (Spaargaren and Mol 1992, p. 339).

The third political program described by Spaargaren and Mol is consistent with what they call “ecological modernization.” Ecological modernization is an adaption of the current technoeconomic system to the challenge of ecological sustainability, based on the “conviction that the only possible way out of the ecological crisis is by going further into industrialization, toward hyper- or superindustrialization” (Spaargaren and Mol 1992, p. 336). EM does not question the capitalist character or power structure of modern society; rather, it is characterized by changes in the technology of production and consumption induced in response to ecological imperatives. The core of this approach, “which must lay the basis for sustainable development, is:

closing substance cycles -- the chain from raw material via production process to product, waste, and recycling must contain as few leaks as possible;

conserving energy and improving the efficiency and utilization of renewable energy sources;

improving the quality of production processes and products.” (pp. 339-340)

A similar program for “industrial ecology” has been described by Hardin Tibbs (1993). Spaargaren and Mol assert that current Dutch environmental policy reflects the EM approach to sustainability; surprisingly, they also report that Dutch environmentalists, with a few neomarxist exceptions, have embraced it as well. “A radical farewell has been said to the small is beautiful ideology” (p. 340), an ideology characteristic of the Radical/Critical paradigm. EM is consistent with the path to sustainable development advocated by the Brundtland Commission and described by some as technological sustainability.

The application of science and management to environmental problems caused by development *has* brought about increasingly sophisticated means of dealing with ecological damage brought about by development (for example, ecological engineering and mitigation, and ecosystems management). However, it is an approach that lends itself to, indeed makes inevitable, increasingly authoritarian, centrally planned solutions -- the more so in proportion to the perceived severity of the environmental

problem. Spaargaren and Mol (1992, p. 341), for example, write that “[t]he theory of ecological modernization is limited insofar as it deals with only the industrial dimension of modernity, neglecting dimensions of capitalism and surveillance [i.e., power and control, erosion of community], and because it narrows the concept of nature to the sustenance base” ignoring what they call “intuited nature” -- i.e., nature as experienced in everyday life, as well as the wild nature that is the concern of traditional preservationists such as John Muir and his followers. Many analysts of sustainable development writing from within the DSP seem unaware of the political implications of their analyses, a complaint that has been levelled frequently by those writing from Marxist, neomarxist or radical perspectives. These perspectives, as I will show, are essentially critiques of the DSP.

The Marxist Paradigm

Marxism and its associated political economic orders communism and socialism, along with market economics and its associated politics of liberalism, comprise the two great ideologies of modernity, and the contest between them has in many ways defined the course of history in this century.³² While there are obviously important differences, Marxism and capitalism share the belief in progress through economic growth and technological development -- i.e., modernization -- that I have traced to the Enlightenment. Some Green theorists argue that the differences between Marxism and capitalism are not as important as their common embracing of industrialism (or, as Atkinson (1991, p. 203) puts it, “the Enlightenment cultural modernisation project”), which they see as being responsible for the environmental problematic.

Orthodox Marxism, according to Eckersley (1992), explains environmental problems as stemming from the exploitative social relations of production under capitalism. “The Marxist explanation for ecological degradation lies in the fact that capital works only for the benefit of the owners and controllers of capital rather than for the benefit of the complete society of producers” (Eckersley 1992, p. 85). However, orthodox Marxism is, if anything, even more firmly pro-growth, anthropocentric, and

³² Atkinson (1991, p. 176) believes that “[i]t is difficult to overemphasise the way in which the struggle between Marxism and bourgeois progressivism acted as the motor to the whole latter-day enlightenment, each of these embodying a fanatical moral crusade that insisted that *its* interpretation of the enlightenment project was the correct one...”

instrumentalist than conventional neoclassical economics. Eckersley (1992, p. 85) states that “[o]rthodox eco-Marxists [i.e., orthodox Marxists who have written about environmental issues] simply seek to replace the private and socially inequitable mastery of nature under capitalism with the public and socially equitable mastery of nature under communism.”

Orthodox Marxists have, for the most part, dismissed environmental concerns as elitist, trivial, and bourgeois at best. Calls for limiting growth tended to be viewed as attempts by the privileged to protect “their” amenities at the expense of the poor. However, the connections between capitalism, environmental degradation, and social inequity have more recently been viewed as fertile ground for Marxist and neomarxist analysis, and the widespread environmental degradation of the former Soviet bloc countries has occasioned a critical self-examination by Marxists (Eckersley 1992).

In practice, until quite recently, Marxist states have pursued a development trajectory similar to that of the industrial capitalist societies. This has led some Marxists to refer to the Soviet bloc nations as “state capitalist,” rather than Marxist. Although orthodox Marxism has been critical of capitalism, it has not been critical of industrialism but rather has embraced it as a precondition to human freedom. As a product of the Enlightenment, Marxism has tended to share the anthropocentrism of the DSP, as well as faith in science and technology and progress through ever-greater control of nature. There has been little attention to the environment, except as a store of resources to be extracted through human labor.³³ According to Clow (1982), there is much in Marx’s writing to support orthodox Marxism’s dismissal of environmental concerns. Clow, addressing the question whether Marx’s writings could provide the basis for an ecologically sound politics, criticizes Marx’s conception of nature as basically anthropocentric and instrumentalist.

On the other hand, Marxist theory provides powerful insights into the causes and dynamics of social change, insights that can be useful in understanding the nature of the change that sustainability seems to call for (see, for example, Merchant 1989, pp. 3-4). More importantly, perhaps, Marxist and neomarxist theory contains a well-

³³ The widespread environmental degradation in the countries of the former Soviet bloc provides evidence that the social organization of centrally planned economies has suffered from rigidity, inflexibility, and a lack of course-correcting mechanisms that render it a poor model for sustainable development. As noted earlier, however, the state capitalism of the former Soviet-style states must be distinguished from Marxism.

developed critique of development under capitalism, an understanding of which is essential to understanding the nature of the political economic system that stands accused of nonsustainability. As Clow (1982, p. 40) puts it, "Much of Marx's critique of capitalism is relevant to an ecological movement which takes seriously the task of social change." It is the blindness of many DSP analyses of sustainability to this perspective, which is concerned with exploitation, conflict, contradiction, and power (the "shadow side" of capitalist political economy) that accounts for their frequent political naivete.

Marx and Engels developed the first systematic critique of capitalist development. Industrial capitalism is frequently claimed to be an unsustainable mode of socioeconomic organization, both socially and environmentally. For example, Worster (1979, p.5), examining the social, economic, political, and ecological factors that led to the Dust Bowl disasters of the 1930s, contends that capitalism "has been the decisive factor in this nation's use of nature." Therefore, it is important to understand the Marxian critique of capitalism.

For non-Marxists, the Marxist literature appears dense, unfamiliar, impenetrable. If, however, one is concerned with who wields economic and political power, how wealth and political power are distributed in society, how wealth and power work together to their mutual benefit, and what the implications of such processes are for sustainability, then one cannot ignore the Marxist critique of capitalism. It is not necessary to espouse the Marxist program of communist revolution, nor to approve of centrally controlled economies either existing or in theory.

Capitalism is a simple term for an extremely complex system of social and cultural organization, replete with characteristic institutions and values. Its institutions include private property, free markets, private businesses and corporate citizens, consumers, owners and laborers, and the state. So thoroughly and for so long have the values and institutions of capitalism been adopted and elaborated in the United States that it is only with an effort that one can distance oneself from their assumptions and logic sufficiently to analyze them critically.

Modern industrial capitalism, to state it simply, is a system in which economic production and social relations are organized to exploit natural resources and appropriate "surplus" labor value into capital in order to further the private accumulation of wealth by ruling elites. Through capitalism, human beings become alienated from the value of their labor, from one another, and from nature. In particular, the institution

of private property leads to the commoditization and alienation of labor, and the progressive substitution of instrumental relations for all precapitalist social relations.³⁴ Capitalist development, according to Marx, could only lead to the accumulation of wealth in fewer and fewer hands, and to an increasing disparity between the wealth of the elite and the wealth of workers (Germino 1972, p. 382). At the same time, however, industrial capitalism would bring about the development of technologies of production that would contain the possibility of liberation from the necessity of labor and thus make possible true human freedom.³⁵ Marx's social and political thought is extremely complex and subtle, and there is considerable disagreement among scholars of Marx over the meaning of his works. There can be little doubt, however, that later interpretations of his work by orthodox Marxists and by those attempting to justify the forms and practices of actually existing communism constitute a distortion and "vulgarization" (Germino 1972, p. 357) of his work.

Recently, there has been an effort on the part of some Marxists (e.g., Parsons 1978; Lee 1980) to seek a critical reconstruction of the orthodox Marxian position on the relationship between man and nature. Some find evidence in the writings of Marx and Engels of a more coevolutionary view than was evident in the orthodox Marxism of the Communist Party. For example, Merchant (1992, p. 135) states that, despite Marx and Engels' insistence that human freedom depended on the domination of nature through science and technology, "they were also acutely conscious of the 'ecological' connections between humans and nonhuman nature." Moreover, some theoretical offshoots of Marxism (e.g., the Frankfurt School) have developed penetrating analyses of their own, as will be seen in the following section. Finally, according to Eckersley (1992, p. 77), "some of the Marxist scholars who have embarked on this new area of inquiry [whether Marxism can be developed to address the environmental crisis] have become increasingly critical of certain aspects of Marxist theory. In some cases this has occurred to the point where these theorists have either

³⁴ Gorz (1989) has explored the consequences and limits of economic rationalization of the life-world. He writes (p. 127) that "*the central problem of capitalist society, and the central issue in its political conflicts, has been, since the beginning, that of the limits inside which economic rationality is to operate.*"

³⁵ Gorz (1989) takes issue with this view. Although he agrees that without capitalism, industrialization would not have taken place, he sees in industrial technology the inescapable perpetuation of relations of dominance, no matter in whose ownership or control the industry resides. "*In short, the process of the domination of Nature by Man (by science) turns into a domination of Man by the process of domination*" (p. 54; *emphasis in original*).

taken on a new ecosocialist label (Andre Gorz) or become recognized as post-Marxists or ecoanarchists (Rudolf Bahro).”

Some neomarxists have mounted ecological critiques of capitalism that demonstrate the potential insights to be gained from a such a perspective, in particular the expansionist dynamics of capitalism and the role of the state in industrial capitalist societies. Allan Schnaiberg, in *The Environment: From Surplus to Scarcity* (1980), for example, offers a plausible social theory of environmental degradation that deals explicitly with the differences and interactions between the social and the ecological, and that provides an example of a neomarxist explanation of the driving forces behind the global expansion of economic activity that is viewed as threatening the biosphere.

Schnaiberg begins his analysis by comparing and contrasting ecosystems with economies. He follows such ecosystem ecologists as Howard Odum (1977) in pointing to the central role of energy processing in what he calls environmental production by ecosystems and in economic production. Ecosystems and economies are both subject to the laws of thermodynamics governing ecosystem organization of production, but the “apparent evasion of these rules [by economies] occurs because humans have learned to operate *across* ecosystems” (p. 15). The single factor that differentiates human societies from biological ecosystems as production systems, according to Schnaiberg, is that in the latter, surpluses of energy input lead to growth in populations and biomass at the upper trophic levels, and eventually to an equilibrium or steady state. In human economies, although some population growth occurs initially, surpluses tend to be used to accumulate still more economic surplus in future periods. The difference in the way that natural ecosystems and human economic systems handle the creation and disposition of surplus energy accounts for their initial divergence, and as this organizational difference is reproduced over time, the cumulative divergence widens. In industrial economies, the surplus is channeled into increasingly more effective technologies that can act on environmental resources to generate higher levels of production. “Thus societies operate to multiply their surpluses, particularly industrial capitalist societies, [while] ecosystems tend to mature by stabilizing numbers of consumers and levels of consumption” (p. 19).

The expansion of economic production necessarily increases the volume of withdrawals from and additions to the biosphere, with an attendant increase in the disruption and degradation of biological systems. Societies differ in production and thus in the number and severity of their impacts on ecosystems. Schnaiberg shows that the variation reflects different forms of social control over production that are related

to “power structures and inequalities within societies created by unequal distribution of production surplus” (p. 413). Schnaiberg offers an insightful critique of the four “causes” to which environmental degradation is frequently attributed: population growth, technological development, increasing consumer wants and expectations, and the organizational features of producers under a capitalist mode of production. While he admits a certain limited validity to each, he argues that production expansion, understood in terms of its internal structure and dynamics, is the control variable. To understand the structure and dynamics of what he calls the “treadmill of production” it is necessary to understand the relationships among capital, labor, and the state in modern production systems.

Focusing on the large, capital-intensive production sector (i.e., monopoly capital), Schnaiberg describes a vicious cycle, or treadmill, that follows from overproduction and the use of profits by monopoly capital to make production more capital-intensive. The essence of the treadmill (pp. 228-229) is that as the use of increasingly capital-intensive production methods expands, the labor input to production decreases (i.e., labor productivity increases). Because of the need to provide employment for growing labor forces, production must expand. Expanded production increases corporate profits, which fund technological change aimed at further increasing capitalization of production and decreasing labor participation. Meanwhile, the expanded production must be absorbed by consumers, so that higher levels of employment are necessary. Higher levels of production entail greater additions to and withdrawals from the biosphere, and greater disruption of ecosystems.

The ever-increasing displacement of labor, depletion of resources, and environmental degradation caused by the treadmill of production put increasing strains on the state, which must not only underwrite monopoly capital (by investing in infrastructure and education) but also pay for welfare and remediation of social problems caused by social inequities. One might expect that those responsible for policymaking would act to alter the logic of capital-intensive production. But on the contrary, because of the constraints on the state in a capitalist society, its role has been to accelerate the treadmill (i.e., promote expansion of production/employment) in order to avoid political conflict.³⁶

³⁶ That governments in the United States, from the local to the federal, are engaged in a constant effort to promote economic growth is incontrovertible.

Schnaiberg summarizes the relationship between social production systems and the biosphere in what he calls the “socioenvironmental dialectic” (pp. 423-424):

1. “Production expansion in societies necessarily requires increased environmental withdrawals and additions.³⁷
2. These biospheric withdrawals and additions inevitably lead to ecological problems.
3. These ecological problems pose potential restrictions for further production expansion.”

The continuing tension between production expansion as thesis and ecological limits as antithesis has historically been reduced by syntheses that are the result of social decisionmaking processes. As Schnaiberg sees it, there are three potential syntheses available, each of which is seen as following from a specified social policy with respect to the treadmill of production. In the *economic synthesis*, the treadmill continues and the resulting future society is “likely to be authoritarian and unequal if environmental degradation increases quickly” (p. 425). The *managed scarcity* synthesis involves limited environmental protection (pollution control and recycling), with a social future characterized by persistence or expansion of current inequalities but moderated expansion of production. The third possible synthesis is characterized as the most durable (sustainable) of the three, but also the most difficult to predict, because it would represent a major change of direction. This *ecological* synthesis would involve a shift to appropriate technologies and the redistribution of surplus from capital to labor, with a resulting society that would be characterized by greater equality but decreased production and consumption of commodities.

Schnaiberg locates the cause of accelerating environmental degradation in the social organization of production; i.e., in the political economy of the industrial capitalist nations. Considering the implications of his analysis for socialist countries, Schnaiberg is equivocal: “Balancing surplus generation and mobilization to create worker welfare and environmental protection remains as much a dialectic as in capitalist societies, and no synthesis is guaranteed to endure. On the other hand, no treadmill is forced on the societies by their sociocultural production structure, even

³⁷ Many technological optimists, on the contrary, believe that production and consumption can expand considerably if not indefinitely through efficiency improvements.

though they have often constructed their own modest versions of the capitalist treadmill" (p. 438).

One criticism of Schnaiberg's analysis is that it proceeds at a high level of generality, with little use of concrete example or empirical evidence. Perhaps this is necessary, considering that the argument is complex enough that even in abstract form it fills well over 400 pages. Schnaiberg's work provides a nice complement to Blaikie and Brookfield's (1987) study of the interactions between political economy and ecology at the ground level in the less developed nations of the Southern hemisphere. That work focuses on the social and environmental impacts of the expanding global capitalist system of industrial production on nations at the periphery. While Blaikie and Brookfield show clearly how global economic penetration and incorporation affect local social organizations and relations of production to produce environmental degradation, the larger forces of production responsible remain something of a "black box." The source of the global industrial economy's seemingly insatiable appetite for growth is beyond their analysis and remains largely obscure. Schnaiberg's contribution to an understanding of the social causes of ecological nonsustainability is to have constructed a plausible account of the inner logic of the growth imperative in modern capitalism.

Eckersley (1992), surveying the field of political thought concerned with environmental issues, has distinguished a school of thought she calls ecosocialism. Ecosocialism, as an outgrowth of Marxist thought, differs from other ecological critiques of modern industrial development in that (like Schnaiberg 1980) it focuses on capitalism rather than industrialism *per se* as the prime cause of the environmental problematic. Most ecosocialists, while adopting Marxist theory, are critical of existing (or recently dissolved) socialist states, which they see as having practiced "state capitalism" rather than socialism (Eckersley 1992, p. 121). Ecosocialists reject both the scientific socialism and growth-mindedness of orthodox Marxism. The ecosocialist critique of both capitalist and state capitalist societies has much in common with other 'ecological' critiques, and could perhaps as well have been included under the Radical/Critical paradigm.

The Radical/Critical Paradigm

As an emerging, rapidly evolving perspective, the radical/critical paradigm is perhaps not yet a completely coherent perspective, although there has been at least one ma-

major attempt to develop it into a theory: Adrian Atkinson's *Principles of Political Ecology* (1991), which is discussed later in this section. What they have in common is a view of both actually existing Marxism and the DSP as comprising systems of oppression that are destructive of communities, cultures, and nature. There are, however, very significant differences among such social movements as Green politics and ecofeminism, as well as their related theories and such other essentially philosophical positions as social ecology and deep ecology. These differences will be explored below.

There is also a fundamental difference between these ecological critiques of modern capitalism (the "emancipatory" positions) and what might be called the "conservative critique" of same, although emancipatory ecological theorists share some of their positions (primarily, a sense that modern, industrial, consumerist society is deeply antagonistic to the fulfillment of humanity's "real" needs and best aspirations). These conservative critics of the modern order have swum resolutely against the current of modern times. Their critique is broadly aimed at industrialization and the commercialization of society. Its roots go back to the early days of the industrial revolution.

The English industrial revolution inspired some of the earliest and most enduring voices against the spread of industrial technology and the elevation of economic development as a major goal of societies. The visionary poet Blake, for example, wrote of the "dark Satanic mills" of industrializing Britain; Dickens was eloquent regarding the social disruption wrought by industrialization. Indeed, the Counter-Enlightenment and Romantic movements of the 18th and 19th centuries can be viewed as a reaction to the increasingly ignoble face of industrial society and the values and beliefs upon which it was based: Baconian science, Cartesian dualism, Newtonian mechanics, and the "disenchantment of the world."

Normative criticisms of the economic growth and industrial development associated with the idea of progress have come not only from religion and the arts and letters (e.g., Coleridge, Thoreau, Faulkner) but also from within the ranks of secular thinkers respected for their contributions to politics, economics, and social theory. John Stuart Mill, for example, whose utilitarian philosophy provided the normative basis for the development of classical economics, was himself of the opinion that a "stationary state" of capital, wealth, and population would be desirable, although he thought its achievement unlikely in the foreseeable future (Arndt 1984, p. 11).

Attacks on continued growth as the goal of an already affluent, industrialized nation have come from various directions since the end of the second world war. Not a few of the most telling criticisms have come from economists themselves: J. K. Galbraith (1962), E. J. Mishan (1967; 1970; 1977), E. F. Schumacher (1973), and Fred Hirsch (1976), for example. Mishan, in *The Costs of Economic Growth* (1967), questions whether, given the contemporary levels of production and income in the developed countries, additional growth will not produce net decrements in welfare, rather than gains as commonly supposed. Indeed, Mishan feels acutely (and argues forcefully) that the “creative destruction” of capitalist industrial society has resulted in “a society being rent apart by the torrential forces of modern technology and commerce, ...one already torn wide open by modern communications, a society in a state of rapid dissolution.” (p. 156-157). Mishan is not an opponent of development *per se*, but argues that “the continued pursuit of economic growth by Western Societies is more likely on balance to reduce rather than increase social welfare,” (p. 171) because of the increasing disamenities of modern, high-tech economies. Among these disamenities Mishan includes the following:

- the loss of “aesthetic and instinctual gratification suffered by ordinary working men over two centuries of technological innovation that changed them from artisans and craftsmen into machine-minders and dial-readers” (p. 160);
- the loss of quiet, clean air, and human-scaled human settlements to the requirements of automobile and air travel;
- the “annihilation of distance” through communications and advanced travel technologies and the consequent destruction of “the differences in manners, in customs, in cultures, clothes, food, architecture” that enriched human experience (p. 136);
- the loss [at the hands of science] of the “myths and great religious faiths” that gave human existence meaning (p. 145);
- the anxiety caused by the constant and ever-growing threat of the obsolescence of one’s personal skills, talents, and knowledge (p. 128);
- the active undermining of morals and virtues and their replacement by consumerism;

- the uprooting of the “rich local life centred on township, parish and village” along with the woods and hedges that sheltered it; and
- the loss of “much that man’s nature doted on in the past: a sense of intimately belonging, of being part of a community in which each man had his place; a sense of being close to nature, of being close to the soil and to the beasts of the field that served him; a sense of being a part of the eternal and unhurried rhythm of life” (p. 123-124).

In the United States, at about the same time Mishan began his diatribes against the ideology of progress through economic development, J. K. Galbraith (1962) was mounting a similar though more optimistic (at least by Mishan’s account) and marginally less vehement attack on the conventional wisdom of progress through economic growth in an already industrialized society. *The Affluent Society’s* primary target was the disparity in the United States between production of private goods and production of public goods. Galbraith pointed out the grotesque disparity between the culture of practically unlimited productive capacity he discerned in the United States, and the continued existence of poverty which American society tolerated.

One of the key features of both Galbraith’s and Mishan’s critiques is their conception of human needs and their relationship to the market. One of the cornerstones of a market economy’s moral justification is the assumption of consumer sovereignty: that human needs are autonomous and irreducible, and that the market operates to give people what they want. A distinction between the “real” needs of human beings and “false” needs created by (variously) urban culture, decadence, capitalism, or the affluent society, has been the basis for social criticism since the Stoics. This distinction can be seen in Galbraith, Mishan, Mumford, Schumacher and other “conservative” critics of modern culture. It has figured rather more prominently recently in leftist and ecological critiques of modern consumer culture. It is closely related to the concept of alienation found in Marx and his descendants.³⁸ The question of human needs, like that of human nature, provides fodder for ideological battles. Most evidence would seem to indicate that beyond certain minimal needs for food, shelter, and human contact (and perhaps contact with the natural world, although this is much in dispute), human needs are complexly cultural and historical, and, like history, open-ended though socially constructed. As Mishan puts it, “to continue to regard the market, in an affluent and growing economy, as primarily a ‘want-satisfying’

³⁸ For a detailed treatment of needs in the Marxian tradition, see Springborg 1981.

mechanism is to close one's eyes to the more important fact, that it has become a *want-creating* mechanism." (1967, p. 111). The enormous expenditures on advertising, as well as the desire for "positional" goods that results in an economic contest among consumers similar to the arms race (Hirsch 1976) seem to ensure that the levels of wealth enjoyed in modern industrial societies do not result in an increased preference for leisure (as might be expected, and as is the rule in traditional societies), but rather in a preference for ever-more consumption.

One of the most celebrated contrarian voices is that of E. F. Schumacher. In his essay, "Buddhist Economics" (in Schumacher 1973), and indeed throughout *Small is Beautiful*, the follies of modern industrial capitalism with its expansionist orientation are sharply contrasted with the possibility of a society organized much more sensibly to meet the "real" needs of human beings. What Schumacher questions, ultimately, is the conception of human nature and of humankind's place upon the earth that is presupposed by conventional economics. If a different conception of humankind, say, that of Buddhism, is taken as a starting point, a very different economics must result. Buddhist economics would organize production at a human scale and would never treat humans or nature as "resources" (i.e., commodities) but rather as ends in themselves. "Buddhist Economics" is offered as a beginning toward finding "right livelihood," a middle path between materialism and traditionalist immobility. In it is an overriding concern with the human *ends* of development, and we are asked to consider "whether the path of economic development outlined by modern economics is likely to lead [us] to places where [we] really want to be" (p. 58). For Schumacher, Mishan, Galbraith, Marcuse, and many others, the answer is clear.

Wilkinson (1973), whose account of the dynamics of development benefits from considering anthropological evidence on the relationship between economies and ecosystems, sees the increased need for consumption in modern societies as belonging more to the realm of necessity than the realm of free choice on the part of the consumer, and as related to conditions of scarcity, not affluence. Briefly, Wilkinson argues persuasively that the conditions of modern life, especially the breakdown of community life, mean that more and more everyday functions are subsumed within the market economy. For example, for many parents today it is necessary to purchase child care, something that was once provided within the extended family or neighborhood. Various other social functions have been commercialized or taken over by the state, not necessarily because people *prefer* the commercial or bureau-

cratic product, but because the social function it replaces is no longer available.³⁹ A case in point (which also indicates the extent to which social disintegration has already proceeded in the United States, especially in urban areas) could be seen in the *Roanoke Times and World News* of April 17, 1992, in which Roanoke County's chief of police is quoted as saying, "Used to be, you had a problem with your neighbor, you went over and talked to him. Not anymore. Now you call a cop. Your neighbor probably has an AR-15 (a semiautomatic weapon) in there. You probably don't even know who he is."⁴⁰

Eckersley (1992) has introduced an analytical framework that is of considerable value in sorting out the distinctions among the various positions within the RCP, as well as among the three political/ideological paradigms. She argues that the environmental problematic "has been analyzed by political theorists as reflecting a crisis of participation, a crisis of survival, and a crisis of culture and character" (p. 179). Green political theory, or what I have called the RCP, is distinguished by "its concern to reconcile and solve all three of these interrelated crises while also offering new opportunities for social emancipation, cultural renewal, and an improved quality of life" (p. 179). Hence the relevance of the conservative critique of modern culture to the RCP; while the environmental problematic may not be central to the concerns of, e.g., Lewis Mumford, it is certainly a relevant element of what is conceived as a larger problem.

The progressive replacement of precapitalist social relations by market relations has been a central point of criticism of both the conservative cultural critics and certain post-Marxists, in particular the Critical Theorists of the so-called Frankfurt school. The Critical Theorists, in particular Theodore Adorno and Max Horkheimer (writing in the 1940s), and Herbert Marcuse (writing in the 1950s and 1960s) attempted to extend

³⁹ This extension and penetration of economic rationality, which uproots traditional life-ways, is characteristic of capitalism (see, for example, Gorz 1989). Marx and Engels, in the *Communist Manifesto*, (quoted in Gorz 1989, p. 19) characterize the inescapable result of capitalism in the phrase, "all that is solid melts into air."

⁴⁰ Similarly, of course, many functions previously performed "for free" by nature are no longer available, either because of the destruction of ecosystems, or because of the increase in the relative size of the human activity in relation to the natural system. Or, as Lewis Mumford (1961, p. 527) would argue, because of the imperatives of our modern technological capitalist economy, which "devotes itself to contriving means to displace autonomous organic forms with ingenious mechanical (controllable! profitable!) substitutes."

Marxian analysis in order to develop a critique of industrial society as entailing both alienation and repression and leading to a culture of dominance: of nature by man, and of some people by others, using increasingly sophisticated technical means. Adorno and Horkheimer (1979) argued that the price paid in the post-Enlightenment period for the banishing of superstition by reason was both the rationalization of the world and its disenchantment, as well as an imperialist attitude toward nature, an attitude that is ultimately self-destructive. This urge to dominate and manipulate nature results in alienation, both of humans from nature and from their own "inner nature." Adorno and Horkheimer (1979, p. 4) also emphasized the relationship between power and the development of science and technology: "Power and knowledge are synonymous" (a point later to be considerably buttressed by the work of Michael Foucault, e.g. 1980).

A number of consequences may be seen to flow from the state of alienation resulting from the rationalization of society: the commodification of nature and other people, the compensatory pursuit of materialism resulting in consumer society, and finally the ecological crisis. Marcuse (1964) takes this critique further, using Freudian concepts of psychological repression to extend the concept of alienation. However, while Adorno and Horkheimer hoped for (though not with much optimism) a reconstructed relationship between culture and nature that would not be characterized by domination, Marcuse looked forward to a future in which science and technology would liberate humans from the necessity of work altogether. And indeed, in the early 1960s, the possibility of an end to scarcity seemed credible enough.⁴¹ Critical theory, by several accounts, has failed to live up to its promise of providing a basis for emancipatory social action (Eckersley 1992). Friedmann (1986) in particular is more than a little contemptuous of critical theorists, and especially Habermas, on this

⁴¹ Adrian Atkinson, in *Principles of Political Ecology* (1991) argues that this possibility is still within our grasp, although it is receding rapidly in the face of the absurdity and irrationality of modern society: "From the point of view of a hedonistic, Utopian sensibility, what is extraordinary about the history of European culture in the 20th century is its refusal to acknowledge and use the products of science and technology to, in Bacon's words, 'relieve man's estate.' The fetishism of armament invention and manufacture and constant warring over what in the end was scarcely more than scholastic ideologizing; the insistence on reproducing ridiculously dysfunctional lifestyles that create enormously elaborate structures that then require utterly alienating work to run and maintain; the equally highly structured format of life outside the framework of productive relations; and finally, the denial of economic and social justice for so many in a situation where its achievement is no more than a matter of concession: this is the experience of European society, forced upon the whole world, during this century."

score. Nonetheless, the critique of instrumental rationality and domination of nature provided by the critical theorists has been used by others within the RCP, in particular Murray Bookchin.

Social Ecology

The social ecologists, whose chief theorist is Murray Bookchin, have followed in this tradition, calling for a rejection of the relations of dominance that characterize modern societies. Bookchin is well known among theorists of the environmental movement for his denunciation of deep ecology on the grounds of its (in his view) antihumanism and irrationality. Bookchin, on the other hand, has been relatively successful in developing a theory for environmentalism that combines ecocentrism with humanism.

Ecology has been called, with good reason, “the subversive science” (Shepard and Mckinley 1969), but its potential not only for deconstruction (Luke 1983) but for indicating at least the parameters of an ecologically reconstructed society has only recently begun to be widely appreciated by social thinkers. Foremost among these has been Murray Bookchin, social anarchist, ecologist, activist, polemicist, and grand synthesizer. Bookchin takes a reconstructed ecology as the cornerstone for a thoroughgoing critique of social hierarchy and domination and for an imaginative and even daring vision of how human society might be transformed.

Bookchin’s reconstruction of ecology is undertaken against those who would see in the natural world, in particular the biological world, either a kind of Hobbesian struggle of all against all in competition for scarce means of life, or “natural” forms of hierarchy (“queen” bees, “the king of the beasts”). Bookchin argues that this view is a kind of perverse projection meant to justify social forms of dominance as well as human dominance of nonhuman nature. On the contrary, he makes the claim that ecosystems are characterized by complementarity, nonhierarchical relationships, mutualism, and unity-in-diversity.

Bookchin is not the first social anarchist to make an argument along these lines. Peter Kropotkin, in *Mutual Aid*, (1972; original 1914) decried the social Darwinists’ singular concentration on competition and struggle as the fundamental mechanisms propelling evolution, and demonstrated how such a view could ethically justify any and all forms of social domination. Kropotkin did not reject the Darwinists’ use of biology as a basis for ethics, but rather took issue with their conclusions. His own

conclusion was that in nature, mutual cooperation, or “mutual aid,” was much more important in determining fitness for survival, and so it ought to be in society.

Bookchin’s project is to demonstrate that global environmental degradation and the prospect of complete ecosystem breakdown have their origins in a social organization based upon dominance -- of man by man, of the poor by the rich, and of nature by society. At the same time, the very certainty of the unsustainability of current modes of social organization and reproduction renders an ecologically harmonious society no longer utopian but in fact necessary if we are to survive at all.⁴²

Nature and Culture. One of Bookchin’s central themes with respect to ecology is what might be referred to as the nature/human problematic. It is the view of human society as being fundamentally distinct and different from the “realm of nature.” This distinction has its aspects in such dichotomies as mind and matter (Descartes), the in-itself and the for-itself (Sartre), and the realm of freedom and the realm of necessity (Marx). It underlies in a fundamental sense the science, technics, and economics of the Dominant Social Paradigm (DSP) described earlier, and it has proved remarkably resistant to theoretical critiques.

In *The Ecology of Freedom*, Bookchin (1982) offers a penetrating critique of the culture/nature split. He rejects both facile attempts to bridge the gap based on human self-interest, as well as attempts to overcome dualism simply by reducing one element to the other. Rather, he offers a complex argument that turns on a view of nature as not the soulless, mechanical, amoral realm of necessity seen by science and economics, but rather as the living, evolving fecund ground of creativity, consciousness, and freedom. Culture is potentially a “vast and indefinite extension of nature” into the evolution of a self-conscious nature (Bookchin 1989a, p. 38). Humans, conceived as a species, “have absorbed the primal ‘first nature’ in which they evolved as mammals into a *social* ‘second nature’ in which they are *still* evolving as cultural beings” (Bookchin 1989b). Society and nature are potentially participatory coevolutionists in a nature evolving toward self-consciousness and ever-greater diversity and freedom.

However, in order to realize this coevolutionary potential, society must throw off, dissolve, deconstruct the objective and subjective structures of dominance into which it has developed. The roots of the development of hierarchy lie in early human so-

⁴² As Karl Hess puts it, “Utopia is, after all, just a sensible choice” (Hess 1979, p. 72).

cieties, and a great deal of Bookchin's writing is concerned with explaining this historical development. In brief, dominance has its origins in human society, especially in the domination of woman by man in early warrior societies. The important point, and it is central to social ecology, is that "the basic problems which pit society against nature emerge from *within* society" (Bookchin 1989a, p. 32).

Bookchin draws a stark contrast between social ecology and "environmentalism," which he views as "a mechanistic, instrumental outlook that sees nature as a passive habitat composed of 'objects' such as animals, plants, minerals, and the like... a storage bin of 'natural resources' or 'raw materials'" (Bookchin 1982, p. 21). Lending credibility to Bookchin's argument for the identity of the origin of forms of dominance, whether their object be nature or society, this view also sees people as "human resources."

Reason. Another important concept reconstructed by Bookchin in a long, complex, and subtle argument that owes much but not all to Max Horkheimer and Theodor Adorno (Horkheimer 1947; Horkheimer and Adorno 1972), is reason. Bookchin sees the reason that informs modern science and economics as "a strictly functional mentality guided by operational standards of logical consistency and pragmatic success" (Bookchin 1982, p. 270). It is an instrumental reason radically divorced from questions of ethics and ends, one which "serves any particular endeavor, good or bad" (Horkheimer 1947, p. 8). It is, one might say, the reason that reaches its fullest expression in engineering and policy analysis -- two disciplines that permeate mainstream environmental planning. Its manifestation in economics is an economics split off from political economy, in which decisions of unprecedented social and political import are made by an invisible hand or reduced to "costs" and "benefits" considered apart from the questions of who bears the costs and who receives the benefits.

Bookchin, perhaps hearkening back to Fourier, argues for an ecologically reconstituted reason, ecological in the sense that all modes of experience -- emotion, intuition, the wisdom of the body -- play a complementary role. In contrast to some in the radical environmental movement (notable the Deep Ecologists, see Tokar 1988), Bookchin does not reject science as such, seeing in it a liberatory, creative force for remaking society. What he decries is a science in the service of domination, "scientism" as "the instrumental engineering of control over people and nature," warped by capitalism into a "harsh industrial rationalism" (Bookchin 1989a, p. 166).

The Role of the State. For Bookchin, as for Bakunin, the State is entirely destructive and antilibertarian. As both “a constellation of bureaucratic and coercive institutions” and “an instilled mentality for ordering reality,” (Bookchin 1982, p. 94), its role is to preserve and expand the systems of hierarchy and dominance. He differentiates his view of the development of the State from that of what he calls “anarchist orthodoxy” (1982, p. 2), in that rather than taking the emergence of the State as the beginning of hierarchy and domination, he sees it rather as the institutional culmination of an historical process in which the development of structures of hierarchy and forms of domination long antedate the modern State. Contrary to the views of some anarchists, Bookchin argues that “what initially characterizes the emergence of the State is the gradual politicization of important social functions” (1982, p. 125), and that this capacity of the State to absorb social functions “provides it not only with an ideological rationale for its existence; it physically and psychologically rearranges social life so that it [the State] seems indispensable as an *organizing principle* for human consociation” (1982, p. 127). The near-triumph of the State’s efforts to penetrate and absorb social life, and “exorcise” the ideal of citizen competence for self-governance, is found in modern capitalistic societies (Bookchin here includes State capitalism), and “what makes capitalism so unique is the sweeping power it gives to economics: the supremacy it imparts to *homo economicus*” (1982, p. 134).

Bookchin’s critical view of the State leaves it no role in the transition to an ecological society, much less in the ecological society achieved. In fact, “the precondition for a harmonious relationship with nature is social: a harmonious relationship between human and human. This involves the abolition of hierarchy in all its forms – psychological and cultural as well as social – and of classes, private property, and the State” (Bookchin 1989a, p. 189). The contrast with the role of the State in the DSP could not be greater. There, the State’s role is central and pervasive: to mediate, where not too costly, the destructive social and environmental effects of the processes of production and social reproduction, even as it encourages the constant expansion of these same processes.

Bookchin’s strength is as a polemicist and social critic. His works on social ecology, particularly *The Ecology of Freedom*, are more effective as deconstructivist social theory than as a roadmap to the ecological promised land. Luke (1983, p.22) describes deconstructionist ecology as follows:

There is no definitive program for the ecological revolution that articulates *what to do*. Deconstructionism does not provide a failsafe recipe for the future or a superfire method for realizing ecotopia. Rather deconstructionism outlines a menu of actions for the present by elaborating clearly *what to undo*. By turning the *undoing* of technical, political and economic domination into a subversive form of *doing*, deconstructionism puts personal emancipation and communal self-determination first on a revolutionary agenda for dismantling the hierarchies, large-scales, complexities, super-centers and uniformities of corporate capitalism.

Bookchin himself would be the first to admit that his expositions of social ecology contain no roadmaps, and to point out that its deconstructionist thrust is consistent with his anarchism. On the transition from “here to there,” Bookchin says that the move

will not be a sudden explosion of change without a long period of intellectual and ethical preparation. The world has to be educated as fully as possible if people are to change their lives, not merely have it changed for them by self-appointed elites who will eventually become self-seeking oligarchies. Sensibility, ethics, ways of viewing reality, and selfhood have to be changed by educational means, by a politics of reasoned discourse, experimentation, and the expectation of repeated failures from which we have to learn, if humanity is to achieve the self-consciousness it needs to finally engage in self-management. (Bookchin 1989a, p. 189)

Here we have as elaborate a statement as can be found in Bookchin on the possible role of the environmental planner whose practice is informed by social ecology. It is a role not unlike that of the radical planner in Friedmann: educator, facilitator of social learning from experience, mediator between theory and local practice, networker. This view sets Bookchin apart, as Luke (1988, p. 305) points out, from some of the other social ecologists, who, “rather than refuting the authority and control of professional experts, ...often seem to call for a new class of ‘ecocrats’ or ‘ecomangers’ who would continue many modern industrial practices only following soft energy paths into an alternative but not revolutionary future.” On the other hand, that Bookchin does not share in Schumacher’s (1973) rejection of, for example, labor-saving technologies, and that he sometimes seems to leave open a role for some advanced technology, are difficult to reconcile with his rejection of expertism and professionalism.

Ecofeminism

Ecofeminism, which is both a nascent social movement and a rapidly developing body of theory (Lahar 1991), represents another distinct position within the RCP. Ecofeminism builds upon a number of themes already introduced by Marxist and

neomarxist theory (e.g., historical embeddedness, the social construction of ideas, attitudes, and identity) as well as by critical theorists (the critique of science, the critique of hierarchy and domination). Ecofeminists have extended the analysis of dominance to gender; that is, the subjugation and exploitation of nature is seen as having common ideological roots with the subjugation of women in a patriarchal society.

Merchant (1992) distinguishes several different feminist theoretical positions that result in different ecofeminist positions, of which the most important are liberal, cultural, and socialist ecofeminism. According to Merchant (1992), what unites these distinct ecofeminist approaches is a concern with *reproduction* and the effects of modern technologies on it. Merchant here uses reproduction in a broad sense, to mean the reproduction of life. In nature, life is transmitted through the biological reproduction of species in the local ecosystem. For humans, reproduction is both biological and social. It is concerned both with child-bearing and child-rearing as well as shelter and sustenance to sustain life on a daily and continuing basis. Many ecofeminists argue that the technologies designed and adopted in a patriarchal culture put reproduction at risk by neglecting their impacts on both human health (and especially women's health and reproductive organs) and ecosystems. For example, many of the contributors to Judith Brady's (1991) volume about women and cancer argue that the "epidemic" of cancers in women are caused by the presence of synthetic chemicals in the environment. In effect, although it is unlikely they would adopt this language, ecofeminists argue that women disproportionately bear the externalized costs of production in modern economies.

Liberal ecofeminists share the belief system that I have described under the DSP and their approach to environmental problems is generally consistent with what was described above as environmental management. Cultural ecofeminism "celebrates the relationship between women and nature" and often takes an anti-science, anti-technology standpoint (Merchant 1992, p. 191). However, as Merchant and other feminists have pointed out (e.g., Beihl 1991), there are problems with a stance that asserts that women have, by virtue of their gender, a special relationship with nature.

First, it implies that men cannot share an empathic, nurturing relationship to nature -- which is demonstrably untrue. Second, because cultural ecofeminists are not concerned with developing a theoretical understanding of why capitalism involves the domination of nature, cultural ecofeminism cannot develop a strategy for social change. Cultural ecofeminists, rather, are often involved (according to Merchant)

with grassroots actions to correct specific environmental abuses (she cites the example of Lois Gibbs of the Love Canal Homeowners Association in Niagara Falls, New York). As Salleh (1991, p. 206) puts it, “what is missing is an explicit and concerted challenge to the multi-national structure of economic oppression: a global economy in which a so-called ‘advanced’ world is utterly dependent for its daily survival on the labors and resources of an ‘un-developed’ Two Thirds World.”

It is such a challenge that is mounted by socialist ecofeminism. According to Merchant (1992, p. 195), “socialist ecofeminism is not yet a movement, but rather a feminist transformation of socialist ecology that makes the category of reproduction, rather than production, central to the concept of a just, sustainable world.” Socialist ecofeminism is concerned to reverse the subordination of reproduction and ecology to production that is found in both the theory and practice of industrial capitalism (Merchant 1992, p. 198). The impact of western-style development on women in the less-developed countries is a matter of special concern to both socialist and non-socialist feminists, and many focus specifically on the differential impacts of environmental degradation and the erosion of indigenous and traditional cultures on women. Vandana Shiva is perhaps the best known writer in this area.

There are many writers from the “developing” world who, like Ghandi, decry the penetration and incorporation of their cultures by the modern (i.e., European) world system. The introduction of the concept of sustainable development has occasioned intensive criticism and (in some cases) calls for rejection of the European model of development on grounds of ecological and cultural survival. Vandana Shiva, for example, sees modern science and development as “the latest and most brutal expression of a patriarchal ideology which is threatening to annihilate nature and the entire human species” (Shiva 1989, p. xvi). “Development” according to Shiva (1989, p. 14) as it manifests in the so-called developing world is “a patriarchal project of domination and destruction, of violence and subjugation, of dispossession and the dispensability of both women and nature.” Alvares (1992) is even more strident in his denunciation of western-style development as applied to the developing world: he argues that “‘development’ is a label for plunder and violence.”

This perspective on the traditional modes of development has sympathizers on the “other side” of the development nexus. William Adams, for example, who has been professionally involved in development projects in Africa, writes of the need for a “green development” that would replace current practice. “Development ought to be what human communities do to themselves. In practice, however, it is what is

done to them by states and their bankers and 'expert' agents, in the name of modernity, national integration, economic growth or a thousand other slogans" (Adams 1990, p. 199).

The claim is frequently made that the fact that indigenous cultures coevolved with their local environment over many centuries is *de facto* proof of their superior sustainability, or at least of the superior environmental sensitivity of their survival practices (see, e.g., Redcliff 1987, p. 150-159). Certainly one of the tenets of ecodevelopment is that a greater reliance on local knowledge (as well as local materials) is needed.⁴³

Toward a coherent Green political theory

Although the perspectives I have included in the RCP differ, there is sufficient commonality to justify grouping them together at a general level. With certain exceptions and qualifications, it is safe to say that most directly question the results and/or legitimacy of modern development; most call for an end to relations of dominance; all favor local self-determination, decentralization, a rejection of consumer culture, and a reconstructed, mutually beneficial relationship of culture and nature. All call for a reevaluation or reconstruction of science, all are critical of the goals of economic progress, all are concerned with not only the destruction of the biosphere but the destruction of community, of cultures, of tradition.

There have been several recent attempts to sift through the disparate viewpoints of the RCP in order to begin to formulate a coherent political philosophy that would take account of the claims of environmentalism. In order to more specifically develop or identify a political theory that is ecocentric, rather than anthropocentric, Eckersley (1992) critically examines a number of positions within the environmental movement. These include:

- resource conservation, which Eckersley describes as "the first major stop ...as one moves away from an unrestrained development approach" (p. 35). It is roughly equivalent to the U.S. conservation perspective I described in Chapter 1 or what Colby (1991) calls the environmental protection paradigm;

⁴³ This is one of the reasons that ecodevelopment can hardly be considered a model for the "first world," where few traces of indigenous culture (or indigenous ecosystems) remain, and where population density is high.

- human welfare ecology - “the movement for a safe, clean, and pleasant human environment” (p. 36);
- preservationism - “the aesthetic and spiritual appreciation of wilderness” (p. 39);
- animal liberation; and
- ecocentrism.

Eckersley argues that only an ecocentric perspective represents a significant advance over the other “streams” of environmentalism. It incorporates a recognition of “the full range of human interests in the nonhuman world”; it “incorporates yet goes beyond” conservationist and human welfare ecology perspectives; it recognizes the interests of nonhuman communities yet goes beyond the simple aesthetic interest of early preservationism; it takes into account the interests of future generations of humans and nonhumans; and it adopts a holistic perspective “insofar as it values populations, species, ecosystems, and the ecosphere *as well as* individual organisms” (p. 46).

Having described and defended a thoroughgoing ecocentric perspective, Eckersley is then concerned to develop a political theory that can incorporate such a perspective. Traditional political theories -- liberalism and conservatism (the political theories of the DSP) as well as Marxism -- are found to be too anthropocentric. She argues that only a truly ecocentric political theory can provide the framework for a lasting resolution of the “ecological crisis,” which she describes as consisting of a crisis of participation, a crisis of survival, and a crisis of culture and character. “Eco-Marxism,” Critical Theory, and ecosocialism are also anthropocentric but diminishingly so, in that order.

Ecoanarchism (in which she includes Bookchin’s social ecology as well as “ecocommunalism” and bioregionalism) best meets Eckersley’s criteria for incorporating an adequate ecocentrism, but is also idealistic, utopian, and “ultimately marginal and ineffectual” (p. 183). Ecosocialism is more realistic as well as more attuned to such issues as civil rights, redistributive justice, and the imperatives of levels of organization beyond the community. However, Eckersley argues that the drastic contraction of the market’s role in production favored by ecosocialists is neither necessary nor desirable. Rather, the market should be retained as the basic system of resource allocation, but with “macro-controls” (p. 184) that would function to prohibit “excessive” concentrations of power, protect biodiversity and ecological

integrity, and promote social justice in the form of greater equality of opportunity. Consumer preferences would still guide investment in competitive markets, but these preferences would “need to be much more ecologically and socially informed” through enhanced consumer education (p. 185).

In terms of political organization, the ecocentric polity would need to provide for multi-levelled decisionmaking (here Eckersley rejects the claim -- frequently advanced by communitarian environmentalists -- that local decisionmaking is always best for the environment), sharing of power and wealth among decisionmaking levels and among communities, and “a far more extensive range of macro-controls on market activity” (p. 185) than is currently found in the industrial democracies. The ecocentric polity would also be one in which an “ecocentric emancipatory culture” flourished.

Adrian Atkinson, in *Principles of Political Ecology*, attempts to construct an adequate intellectual framework for what he describes (as does Eckersley) as a crisis that is at once one of culture and one of survival. Like Eckersley, Atkinson takes an ecological crisis as given: “political ecology starts from an acknowledgement of the environmentalist warning that our cultural trajectory is potentially catastrophic” (1991, p. 4). Atkinson, though sympathetic with the direction of much “ecophilosophy,” rightly criticizes its preoccupation with, and failure to go beyond, an ethics approach to the environmental problematic. This failure leaves those concerned with finding solutions without “practical purchase,” that is, with no real guidance for practical action. Atkinson is concerned with the theoretical, philosophical, and practical, strategic issues associated with fairly rapid transition to a “Green utopian” society, fully recognizing that “any headway in this direction will be made over the dead body of capitalism” (p. 5).

Ultimately, the ideologies of progress and economic growth that legitimate modern industrial capitalism must be abandoned (or rather, deconstructed): “political ecology denies that there is any grand trajectory to the enlightenment process -- indeed it rejects the whole notion of progress and enlightenment universalism more generally -- and insists that we must build a workable society here and now, within contingent and local constraints and opportunities” (p. 182).

Before an ecologically oriented society can begin to be built, it is necessary to recognize the massive inertia and importance of existing ideas about what is possible and what is not. At the same time, however, Atkinson demonstrates that there is a

quite sufficient reservoir of alternative ideas in the “social subconscious” about how an ecologically benign society might be structured. Along with the thoroughgoing examination and reconstruction along ecological lines of the ideologies underlying modern industrial capitalism, it will be necessary, finally,

to initiate the process of devising Utopian models and strategies. This is a matter of using whatever tools are immediately to hand, including technocratic planning procedures as well as fictional and speculative visions of an ecological future, together with a gathering of strength of the Green movement to tap new intellectual, analytical resources and beyond that experimentation with lifestyles and political strategies to raise general awareness and move in a structured way toward the Green utopia. (p. 11)

Atkinson likens the transition to the sustainable society to the end of a voyage, a time when the goal (the shore) can be seen but which is in some ways the most hazardous stage of the voyage. Much can go wrong and successful disembarking is by no means assured.

The Green utopia envisaged by Atkinson would involve decentralized social and political structures, with conceptual affinities to both bioregionalism and communitarianism. However, in order to make a transition to such a society, social inequities will have to be dealt with: indeed, Atkinson argues that undoing the “inegalitarian and incommensurable” social relations currently existing is the “most delicate aspect of the project of political ecology” (p. 182). Closely related is the need to recognize, to feel at a deep level throughout society, that our “ancient fear of want” is no longer justified, that the means are at hand to solve “the material problem” (p. 193) -- although they may not be for long if our current trajectory is not altered!

Yet Atkinson rejects the coercive oppositional and revolutionary strategies of social change that characterized Marxism. Such a course of action can only fall prey to the same distortions and pitfalls as did Marxism. “If political ecology is to make headway, as demonstrating the route to the end of the enlightenment project, then it must operate as if it were already there, eschewing all coercive strategies and arguing and acting out the ultimate settlement here-and-now” (p. 212). This is essentially an anarchist strategy: building the new society in the midst of the old, rather than trying to overthrow it. However, the redirected and subversive use of various technocratic forecasting and modeling techniques, in order to better understand and draw attention to “the human and spiritual ‘underside’” of our current cultural trajectory may be useful. The desirability and, indeed, necessity of an ecological deconstruction

of existing ideologies and beliefs about progress and growth, simultaneous to the experimentation with new communities which Atkinson advocates, has been pointed out by Luke (1983), Kloppenburg (1992), and others.

Contributions of the three paradigms

The three political/ideological paradigms described above represent distinctly different perspectives on development. The technical approaches to sustainability being developed within the DSP -- ecological economics, ecological engineering (e.g., wetlands creation, integrated pest management) -- will be necessary during the transition to a sustainable society however that is accomplished. The identification of certain technical requirements of an ecologically benign, sustainable economy -- optimization of scale, the limitation of throughput, the importance of an appropriate approach to discounting, as well as the science involved in identifying ecological limits, restoring ecosystems, and so on -- can be and are being worked out within the DSP. These approaches lend themselves to an incrementalist strategy which will be necessary in any case to buy time, and which may be all that is achievable in the short term. But the question then arises: for what are we buying time? Sustainable development is not about the short term. What is it that we expect to happen that will make sustainability possible?

It is in the construction of possible futures that the differences among the three paradigms becomes most clear. Within the DSP, there is little discussion of directed social change to bring about a desired future, because history is seen as something that simply happens through the interplay of autonomous forces (the invisible hand), the creativity of business entrepreneurs and scientists, or perhaps the courage and decisions of "great men." Gorz (1989) has described with alarm the obliteration of the public sphere by the market in capitalist societies (a concern that echoes that of Friedmann (1987)). Liberal ideology, says Gorz, tells us that society "will be at its best if ...no one shows concern for anything but their own good" (1989, p. 129).

The ideology of progress implies that the present is the best of all possible worlds, and that the future will be even more so, inevitably, if technological improvements and economic development are given free rein. Technological optimists confidently predict that some new source of clean and plentiful energy will come online, allowing further growth of population and economic growth. Certainly such a technological breakthrough would be most welcome, although it might well exacerbate other as-

pects of the “ecological crisis,” allowing, for example, an acceleration in urban sprawl and habitat loss. However, the technologies for managing the global change that would inevitably accompany further expansion of population and economies along existing lines would be forthcoming. Resources would be increasingly intensively managed, including the use of land. Power and wealth would remain unevenly distributed, with large multinational corporations and/or centralized government agencies asserting greater control over local communities and ecosystems even as production processes become cleaner, at least in the industrialized nations.

Ever-more intensive environmental management is likely to require ever-more pervasive and effective means of social control. That such control might, as the Critical Theorists have argued, be through seduction rather than coercion is small consolation: control is control, however it be exercised. Finally, the technological sustainability that the DSP seems to point to does not begin to deal with, or even recognize, aspects of sustainability raised by the Marxist and radical/critical perspectives: social justice, equity, and the emancipatory possibilities of social change necessitated by sustainable development.

The Marxist paradigm contributes a rich theoretical foundation for understanding the role of power and forms of dominance in industrial capitalism, the nature of alienation and its causes, and the historical dynamics, possibilities, and limitations of capitalism. The recent collapse of the centrally planned economies in Europe, has removed that form of economic organization from consideration as a serious alternative to market economies or as a viable alternative future (Heilbroner 1990). The consequences of “actually existing” Marxism’s espousal of a kind of Promethean industrial development -- socialist man conquering nature -- as its version of the Enlightenment project, can be seen in the severe environmental degradation throughout the former Soviet Union and its client states. However, it must be recalled that the Soviet-style regimes bore little relationship to anything Marx himself would have endorsed; indeed it is likely that he would have seen them as a grotesque parody of his ideas, which were above all about the possibilities for human freedom. The Marxist critique provides unsurpassed insights into the nature and dynamics of development under capitalism, as well as providing important theoretical tools for the development of a theory of ecological/economic change (e.g., Merchant 1989). The utility of concepts such as alienation and commodification for the development of a theory of why capitalism may not be ecologically or socially sustainable has been noted by many (e.g., Eckersley 1992).

The radical/critical paradigm incorporates many insights of Marxism but pushes farther to the root causes of the current environmental problematic. These are seen as residing in enlightenment epistemologies and ontologies; in social relations of dominance; and in a conceptualization of the human/nature relationship that, while once useful, has outlived its context. Several of the analyses found in the RCP have great explanatory power with respect to the causes of nonsustainability. They treat it not merely as a constraint but as an opportunity, albeit an opportunity forced upon society.

The RCP, by deconstructing existing ideologies, also clears a conceptual space for a much-needed broadening of the cultural discourse about the nature of progress and development, one which incorporates the perspectives of those who bear the costs of development. Although certain positions within the DSP are culturally regressive (some versions of deep ecology, for example, are quite misanthropic), still it offers the possibility of a lasting solution to the (present) contradiction between nature and culture.

However, with the possible exception of ecofeminists, those who share the perspective of the RCP are yet a tiny minority in most places, hardly a blip on the cultural radar. Many supporters of the RCP see signs of a rising tide of support, but it too often seems as though they all cite the same handful of examples of radical environmental movements -- the Chipko movement in India and the women's Greenbelt movement in Africa -- which are quite marginal even in the context of their countries. The fact is that while many polls (Dunlap 1987, 1991) show widespread, even majority support in the industrialized nations for general environmental goals and values, most people are firmly entrenched in the set of beliefs of the DSP. Values and beliefs are subject to revision and replacement, however, and a large-scale ecologic catastrophe could bring about very rapid change. Still (as Atkinson points out) the inertia of cultural beliefs about what is possible and what is not cannot be underestimated. Moreover, real structural social change, with redistribution of power and privilege, will meet with real resistance. The course of Russian communism, for example, might have been very different had it not aroused the hostility of the rest of the industrialized world. Thus, as reasonable as the ecological utopian alternative may seem to some, major problems stand in the way of its realization.

The choice among paradigms would seem to depend on one's values, position, and perception of the extent and seriousness of the environmental problematic. Certainly the point of departure for the RCP is that the environmental situation constitutes a

crisis, a potential catastrophe, and one that is upon us now, whose effects will soon begin, indeed have already begun, to “bite.” Unless and until this happens, there will be no incontrovertible proof of the seriousness and dimensions of the problem. Much depends, therefore, upon how much risk one is willing to tolerate; this in turn depends upon where one sits, because risk is not distributed evenly. Those who benefit most from the current technoeconomic arrangement of things -- the affluent in the industrialized nations, as well as westernized elites in the less-developed nations -- bear the least risk, while those whose status is already precarious are vulnerable to even slight perturbations in the world economy, as well as being most vulnerable to environmental degradation.

Some environmental problems, however, have the potential to affect all of humanity: global warming, the thinning of the ozone layer, and (though many are unaware of it) the loss of biodiversity. Indeed, given the unequal distribution of power and wealth both among nations and within them, it is apparent that much depends on those who have power becoming aware of the risks that they, as well as the poor, face.

What the juxtaposition of the three political/ideological paradigms in the discourse on sustainable development does, fundamentally, is to raise the question of the good society. The dominant social paradigm, the radical/critical paradigm, and the Marxian paradigm essentially describe three alternative paths to sustainability. *The concept of sustainable development is an open question, an invitation, to a re-opening of the fundamental (and fundamentally political) question of what kind of future we want.*

Chapter 3: Challenges to Environmental Planning in the 1990s

The purpose of this chapter is to describe a “mainstream” model of planning that incorporates the perspectives and values of the Dominant Social Paradigm (DSP). There are a number of emerging epistemologies and perspectives, however, that are likely to influence planning theory and practice in the near future. New directions for planning are suggested by challenges to the mainstream model, including (1) challenges to certain of its conceptual foundations and aspects of its substantive theory that continue to be dominant in determining its stance toward sustainable development -- principally its espousal of positivism and technical rationality, its instrumentalist conception of ecology and of the human/nature relationship, and its dedication to the project of modernity (now under seige) -- and (2) its context, which is one of rapid change, both social and environmental. There is a correspondence between the mainstream approach to planning and the conception of sustainable development found in the dominant social paradigm (DSP), which was described in the previous chapter -- understandably so, since the mainstream model of environmental planning has many of the same historical roots and shares many of the same assumptions (and blind spots) as the DSP.

Mainstream Environmental Planning

Environmental planning has recently been defined as “a functional area within the broader field of planning and... an activity undertaken by individuals and organizations dealing with problems arising at the society-environment interface [i.e., not, as some would argue, within society] and devising courses of action to solve these problems” (Briassoulis 1989).⁴⁴ Other definitions are possible, of course. Faludi (1987,

⁴⁴ In this definition, we already see a central feature of the mainstream approach to environmental

p. 139), for example, uses the term environmental planning comprehensively, to include land use planning but also many other “forms of intervention in the environment” which are related to land use planning.

The range of environmental planning’s institutional contexts and situations to which it is applied is large, even if consideration is limited to the U.S. It encompasses three major substantive categories: (1) environmental land-use planning and management, (2) pollution control/residuals management, and (3) natural resources management. Briassoulis’ definition is sufficiently broad to encompass not only bureaucratic practice but also the work of many nongovernmental environmental organizations.

In his schematization of planning in the public domain, Friedmann (1987) distinguishes between planning for societal guidance and planning for social transformation (among other distinctions). As Friedmann states (p. 39), societal guidance “implies a central involvement of the state and incorporates both allocative and innovative forms of planning. Related theories include neo-classical and institutional economics, public administration, and organization development.” Societal guidance is concerned with system maintenance and marginal system change, and it is within these broad functional areas that mainstream environmental planning is found. As Friedmann (p. 32) notes, system-changing practice integrates radical proposals with the structure of the guidance system of society, and occurs through a process that is “riddled with conflict and compromise.” System maintenance, on the other hand, is bureaucratic in nature and in general poses no threat to the existing political economic structures. Social transformation, for Friedmann, involves change that alters the relations of power in society.

Mainstream environmental planning as I use the term falls within societal guidance as system maintenance and change. This use may be further clarified by a cursory review of the institutional contexts in which environmental planners are typically found, and of the functions they perform in those contexts. At the system maintenance end of the spectrum are found environmental planners functioning within bureaucracies at all levels of government and in some large nongovernmental organizations, such as (lately) the World Bank. At the local government level, an

planning: the fundamental perception of environmental problems as discrete problems capable of being treated separately from everything else. Murray Bookchin and other social ecologists would argue that this is itself an example of nonecological thinking.

environmental planner might be involved in reviewing site development plans or working with civil engineers to plan for upgrading of a stormwater collection system to comply with pollution control regulations. At the state and federal government levels, environmental planners engaged in system maintenance work to prepare plans for water supply development, energy facilities development, waste disposal facilities siting, complying with air- and water-pollution control legislation, and the like. To the extent that they are involved in the development of policy or practice innovations, such as new pollution control regulations or procedures for improved public participation in public lands planning, environmental planners can be said to be involved in incremental system change. Environmental planning for system change may also include the activities of such environmental organizations as the Environmental Defense Fund or the National Wildlife Federation. These groups, whose staffs include lawyers and technical experts, lobby Congress in order to influence environmental policy and take legal action to ensure enforcement of environmental laws and regulations. Their memberships are largely made up of passive dues-payers. They can be seen (in terms of Friedmann's scheme) as mediating between the social transformative ideas of radical environmentalists and ecologists, on the one hand, and the structures and functions of the State, on the other. This process, to reiterate Friedmann's phrase, is "riddled with conflict and compromise."

The rational comprehensive planning model, which shares a common epistemology with policy analysis, is the prototypical mainstream environmental planning process. Rational comprehensive planning, also called synoptic planning, "has dominated a large number of environmental policy and planning endeavors..." (Briassoulis 1989, p. 384). Although recently the process has been modified with the intent (though not always with the result) of increasing public participation, as well as incorporating elements of incrementalism, it is still the mandated process in many U.S. federal public lands agency planning and water resources planning at the federal and state levels. Briassoulis (1989) describes the basics of the approach:

(1) objective and exhaustive analysis of the environmental and socioeconomic conditions of an area along the lines of a systems analytic framework borrowing basic concepts from ecology (ecosystem, stability, resilience, carrying capacity), (2) identification and formulation of alternative solutions to the problem studied, and (3) selection of the best solution that meets objective scientific criteria. Experts are given a primary role assuming that they work for the public interest. The environmental planner is more of an apolitical technical expert, striving to engineer a harmonious relationship between nature's and man's works to avoid irreversible damage and to secure the long-term viability of ecosystems. (p. 384)

This description touches upon a number of characteristics of the mainstream approach to environmental planning. In the first place, objective, scientific analysis is fundamental to mainstream environmental planning, since, as noted previously, mainstream planning incorporates many of the basic tenets of the DSP (see Chapter 2 pp. 9-10). Weaver and others (1985, p. 158) argue that rational comprehensive planning was “the planning framework which attempted to apply logical positivism to society. It defined rationality exclusively in terms of positive knowledge and instrumental calculation. Such knowledge was claimed to be objective and universal. The deep structures of sociological knowledge and embedded impressions of personal experience were rejected.” Rationality is a central concept in planning, although a difficult one (see Friedmann 1987, pp. 97-105, as well as Breheny and Hooper 1985). One may define rationality in planning in one or more of several ways: (1) in terms of the technical, analytic methods used by planners (quantitative analyses, formal modelling); (2) in relation to the stance of political neutrality and scientific objectivity taken by some planners; and (3) in terms of a process in which rational decisions are those made through some formal and instrumentally efficient (the means are reasonably related to the ends) logic.

There is a broader sense of rationality which I wish to emphasize here, however, because it underlies and legitimizes planning. It is the sense of rationality that I traced to the French Enlightenment in Chapter 2: the belief in reason, as opposed to religion, faith, superstition (and, more recently, politics and markets) as a guiding principle in human progress. The tradition of scientific rationality that emerged from the French Enlightenment has been summarized in terms of a few relatively simple propositions (Teitz 1985, p. 139, following Berlin 1980):

First, that human nature is essentially the same at all times and places. Second, that universal human goals, true ends and effective means, are discoverable in principle. Third, that methods akin to Newtonian science may be discovered and applied in morals, politics, economics, and human behavior, toward the elimination of social ills. Fourth, that a single coherent structure of knowledge embracing fact and value is, in principle, possible.

What this description leaves out is the connection between scientific rationality and control. Friedmann (1987, p. 414) refers to this science of domination, this science that predicts in order to control, as “Comtean scientism.”

Although it is not stated in the above-quoted passage (Briassoulis), the rational comprehensive planning model generally assumes a decisionmaker other than the planner. Thus, the planner recommends the “best solution” according to *objective*

scientific criteria but the decisionmaker is free to take other values and criteria into account.⁴⁵ Its analysis is objective and makes use of systems analytic concepts, especially in ecology. The criteria used to choose among the identified alternative solutions are purportedly objective and scientific. Miller (1985) has correctly described the style of thinking that dominates the mainstream in environmental management (and, I would add, environmental planning) as “technological thinking.” Technological thinking is based on a belief in positivism, which in practice emphasizes problem-solving strategies that are empirical, objective, reductionist, and quantitative (Miller 1985).

The mainstream environmental planning process is predicated upon the assumption that there is an identifiable public interest that can be discovered using the proper planning techniques (public participation, cost-benefit analysis, etc.). The environmental planner’s role, then, is ideally that of apolitical, professional, technical expert serving the public interest.

The synoptic or rational comprehensive planning model is only one of several, the others (according to Hudson 1979) including incremental planning, transactive planning, advocacy planning, and radical planning. The rational comprehensive planning approach is and has been the mainstream in planning theory, with the other approaches defining themselves in relation to it.⁴⁶ In mainstream planning practice, the rational comprehensive approach has been modified to include elements of incrementalism and advocacy planning. Its basic process could not be simpler, nor more apparently reasonable. The process begins with the identification of goals, which can be either given or developed in response to some problem or opportunity. Alternative courses of action (means) for reaching the goals (ends) are identified and evaluated; one is chosen as the preferred or recommended alternative, and then implemented. The process frequently involves overlap between steps as well as iterations and feedback loops among the steps. It has been refined, elaborated, and

⁴⁵ Thus some decisions that might seem ecologically and/or economically irrational may be more readily understood when such considerations as the political power of interest groups are taken into account. But recent developments in the sociology of knowledge and post-Kuhnian philosophy of science, in particular the postmodern critique and the feminist standpoint theories, have challenged objectivity in this sense, as will be shown below.

⁴⁶ “During much of the 1950s and 1960s, Western planning thought became almost coterminous with the Rational Comprehensive model.” (Weaver and others 1985, p. 157).

tailored to specific situations and substantive areas of planning. The logic and simplicity of the approach no doubt account for some of its appeal and durability.

There may be political reasons for its dominance as well. Rational comprehensive planning serves established power. This is a historical fact but there are reasons inherent in the approach that account for it as well. The process, at least as it is usually presented, assumes that there is an actor (individual or institutional) that can view social situations “from above,” make decisions rationally for the public good, and enforce decisions comprehensively. In practice, the synoptic approach relies heavily upon the reductionistic assumptions and methods of scientific rationalism: quantitative analytical methods and a systems approach to problem conceptualization. Besides scientific rationality, the other great tradition that informs rational comprehensive planning is that of social reform, with its bent towards large-scale social engineering (Friedmann 1987, chap. 3).

The assumptions and methods usually associated with rational comprehensive planning lend themselves easily to a top-down approach to social decisionmaking in which a technocratic elite makes decisions for the public good in a way that seems, and is represented as, objective and impartial. Indeed, the tradition of rational comprehensive planning, the very idea of rational comprehensive planning, developed as an alternative to what its advocates saw as the self-serving irrationality of politics.

One fundamental critique of rational comprehensive planning focuses on its premise that action should be directed toward some conception of the “common good.” In mainstream planning theory (which subsumes both rational comprehensive planning and incremental planning), both the goals of society and the means for attaining them are viewed as in some sense beyond question. There is no need for critical appraisal. Rather, it is accepted that there are certain actions and goals (for example, economic efficiency) that are in the “public interest,” and so planning becomes merely a technical exercise for the attainment of those goals. The possibility of fundamental contradictions among goals or basic, irreconcilable differences among conceptions of the public good tends to be ignored or attributed to “public irrationality,” which can be overcome through good public relations (see, for example, Piller 1991) and public education.

Since the 1960s, there has been some movement toward opening up the rational comprehensive planning process to include a broader range of views and actively solicit public input, but this movement has had mixed success. In some cases, the

scientific and technical analyses (e.g., cost-benefit analysis) serve to obscure and rationalize what are fundamentally normative political decisions. In others, public participation processes provide a forum for airing the narrow or parochial agendas of various interest groups, rather than constructively helping to reach consensus.

The incremental approach to planning, associated primarily with Charles Lindblom, was developed as a response to certain perceived shortcomings of the synoptic approach. In the first place, according to Lindblom (1959), the important social problems that require planning cannot be understood comprehensively. Their complexity simply defeats our ability to collect, digest, and make use of information. Furthermore, they cannot be dealt with through comprehensively applied action programs directed from on high (institutional capacity does not exist); nor should they be, in a society that aspires to democracy.

In the place of rational comprehensive planning, Lindblom would substitute an approach he called "the science of muddling through." Muddling through involves improvisation, selectivity and discrimination in both problem selection and action. Action programs should be highly focused rather than broad, and should be designed so that learning can take place after inevitable failure. Rather than a central authority making large decisions, many decentralized actors should make small decisions. Lindblom's approach is not a rejection of rationalism, but rather involves an appreciation of the practical limitations on the attainment of rationality in decisionmaking. It is a sort of market approach to policy decisions.

In an essay on incrementalism and environmental planning, Lindblom asserts that the fact that ecological thinking shows that everything is interconnected does not necessarily imply that therefore comprehensive planning is the only response. We got into the environmental crisis incrementally, he says, and incremental action is our best (and for practical purposes, our only) way of getting through it. As Friedmann (1987, p. 133) points out, Lindblom's model can only be justified if certain assumptions are met, among them that (1) society is no more than a collection of self-interested individuals; (2) the context for policymaking is "normal times;" that is, no fundamental structural changes in society are necessary; (3) access to power and information are evenly distributed; and (4) there exists some basic level of consensus in society -- that is, that there are no fundamentally irreconcilable conflicts and all the actors on the policy stage agree on the basic rules. Despite his recognition that these assumptions are at best imperfectly met in contemporary American society, Lindblom refuses to concede the possibility that the comprehensive approach can ever be

successful, even if incrementalism may be inadequate too. Weaver and others (1985, p. 158), calling incrementalism “the Liberal Political-Science Critique” of rational comprehensive planning, refer to it with some justification as “an antiplanning model of planning.” In their historical review of paradigms of planning thought, they place both rational comprehensive and incrementalist planning in the mainstream.

Advocacy planning has its roots in the confrontational politics of the 1960s. The essence of advocacy planning is the abandonment by the planner of the stance of objective impartiality. The planner’s role becomes the support of social groups or points of view neglected by or excluded from the decision process, in an effort to bring about change within the system. Advocacy planning may engage in debate over technical issues, but it explicitly recognizes the political character of the decision process. The desired effect of advocacy planning is to broaden the spectrum of viewpoints considered in the planning process, while accepting the process itself as legitimate and desirable. Citizen participation in planning is a legacy of advocacy planning, and to varying degrees, planning processes at all levels of government have been modified with the stated intention of including a broader spectrum of public opinion than was previously the case. For example, in some (but by no means all) federal planning processes involving natural resources, efforts are now made routinely to include environmental groups as well as economic special interest groups.

Lisa Peattie has identified three forms of advocacy planning, ranging from “working within the system” to (in the most radical version) promoting the growth of alternative organizations. Thus there is, in Peattie’s view at least, a broad range of possibilities for advocacy planning, with a considerable degree of overlap between radical planning, advocacy planning, and transactive planning. Others, including Friedman, would distinguish advocacy planning from radical planning on the basis of its intent: does it aim at system change or system transformation? It is possible to distinguish (although imperfectly) environmental groups on this basis.

Evolution of environmental planning practice

If the rational comprehensive approach has been the ideal for planning, the incremental approach has been the practice. Besides the aspects of incrementalism codified in many federal laws, there are powerful reasons, both positive and negative, for the breakdown of the rational comprehensive approach and the substitution of a more incremental approach in practice. “In practice” indicates the implementation

of these laws and regulations, and when one moves away from the rarefied air of the federal perspective, one finds major limitations in terms of both institutional effectiveness and ability to implement as well as pervasive political and economic tradeoffs. Monitoring is inadequate due to lack of resources, enforcement only happens when a crisis is reached, as with, for example, the Kim-Stan landfill and Avtex Fibers to name just two with local notoriety in Virginia. Anticipatory planning -- the ideal of the rational comprehensive approach -- is impossible as agencies spend their resources in a crisis-management mode. Emerging problems are dealt with in tried-and-true ways which, however, may be inappropriate or ineffective.

While the comprehensive approach at the federal level may embody some perceived national consensus, when it comes to specific communities bearing economic costs, the lack of consensus is palpable.⁴⁷ Moreover, the institutional contexts for many real-life environmental problems are complex and multilayered, with multiple local, state, and federal agencies involved. Under these conditions, a coordinated, comprehensive approach is impossible, and something approaching "muddling through" is frequently the result.

The rational comprehensive approach (and, to some degree, the incremental approach) implies faith in the impartial application of (presumably) objective scientific and technical knowledge to decision processes, and thus entails a role for the planner as technocrat. The past two decades have seen a remarkable transformation of many federal-level planning processes from exercises in technical analysis and evaluation to adversarial arenas in which competing interests do battle in order to influence natural resource decisions. Environmental nongovernmental organizations (NGOs) have become increasingly technically sophisticated and participate effectively in planning processes as advocates for the environment and for specific groups, as was not previously the case. Their participation, as well as that of less sophisticated (and perhaps therefore less effective) community/citizen groups and even individual citizens, has been explicitly encouraged both by NEPA and in other federal environmental statutes in order to broaden the social basis of environmental decisions.

⁴⁷ Teitz (1985, p. 144) says that "the reality of community political life in the U.S.A. presents a hard prospect for sweeping measures of reform. Proposals may be adopted with overwhelming support [consensus], yet they are fiercely attacked and whittled away where they impinge on the interests of powerful organized groups." He cites the experience of the California Coastal Commission, where the sweeping mandate devolved into highly circumscribed powers and near-extinction, as an example of this tendency.

The presence of advocacy planners (advocating public health, economic interests, the environment) in nearly every major and most minor public decision processes involving development and the environment, and the consequent transformation of environmental planning from technical exercise to conflict management in some cases has led to unresolvable impasses or litigation. In an effort to provide some better way to resolve such impasses, an approach called “participatory/consensual planning” (Briassoulos 1989) has been developed. It has been used extensively in Virginia, with the Institute for Environmental Negotiation managing small groups whose members are chosen to represent all legitimate shareholders in decisions in an effort to reach a consensus. This approach combines aspects of advocacy planning (in that members are chosen on the basis of their representing and advocating different perspectives and interests) as well as social learning/transactive planning (in that there is face-to-face contact and a group learning process is encouraged). Success of this approach depends upon whether win-win solutions are possible, or whether at a minimum there are alternatives that involve acceptable compromises.

Another model that is useful in understanding the development of environmental planning over the past two decades is that proposed by Colby (1988) in his paper on the evolution of paradigms of environmental management in development. Colby posits a dialectical movement with “frontier economics” and “deep ecology” as the two terms of a fundamental antithesis of paradigms of the relationship between humans and nature with respect to development. Frontier economics predates deep ecology, which appeared as a cultural force in the late 1960s. The first attempted resolution of this antithesis (“environmental protection”) resulted in the environmental statutes of the early 1970s, which focused on limiting the harmful effects of human activity and protecting human health. The notion of direct and inevitable tradeoffs between environmental quality and economics is central to this paradigm. “Resource management” is a further step in the direction of synthesis of the fundamental contradiction that takes resource depletion and degradation as matters of serious concern. Economic development in this paradigm is seen as constrained by the requirement of sustainability, but there is still the notion of a tradeoff between environmental quality and economic development. In terms of the theory that informs environmental planning, we are somewhere between environmental protection and resource management; in terms of practice, still mostly in environmental protection. In Colby’s model, there is a progression from environmental protection, to resource management, to (ultimately) “ecodevelopment,” the paradigm in which the relationship between economy and ecology will be fundamentally transformed.

Ecodevelopment is thus presented as the next stage, in which “man manages self first, then nature.”

Challenges to the Conceptual Foundations of Mainstream Planning

In this section I review challenges to several of the conceptual foundations of mainstream planning theory that are likely to influence the course of environmental planning thought in the 1990s, particularly as the field of planning attempts to implement sustainable development.

Postmodern critiques of scientific rationalism

The prestige of science and technological optimism in society at the end of the 20th century show the effects of at least two decades of steady erosion. This questioning of what was previously for many an article of faith is one aspect of the regrettable condition called postmodern.⁴⁸ Philosophical postmodernism, if one may refer to it as such, does not represent a unified philosophical position, but is rather associated with a pastiche of criticism of all that modernity has stood for. Some postmodernists (e.g., Lyotard, Baudrillard) are skeptical to the point of nihilism; others are more optimistic and affirmative (Rosenau 1992).

There are nonetheless common postmodern themes that, taken together, constitute a powerful if somewhat disjointed critique of modernity. Postmodernism questions authority in all forms; it “challenges global, all-encompassing world views”; it “questions the superiority of the present to the past, the modern over the pre-modern.” (Rosenau 1992, p. 6). It was argued earlier that mainstream planning serves established power. Its claims to legitimacy rest upon the objectivity of its scientific analysis and upon the legitimacy of the power that it serves (Lake 1992). Postmodernism is at best ambivalent about both of these bases of legitimacy; the more skeptical postmodernists dismiss them out of hand. For the postmodernist,

⁴⁸ I say it is regrettable, because it constitutes more of a negation of modernity than a positive program; it is the uncomfortable symptom of a (one hopes) temporary period of confusion and transition: a period between epochs.

“[r]eason and rationality are presumed to disguise power relations” (Rosenau 1992, p. 131; Foucault 1980).

Forester (1988, pp. 46-47), though not a postmodernist, nonetheless offers an account of a central aspect of planning practice that might be consistent with postmodern skepticism of the claims of authority and rationality:

Recognizing structural, routine sources of misinformation, the progressive planner seeks to anticipate and counter the efforts of interests that threaten to make a mockery of a democratic planning process by misrepresenting cases, improperly invoking authority, making false promises, or distracting attention from key issues. ...this means beginning with the demand that impact reports be intelligible to the public... countering corporate misrepresentations of costs, risks, and available alternatives... tempering the exaggerated claims of developers and demystifying the planning process itself.

The familiarity of Forester’s account and the position of some postmodernists is not surprising, since both draw upon Critical Theory, which has been concerned from its inception with questions of legitimation and the critique of scientific rationality.⁴⁹

The critique of scientific rationality *per se* would have been unthinkable to Marx and to most of his followers. Postmodernism has been rejected by many Marxists, especially orthodox materialist Marxists and Marxist-Leninists (Rosenau 1992, p. 157). However, the postmodern focus on legitimation and its relation to scientific rationality lends itself to accounts of late capitalist societies and planning’s changing role therein. Lake (1992) contrasts planning in the modern epoch with its situation under the changing conditions of postmodernism. He emphasizes the legitimizing function for planning of the methodological stance of technical neutrality and of the political disinterestedness also assumed under the mainstream model of planner as technocrat. Lake’s political economic analysis leads him to describe modernist planning as involved in a contradiction between “the lofty ambitions of the visionary role and a planning practice constrained and directed by the structural demands of capital” (1992, p. 416), as well as the possibly more significant contradiction “between the planners’ position within the state and the assumption of state neutrality (p. 416).” However, one of the defining aspects of the *postmodern* condition is the changing world economy, leading to what Lake calls “the changing requirements of capital in the postmodern era (416).” While the changing world economy is explored

⁴⁹ Critical Theory developed from the work of Horkheimer and Adorno (the “Frankfurt School”) and is most closely identified with the seminal work of the sociologist Jurgen Habermas (e.g., 1975, 1984).

more fully in a following section, its salient characteristics include a loosening of capital from location, leading to accelerated mobility; the “increased dominance of market relations, a diminished role for the state in social provision, and the ascendancy of the private over the public in social and cultural spheres.” (Lake 1992, p. 417; see also Rosenau 1992; Harvey 1989).

Lake (1992) sees postmodernism’s challenge to planning coming not only from its uprooting of “the tenets of rationality, objectivity, universal values, political neutrality, and the existence of a unitary public interest -- in short, the entire edifice of modern planning” (p. 417) but also from its position vis-a-vis the changing requirements of capital. He discerns a kind of schizophrenia in planning, in which planning theorists are “responding to capital restructuring by discovering the critical politics of postmodernism,” while planning practice, in urban planning at least, is beginning to look very much like the activity of private developers. Thus, eschewing the modernist posture of political neutrality, “the planner’s normative goal has shifted from achieving the livable city as a substantive end-product to promoting economic growth as a desirable process (p. 419).” Lake’s last comment is perhaps more precisely applicable to economic development planners and some urban planners than to land use or environmental planners. The latter play less a promotional role in the economic growth process than perhaps a facilitating one, depending on the institutional context in which they work.

Like Forester, Lake sees an important role for the planner who grasps the postmodern situation: deconstruction. Deconstruction is a methodology of criticism that seeks to expose unstated but basic assumptions, that uncovers hidden relations of power and authority, that points to the way in which what is unspoken and unanalyzed conceals such relations. The task of deconstructionism is reminiscent of the scene in the popular film, *The Wizard of Oz*, in which the dog, Toto, pulls back the curtain to reveal a quite ordinary and fallible man furiously pulling the levers that animate “the great and powerful Oz.” Tett and Wolfe (1991) used a deconstructionist method in their analysis of Canadian city plans to argue that “a language of agentless change (‘population grows’; ‘development spreads’; ‘industry locates’) deflects accountability from culpable agents and interests to disembodied, impersonal forces” (Lake 1992, p. 418). What Tett and Wolfe found to be unstated -- what property interests would benefit, and what redistributive alternatives there were -- are matters of no small importance. Similarly, in economic analyses performed for many federal projects, the focus is on aggregate measures of wealth, such as national income or

sometimes regional income. Who, specifically, are the winners and losers in resource development schemes are often concealed by technical planning analyses.

The postmodern critique of scientific rationality and its legitimizing function may be dismissed by some as both controversial and marginal. Emphasizing its controversiality, however, is hardly a valid criticism. As a discourse it certainly is marginal in the sense of being far from the mainstream, although interest in postmodernism is growing (Rosenau 1992). Its assault on the central tenets of mainstream planning is, however, so direct that it cannot be ignored by planning theorists; nor has it been (see, for example, Dear 1986, 1988, 1989; Beauregard 1989, 1991; Rosenau 1992). Its relevance to the situation of environmental planning as it attempts to assimilate the ideas of sustainable development seems clear.

The feminist critique of science

Another major critique of scientific rationality of special relevance to environmental planning for sustainable development is that of feminism.⁵⁰ This critique, which has certain parallels to the postmodern critique, sees science as socially constructed, not somehow reflective of laws inherent in nature. Bird (1987, p. 255), for example, argues that "scientific knowledge should not be regarded as a *representation* of nature, but rather as a socially constructed interpretation with an already socially constructed natural-technical object of inquiry." It views science as both contingent and historical, "grounded" in specific, historical social situations (Harding 1991, p. 58). In particular, Western science since the Enlightenment is seen to be inseparable from relations of power and domination in society. Such relations may include structures of class domination, cultural imperialism, and gender relations.

In Sandra Harding's (1991) account, it is not that the sciences necessarily produce unreliable information because of being socially situated, nor that science is invariably oppressive; rather that its "descriptions and explanations of [its] subject matters are shaped by the origins and consequences of [scientists'] research practices and by the interests, desires, and values promoted by such practices" (p. 15). Harding is unapologetic about her agenda in critiquing science: she is interested in creating

⁵⁰ Actually, as Harding (1991) emphasizes, there are many different positions taken by feminist critics of science. Some focus their critique on what Harding calls "bad science," while others, including Harding, wish to go beyond this to criticize what she calls "science-as-usual."

“the kinds of societies in which the dominant institutions of knowledge production are no longer so complicitous in benefiting the few to the detriment of the many” (p. 46).

The claims of certain feminist epistemologies might be (and frequently are) taken, in a pluralist social theory, as simply those of yet another special interest group. Yet it may not be so. Harding shows in detail how, once certain feminist epistemological claims are considered plausible, they “wreak havoc within networks of traditional belief. One cannot simply ‘add’ feminist claims to those they challenge any more than one can add Copernican to Ptolemaic astronomy” (p. 113). What the feminist critique of science as presented by Harding does is not so much to deny the validity of the scientific endeavor per se (although other feminists might do so), as to deny its current one-sidedness and partiality.

The critique centers around a reconstruction of the concept of objectivity. Feminist standpoint theory, although denying conventional accounts of objective knowledge (“objectivism”) as that which is value-free, impartial, and dispassionate, requires, according to Harding, “strengthened standards of objectivity” (p. 142) that critically expose and thus take into account the standpoint of the scientist. Although some critics of objectivism have argued for its replacement with a cultural or even personal relativism, for Harding this would be tantamount to throwing out the baby with the bathwater. For her it is objectivism that should be thrown out, but objectivity retained:

Objectivism results only in semi-science when it turns away from the task of critically identifying all those broad, historical social desires, interests, and values that have shaped the agendas, contents, and results of the sciences much as they shape the rest of human affairs. (p. 143)

Furthermore, conventional, objectivist accounts of science have tended to focus exclusively on the methodology of science while ignoring other key parts of the scientific process, in particular scientific problematics, the process by which certain problems are defined as worthy of scientific study.

One way to see this issue is to notice that though scientific methods are selected, we are told, exactly in order to eliminate all social values from inquiry, they are actually operationalized to eliminate only those values that differ within whatever gets to count as the community of scientists. If values and interests that can produce the most critical perspectives on science are silenced through discriminatory social practices, the standard, narrowly conceived conception of scientific method will have not an iota of a chance of maximizing either value-neutrality or objectivity. (Harding 1991, p. 41)

Finally, Harding argues that “objectivist justifications of science are useful to dominant groups that, consciously or not, do not really intend to ‘play fair’ anyway” (p. 143). Harding is concerned to salvage objectivity because she rightly sees its emancipatory potential, which indeed has been apparent in its long history since the days of the Enlightenment, when scientific objectivity was brought against superstition and arbitrary exercise of power.

It is apparent from this very brief and sketchy review of the feminist critique of science, and in particular feminist standpoint theory, that it is in principle extendable to other marginalized groups; i.e., groups whose points of view have been systematically excluded from the scientific endeavor. Such groups include many non-Western and traditional cultures, racial and ethnic groups, and Third World women; it is the inclusion of such viewpoints into the discourse on development that characterizes the Radical/Critical Paradigm.

It is not difficult to see similarities between the systematic exclusion of non-elite groups from the production of scientific knowledge and the systematic exclusion of other points of view from mainstream Western ideas about the nature of progress and development as well. The inclusion of such points of view, the admission to the conversation of those who previously were its objects (if noticed at all), similarly can be expected to result in quite different versions of what constitutes development, and the consequences of such inclusion are touched upon in Chapter 2, e.g., pp. 39-40. The erosion of existing hegemonic authority and an increasingly strident insistence upon the legitimacy of previously excluded views is one aspect of the postmodern condition, and one with which planners will increasingly be confronted in the 1990s.

The feminist epistemological critiques described by Harding (1991) and discussed above are not the only feminist critiques of science. Ecofeminism as well has developed as a potent critique of the way science developed, as discussed in Chapter 2. In her polemic on gender, nature, and development, Vandana Shiva (1989, p. 29) describes the origins of Western science thus: “The Baconian programme of domination over nature was centrally based on the controlled experiment which was formulated and conceived in the language and metaphor of rape, torture and the inquisition.” That Bacon used such language and metaphor to describe the process of getting nature to reveal “her” secrets is undeniable. Merchant (1980) provided an extended historical analysis of the interrelations between the rise of scientific rationality (she spends considerable time on Bacon), the alienation and domination of women, the exploitation of nature, and the expansion of European commercial

economies. These historical developments followed upon and reinforced a reconceptualization of nature as mechanical, inert, passive, dead; something to be dominated, exploited, subjugated, controlled. Although scientific rationalism is a central theme of Merchant's, Shiva's, and other feminists' work, with the ecofeminist writers one sees a broadening of the analytical horizon to include social relations and the relationship between humans and nature. Such accounts provide alternative perspectives on the origins and nature of certain aspects of the dominant social paradigm that many argue to be deeply implicated in the current crisis of nonsustainability, as will become apparent below.

The human/nature relationship and the critique of domination

Environmental planning is that part of the larger field of planning that is most immediately concerned with the intersection of human activities with nature. As such, at least in its mainstream versions (as I have argued above), it relies upon scientific and technical knowledge and attempts to apply such knowledge to the solution of problems "at the society-nature interface," in Briassoulis' (1989) words. In Chapter 2, I characterized the relationship between human society and nature in the dominant social paradigm (DSP) as one in which nature (and some social groups) are seen as subject to appropriation, control, enclosure, and management by dominant groups.

Ecosystems theory: While the DSP has been built on the inherited premise of a radical separation between the human and the natural, there are many efforts to heal the rift. Attempts to integrate natural systems and human economies analytically have resulted in new disciplines, of which the foremost is ecological economics. Better and more sophisticated understandings of natural systems have extended the technical possibilities of "sustainable planet management."⁵¹ Whether even a vastly improved understanding of the "mechanics" of planetary ecosystem functioning can ever be adequate to the task of planet management is an open question. Recent developments in ecology suggest that the biosphere may be full of surprises.

Environmental planning necessarily relies upon knowledge of the natural environment. The knowledge that has been developed -- for example in hydrology, soils science, biology, atmospheric chemistry -- is vast and accumulating at an increasing

⁵¹ However, as Blaikie and Brookfield (1987) and Redclift (1987) have argued, there are social, structural reasons why the effective management that is technically possible may not be implemented.

rate. There is a voluminous literature on scientific and technical issues associated with environmental degradation, and a great deal of expertise within specific scientific disciplines has been developed for addressing these technical issues with essentially technical solutions.

As the interconnectedness of various environmental systems has become increasingly apparent, the concept of the ecosystem has become central to environmental planning, especially as it concerns land use (as several cases described in Chapter 5 will show). Steiner, Young, and Zube (1986) recently reviewed the development of an "ecological planning" literature, and an "ecosystem approach" is central to some large-scale planning efforts (e.g., Royal Commission on the Future of the Toronto Waterfront 1991).

An *ecosystem* has been defined as "the interacting environmental and biotic system" (Allen et al. 1949, quoted in Siegel 1984); "the community of organisms living in a specified locale, along with the nonbiological factors in the environment -- air, water, rock, and so on -- that support them, as well as the ensemble of interactions among all these components" (Ophuls 1977, p. 20); and, more comprehensively, as

the whole system (in the sense of physics) including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome -- the habitat factors in the widest sense. Though the organisms may claim our primary interest, when we are trying to think fundamentally we cannot separate them from their special environment, with which they form one physical system. It is the systems so formed which, from the point of view of the ecologist, are the basic units of nature on the face of the Earth. (Tansley 1935, quoted by Rich 1988)

The epistemology and methodology of ecosystems ecology (the study of ecosystems as systems) are worth examining because of the use of their concepts by mainstream environmental planners.

Ecosystems are variously characterized in terms of the functional interrelatedness of their components, their hierarchical or trophic structure, and the processing of energy and material within the ecosystem. There is a fundamental tension in the enterprise of ecosystems ecology between reductionism, which has characterized Western science (and economics), and holism. Although ecosystems are made up of individual organisms and their physical environment, the properties of ecosystems are not strictly derivable or deducible from the individuals (or even the individual species, to jump up a level) that comprise them. The functioning of the system, in-

deed the system itself, is considerably more than the sum of its parts. Odum (1977) has argued forcefully for the necessity of “synthetic and holistic” thinking in ecology, and ecosystems ecology is fundamentally a synthetic discipline.

A systems ecological approach is based on a mechanistic epistemology. The view of culture and nature as mechanism has its roots in the 17th century, “when ‘nature’ became materially and ideologically commoditised, an object of control and domination” (Watts 1983). Howard Odum (1983), in his text, *Systems Ecology*, has offered perhaps the fullest statement of a mechanistic view of ecosystems, including human ecosystems. Odum focuses on energy flows and cycling within and between systems. Wilden’s comment (1979, p.77, quoted by Watts 1983), seems appropriate to the systems approach: “Organism, atom, and person became ontologically and ideologically equivalent -- and explained by overt or covert mechanical metaphors.”

Ecosystems ecology, as a discipline, is still in the early stages of development, and hence, its results tend to be descriptive rather than explanatory and predictive (Pomeroy et al. 1988). There is considerable disagreement within the field over the scientific status of its methods and conclusions.

Because of the complexity of ecosystems, it is possible that strong predictive generalities may never be attainable. Certainly the state of the discipline is far from the point at which it will be able to establish universal laws. Rather, probabilistic explanations may be the best that can be expected. The impossibility of controlled experimentation with highly complex natural systems (or more difficult yet, natural/social systems) that may not be fully deterministic even in principle would suggest that inference and descriptive modelling may have to satisfy.⁵²

It seems at first glance intuitively obvious that the definitions of ecosystems offered by the ecosystems ecologists are sufficiently broad to include human communities. As Ophuls (1977, p. 21) puts it, “it should be obvious that, since man inhabits the biosphere, ecology must also be concerned with him. There can be no valid distinction between ecology and human ecology.” In fact there has been a great deal of debate among ecologists and others on this point, which is analogous to the gradual

⁵² Although the claims of some ecologists (e.g., Paul Ehrlich) with respect to the global environmental situation have been attacked on the grounds that they are not scientific, these criticisms may be overstated. While induction cannot be logically justified, this certainly does not mean that inferences based on observation have no value.

inclusion of development considerations into what were originally questions of nature preservation in the tropics (discussed in Chapter 1). Ecological economics is a rapidly developing discipline within the DSP which attempts to link scientific models of ecosystems with economic models, bringing together human and natural systems in an integrated analysis that will, presumably, extend the ability to manage both. There is some evidence to suggest that ecosystems may not be easily modeled, however (or managed either).

Ecosystems ecology is currently being challenged from within and without. As Worster (1990, p. 8) puts it, "ecology is not the same as it was. A rather drastic change has been going on in this science of late -- a radical shifting away from the thinking of Eugene Odum's generation, away from its assumptions of order and predictability." The old assumptions of tendencies towards equilibrium, of climax communities, says Worster, are being challenged by newer studies that argue that "change is without any determinable direction and goes on forever, never reaching a point of stability" (1990, p. 8). Much of the "new ecology" (for example, Pickett and White 1985) focuses on survival processes of individuals and populations, not on communities. The holism and emergent properties of ecosystems ecology have lost their explanatory lustre. The emergence of the new ecology is explainable, according to Worster (1990, p. 13), in several ways, not necessarily mutually exclusive: (1) as a "triumph of reductive population dynamics over holistic consciousness"; (2) as a triumph of social Darwinist or entrepreneurial ideology over a commitment to environmental preservation; or (3) as the beginnings of the application of chaos theory to ecology. Worster comments that the implications of the introduction of chaos theory into ecology cannot be predicted as yet, but cautions that they may serve to increase our alienation from nature: "What is there to love or preserve in a universe of chaos? ...What, after all, does the phrase 'environmental damage' mean in a world of so much natural chaos?" (1990, p. 13). The "new ecology" is vigorously contested intellectual terrain, and at this point is too recent to have had any impact upon environmental planning. Worster, however, makes it clear that he considers it threatening to nature preservation efforts. If any conclusion for environmental planning may be drawn from it, perhaps it is that nature is even less predictable than has been thought.

Ecofeminist critique of domination: Even if models of ecosystems that allow prediction and control can be developed, the question whether planetary management is even something to aspire to is highly controversial. Ecofeminist accounts of the relationship between humans and nature take issue with the assumptions of the domi-

nant social paradigm, particularly the assumption that nature exists for our disposal. Ecofeminists are especially concerned to establish the structural social roots of environmental degradation. According to Warren and Cheney (1991, p. 179), ecofeminism, or "ecological feminism," is "a feminism which attempts to unite the demands of the women's movement with those of the ecological movement in order to bring about a world and worldview that are not based on socioeconomic and conceptual structures of domination." As such, they are part of what I have called in Chapter 2 the "Radical/Critical Paradigm." The "critique of domination" that is extended by ecofeminism (Schroyer 1973) was developed by the so-called Frankfurt School that included Max Horkheimer, Theodore Adorno, and Herbert Marcuse as a post-Marxist critique of industrial capitalism. According to this critique, and speaking in very general terms, forms of cultural oppression -- racial, sexual, class -- are linked both to each other and to the domination of nature, both "external" nature and "inner" nature (i.e., those parts of human nature that are suppressed, repressed, and distorted by the dominance of instrumental reason).

Plumwood (1991) distinguishes ecofeminism from other attempts to reconstruct the relationship between culture and nature, specifically those of deep ecology and environmental ethics. "Mainstream environmental philosophers" tend to view the instrumentalist view of nature (which is, both she and they would argue, the basis for appropriation, control, and exploitation, as well as environmental degradation) as a problem in ethics, for which the solution is some kind of theory of intrinsic value. Her argument, which, I believe, correctly states a key ecofeminist position, is that such a view neglects several crucial aspects of the overall problem: first, the dualistic ontology of the Western view of nature, which posits nature as sharply discontinuous from human culture, and which ecofeminist as well as social ecologist (e.g., Bookchin 1989) accounts (and, for that matter, those of ecological economics) deny; and second, the connection between this discontinuity and the instrumentalist view of nature. Deep ecology, on the other hand, denies any ontological separation or even any distinction between humans and nature, and thereby neglects "the broader political aspects of the critique of instrumentalism" (p. 10). Thus, the environmental ethics view tends to carry on the separation of culture and nature, while the deep ecology account has neither a politics nor a psychology.

In this latter connection, it is a strength of Plumwood's article that she demonstrates the relationship between ways of conceiving of the relationship between humans and nature and ways of conceiving of "human nature." She argues (p. 19) that "the self that complements the instrumental treatment of the other [be it nature, women, tra-

ditional cultures] is one that stresses sharply defined ego boundaries, distinctness, autonomy, and separation from others -- that is defined *against* others, and lacks essential connections to them." Such a self is, according to Plumwood, a masculinist conception and one that is closely related to economics' *homo economicus*, self-interested, rationalizing man, for whom both nature and other people are means, not ends.

Anthropocentrism and androcentrism in particular are linked by the rationalist conception of the human self as masculine and by the account of authentically human characteristics as centered around rationality and the exclusion of its contrasts (especially characteristics regarded as feminine, animal, or natural) as less human. (p. 21)

On the contrary, she argues, a more realistic account shows that humans are *essentially* social and connected both to each other and to nature; not, moreover, to some abstract conception of nature or the global biosphere, but to "*particular* places, forests, animals . . . toward which one has specific and meaningful, not merely abstract, responsibilities of care" (p. 21). Recognition of this fact does not necessarily imply loss of self, but rather a different relationship to others and nature, a more intimately interpenetrating, mutually interdependent, mutually constitutive relationship.

Deep ecology: The view of humans as embedded in nature, as a part of nature, can be taken to deny, in some sense, the traditional Judeo-Christian view of humanity as the "crown of creation." Some deep ecologists, for example, have been chastised by others both within and outside the environmental movement for the moral levelling implicit in their views. Their rejection of industrial civilization and their dismay and fury over the ravaging of many natural ecosystems have led some deep ecologists to take a decidedly anti-human stance in defense of the earth. The metaphor of humanity as a disease upon the planetary body, a cancer or a deadly virus, is not atypical of some deep ecologists, particularly the less academic, more activist groups such as Earth First! The preferred future of the deep ecologists is a "de-humanized" landscape, one in which humans, vastly reduced in number, are hardly apparent. Both ecofeminists and social ecologists reject this future as both impractical (what to do with the excess five billion or so people) as well as unduly harsh in its assessment of the place and possibilities of humans on earth.

Changing understanding of environmental degradation

One of the principal challenges to the mainstream approach to environmental planning -- which here includes elements of rational comprehensive planning, incrementalism, and, to a lesser extent, advocacy planning -- is that its substantive theory [i.e. its theory of environmental degradation and its relationship to development, as well as its theory of development] is changing rapidly. As Hudson (1979, p. 393) has correctly argued, "mainstream [planning] theories are principally concerned with procedural techniques... [but] [o]ne needs a substantive theory of [for example] poverty, built up from comparative and historical study of its nature, as well as from principles of social justice and theories of transformation in economic structures."

In Chapter 2, I explored the various understandings of the causes, meanings, and dimensions of global environmental degradation within three "political/ideological" paradigms (this is but one of many possible ways to organize what is an exceedingly broad and heterogeneous literature, that dealing with sustainable development and global environmental problems). The shared ideologies and basic assumptions of mainstream environmental planning (MEP) and the DSP implies that MEP's understanding of the causes of environmental degradation -- its substantive theory -- is that of the DSP. Thus environmental degradation is variously considered to be due to market failures; overpopulation, especially in the developing countries; inappropriate location/scale decisions for developments ("mismatches"); the "tragedy of the commons." This theory of environmental degradation was contrasted with those of the Marxist and Radical/Critical paradigms.

Lynton Caldwell's scheme for considering the causal models of environmental degradation that have informed environmental policy over the past 20-30 years, described in Chapter 2, is worth recalling. At Caldwell's third level of causal understanding of environmental degradation, basic changes in technical and behavioral systems and redesign of institutions becomes necessary if environmental degradation is to be avoided, stopped, reversed.

In terms of Caldwell's scheme, most environmental planning practice addresses the causes of environmental degradation perceived at the first two levels of comprehension, but not the third. Thus, corrective laws and regulations, disclosure laws, impact statements, technology assessments, and review of development proposals are viewed as adequate responses. If, however, the causes of environmental degradation are perceived at the third level of comprehension, radical departures from pre-

vious practice may be called for. Such changes will not be merely in practice, but in theory as well, if environmental planning is to help in the transition to a sustainable society.

Orr (1992, p. 4) asks a similar question: "Can the values, institutions, and thrust of modern civilization be adapted to biophysical limits, or must we begin the task of consciously creating a postmodern world?" He likens the search for the causes of the nonsustainability of our current course to peeling the layers of an onion, in the process revealing progressively deeper causes. He discerns five distinct interpretations, and maintains that a full explanation of what he describes as the crisis of nonsustainability would implicate all five.

1. At the outer layer -- the most apparent, and perhaps least problematic -- he sees the crisis resulting from the operation of one or more *social traps*: situations in which seemingly rational behavior on the part of individuals leads to perverse results. The classic description of a social trap is Garrett Hardin's tragedy of the commons (Hardin 1968). But Orr shows that the rational behavior that leads to social traps is often a highly constrained or bounded rationality, more rationalizing than rational.
2. Orr's second cause "has to do with the propensity of all industrial societies to grow beyond the limits of natural systems." (pp. 5-6). He attributes this propensity to flaws in mainstream economic theory: that is, he locates the cause of industrial capitalism's growth propensity in the realm of ideology. This approach may be contrasted with that of, for example, Schnaiberg (1980), for whom it is more of a social trap inherent in the combination of technological change (which increases productivity) and the needs of capitalism (the "treadmill of production").
3. Enlarging the frame of analysis ("economics is ...a part of a larger enterprise to dominate nature through science and technology" (p. 11)), Orr finds a third dimension of causality in the course of Western science and technology, in which he discerns an urge to dominate nature.
4. At yet a broader cultural level of analysis, Orr speculates that perhaps Western civilization itself represents an "evolutionary wrong turn" (p.16), a blind alley. Here he espouses a cultural relativism typical of anthropology in comparing the success of Western civilization in meeting the real needs of human beings with that of traditional (i.e., preindustrial) cultures. On the whole, he argues, there is

no clear basis for claiming superiority for industrial civilization, and there is much we might learn from traditional cultures which were less alienated from nature.

5. At the deepest level, Orr argues that the “crisis of sustainability” may be due to the basically flawed nature of human being. This subject has certainly been fundamental to many religions, and especially to certain interpretations of Christianity. The flaw has been variously described as the “demonic” in the human heart (“our insatiable restlessness, greed, passions, and urge to dominate”), our fallen nature, hubris, the Promethean urge for immortality. In the end, such essentially theological explanations of the “crisis of nonsustainability” point toward only one possible solution: a “change in consciousness and deeper self-knowledge that recognize the limits of human rationality” (p. 18). This theme -- the limits of human rationality -- is one that is wonderfully summarized by Swift in *Gulliver’s Travels*. His description of the Laputan civilization (a hyper-rational scientocracy) is an extended play upon the pretenses of rationality. The name Laputa -- “The Whore” -- indicates Swift’s recognition that reason is continually prostituted to the emotions and what used to be considered the baser instincts (Barrett 1962).

There can be no proof that any one interpretation of the causes of the global crisis of sustainability is correct, just as there can be no proving that one version of the nature, dimensions, implications, and meaning of the crisis is the correct one. This is not to dismiss the problem; on the contrary, it is perhaps the central problem if environmental planning (along with other many other disciplines) is to help society make what may be a necessary transition to sustainability. This is not to say that efforts to find and implement short-term, technical solutions to specific environmental problems are of no use if they do not address the underlying causes of environmental degradation. In a world in which there are over five billion people, and in which the processes of industrialization and the extension of capitalism are proceeding rapidly, there will be plenty of situations for which immediate symptomatic treatment is necessary.

David Orr (1992) points out that the term “crisis” is of medical origin. It means, in that context, “the turning point for better or worse in an acute disease or fever” (Webster’s *New Collegiate Dictionary*): it is the decisive point, the time that determines whether the patient will improve or decline. Certainly many who speak of our current environmental situation as a crisis see the next decade or two (or four) as decisive (e.g., Postel 1992). Orr continues the medical metaphor, however, to distin-

guish between those actions taken to deal with the acute disease (the heart attack) and those which, after the crisis has passed, must be taken if the conditions that led to the crisis (high blood pressure, high cholesterol levels, and, to push back the causal chain even farther, poor eating habits and lack of exercise) are to be ameliorated. Thus we can distinguish short-term strategies that may include a variety of technical fixes such as mitigation, environmental restoration, and various methods of dealing with toxic wastes, and longer-term strategies that include education, social learning, lifestyle changes, Caldwell's basic changes in the technoeconomic system, Friedmann's societal transformation.

The Changing Context of Environmental Planning

The world which confronts environmental planners in the 1990s is one of rapid and continuous change. It is, moreover, one that is already very different from that in which most planning educators were themselves educated. Models of reality may no longer fit. This section reviews a number of changes and trends in society and the world that will necessitate changes in what planners do and how they reflect upon what they do. Part I of this dissertation has described in considerable detail the environmental changes occurring in both local and global contexts, leading to a serious questioning of the sustainability of continued development along existing technoeconomic lines as well as a reconsideration of the meaning of development itself. The remainder of this chapter will therefore be limited to pointing out some other aspects of changing context in which planning for sustainability must happen. This changing context will constrain and condition the possible response of planners, but also will provide opportunities for new directions.

Political shifts

Castells (1992) refers to the collapse of communism as a fundamental political change which entails the "historical failure of statism and of centrally planned economies, along with the recognition of the market as the least irrational mechanism to allocate scarce resources" (p. 74). Sachs (1992, p. 11), at least, would question the the sweep of the latter assertion, denying that "the collapse of centrally planned 'command economies' constitutes proof *a contrario* of the excellence of pure market economies and the end of planning." Although the rout of central planning *per se* is complete (it having demonstrated its inadequacy and fundamental incompatibility with an infor-

mational society), still the possibilities for both mixed economies (at the national level) and local planning remain undiminished.

A major political shift in both the industrialized nations and some less-developed nations has been discerned. It has been variously interpreted, appearing under the rubric of "People Power" in the popular media's coverage of the overthrow or collapse of unpopular regimes in a number of countries and even entire regions (e.g., the Phillipines, the former communist bloc). At bottom it is an attack on the legitimacy of nondemocratic forms of government and an affirmation of the rights of individuals and communities to self-determination.

Some academics, reflecting on these changes, discern the re-emergence of civil society after a century and a half of being eclipsed by market capitalism or the state (Cohen and Arato 1992) in the reassertion of the claims of organized citizens frequently in opposition to those of both large-scale capital and government (which sometimes are congruent, sometimes not). This "reborn" civil society is seen in "citizen initiatives, associations, and movements [which] have increasingly oriented themselves toward the defense and expansion of a variously described societal realm, the forms and projects of which are clearly distinguished from statism" (Cohen and Arato 1992, p. 29). The reassertion is evidenced in land use struggles over facilities siting (Lake 1992, 1993; Heiman 1990).⁵³ Some authors have tied the reemergence of civil society to a global trend toward governmental decentralization and the decline of the nation-state as a sovereign entity (Behrman 1992; Camilleri 1992). At the same time that central political structures are disintegrating, however, a centralizing trend is evident in the world economic system.

The changing economic environment

The structure of the world economy has undergone a transformation in the five decades since the end of World War II. The transformation is characterized by globalization of trade and production processes as well as (and perhaps most importantly) of information and capital flows. Transnational corporations increasingly

⁵³ Whether this is cause or effect of the general skepticism toward authority in any form and especially the questioning of the authority of technocrats that is pointed to as a characteristic of the postmodern era, nevertheless the implication is that the claims of planning to legitimacy through a stance of apolitical technical expertise in the service of either large-scale capital or government will be subject to skepticism and doubt.

dominate the global economy, yet the nature of transnationals has also been transformed: mergers, acquisitions, joint ventures, and other maneuvers have created a global network of dominant corporations (Lowe 1992) in a number of industries. The rapid transformation of both production technologies and organizational structure, together with the unprecedented mobility of capital, combine to create turbulence and volatility in the global economy (Dicken 1992) and in local economies tied to the global economy (a condition that is increasingly unavoidable, as the market grows both extensively and intensively). What this means for local communities is that the capacity for self-determination in the sense of business decisions being made within the community is diminishing. Decisions on opening and closing extraction and production facilities, as well as production processes and technologies, which may have major ramifications for local communities, are increasingly being made in distant centers of the global capitalist economy.

Another economic trend with significance for the quest for sustainability is the increasing stratification of countries into rich and poor, as well as the increasing stratification within some nations, e.g., the United States. The globalizing and expanding world economy has not worked to the advantage of the poorest one-fifth of the world's population; indeed the position of the poorest countries in relative terms, and in some cases in absolute terms, has deteriorated (UNDP 1992). Indeed, some (e.g., Brown and others, 1993) see in recent trends the end of the post-war era of rapid growth in gross domestic product. The World Bank is more optimistic about the potential for growth of real per capita income in the 1990s, but the basis for this optimism is difficult to understand, given recent trends. Per capita income figures cited by the World Bank (World Bank 1992, p. 32) actually show a declining trend for the poorest regions (Sub-Saharan Africa, Latin America, the Middle East and North Africa, and Eastern Europe) over the past three decades, yet the Bank projects a reversal of this trend during the 1990s (World Bank 1992, p. 32). Given rapidly increasing populations, accelerating environmental degradation, and a crushing debt burden in many of the countries in these regions, it is difficult to envision how such a reversal of fortune might come about. Further deterioration of economic and environmental conditions seems a more likely outcome. The Brundtland Commission emphasized the environmental consequences of massive poverty in the less developed countries; others have noted the destabilizing potential of massive emigration from areas of rapid population increase combined with poverty and environmental degradation. It is increasingly likely that, absent large transfers of capital, continued growth in the affluence of the industrialized nations will be set in stark contrast against massive immiseration in the poor countries. With the growth of communications, the rich and

the poor will be increasingly aware of one another, and it will be increasingly difficult to conclude other than that the enrichment of the one is at the expense of the other.⁵⁴ This perception is already widespread among those representing the less developed nations. If actions are not taken to reduce the rift between the rich countries and the poor, the moral dilemma of countries like the United States could become acute.

Capital, income, and knowledge are increasingly concentrated in the industrialized nations. At the same time, the relative position of the United States within the leading economies has slipped, perhaps irreversibly (Castells 1992). The relative economic power of the United States has declined relative to that of Japan in recent years, and with the ascendancy of Western Europe and the Pacific Rim economies, it is unlikely that the United States will ever regain the position of preeminence in the world economy that it enjoyed in the first two post-war decades.

Changing value context

Disputes over the control of land and other resources in the United States are contentious. Although numerous opinion polls show continued and even strengthening support for environmental protection (Dunlap 1987), opposition is consolidating and focusing. The so-called Wise Use movement, superficially a populist movement though funded by large resource extraction firms and organizations, has focused local opposition to state and federal environmental protection. At the other end of the spectrum, the more extreme wing of the environmental movement seems also to be pushing toward polarization. Finally, it seems worth pointing out that land-based natural resources, particularly undisturbed landscapes and ecosystems, are becoming scarcer in relation to population in many areas, particularly near large urban centers. The upshot is that land use planning and decisionmaking processes are likely to take place in an increasingly antagonistic atmosphere, with fewer opportunities, perhaps, for consensus building.

Complexity, unpredictability, and limited institutional capability

Recent revisions in ecosystems theory, described earlier in this chapter, call into question conventional views of natural ecosystems as inherently equilibrium-seeking,

⁵⁴ See, for example, Goodland and Daly 1992.

relatively stable over long periods, and therefore to some extent predictable in their behavior and in their response to changed conditions. Timmerman (1987, p. 437) calls these conventional views "myths of equilibrium... [that] tend to downplay questions of instability (or the unpredictable) in favor of stability, control, and idealization against the backdrop of absolute time and space." However, more recent models (or, as Botkin (1990) would put it, more recent metaphors) of ecosystem functioning emphasize discontinuities, complexity, randomness, uncertainty, and change. As Garcia (1991, p. 236) points out, these newer models are relevant to environmental planning theory; they argue for strategic planning that "incorporates frequent environmental scans that can detect random fluctuations." When human reflexivity (i.e., capacity for reinterpretation and new constructions of reality), rapid technological change, economic fluctuations and transformations, the vagaries and unpredictabilities of human social/cultural/political/religious events and developments as well as wars, accidents, disease, and the results of ignorance, irrationality, and perversity are added (as they must be) to the inherent dynamism of undisturbed ecosystems, the requirements for rational management are impossibly large. Furthermore, the managing agents themselves -- human planning organizations, bureaucracies, governments -- are subject to less-than-perfect control. Finally (as C. S. Lewis -- and Freud -- long ago pointed out), even if ecosystems, organizations and people were perfectly knowable, predictable, responsive and controllable, those who would control are not themselves rational!⁵⁵

Reflecting on the prospects for technologically oriented environmental management in the face of rapid change, uncertainty, complexity, unpredictability, and the interdependence of interacting problems, Ophuls and Boyan (1992, p. 167) are pessimistic. They point to "delays, planning failures, and general incapacity to deal effectively with even the current range of problems" as evidence that an enhanced capability to deal with problems in the future is a somewhat heroic assumption. Waterstone (1993) has expressed a similarly pessimistic view of society's ability to resolve the global warming problem. The political struggles attendant upon major social decisions regarding large-scale technologies, such as nuclear waste processing or storage, render governments incapable of acting quickly and decisively; yet, the capacity to plan and implement at a large scale, which will become increasingly indispensable to a

⁵⁵ Lewis wrote, "At the moment, then, of man's victory over nature, we find the whole human race subjected to some individual men, and individuals subjected to that in themselves which is purely 'natural' -- to their irrational impulses. Nature, untrammelled by values, rules the Conditioners and, through them, all humanity." (Lewis 1947, pp. 79-80; quoted in Orr 1992, p. 12).

more intensively managed, more densely populated, less stable world, is inimical to ideals of democracy and self-determination. This is a fundamental contradiction of technological environmental management.

Erosion of community and "moral capital," derelict landscapes

In the 1990s some of the unintended consequences of the organization of society around markets -- that is, of capitalism -- are becoming apparent. These consequences, which concern the undermining of the values and social relationships and obligations, constructed over centuries, that made exchange economies possible, were forecast by Schumpeter and have been further elaborated by many others, e.g., Habermas. The decline of civility, the loosened attachments of family and community that both allow and necessitate the taking over of our basic responsibilities for one another by either commercial organizations or the state, are the "dark side" of the mobility, freedom, and possessive individualism essential to capitalist economies and extolled in the United States above all.

While community -- social relatedness -- is essential for the fulfillment of basic human emotional needs (and indeed for the development of human persons in any real sense), the modern, media-dominated, consumption-oriented economy encourages the substitution of consumption and material possession for genuine emotional fulfillment; it glorifies freedom from commitment, mobility, and escapism. The process of the substitution of consumption for fulfillment of emotional needs has a treadmill quality, since the basic needs remain unfulfilled.⁵⁶

The role of advertising in creating desire, in encouraging the purchase of commercially supplied products and experiences as substitutes for social and emotional needs, can scarcely be denied. Ewen (1976) has traced the historical development of the advertising industry and exposed its role in creating the consumer society in the service of industry. Ewen emphasizes the ability of American capitalism, through advertising, to penetrate the "lifeworld" of ordinary people, to influence their processes of identity-formation in accord with the needs of industry for consumers. Advertising is, for Ewen, at bottom a sophisticated means of social control. Jackle and

⁵⁶ The other end of the treadmill, which has been pointed out by Alan Schnaiberg (1980), is on the production side: since positive returns to investment are required, and since technological advance (almost by definition) makes labor more productive (i.e., makes labor less necessary for a given level of output), constantly increasing demand for constantly increasing production must be maintained.

Wilson (1992, p. 48) agree: "The consumer culture is not only a value system underlying a modern society saturated by mass-produced and mass-marketed goods, but also a new set of sanctions for elite control of society."

The transformation of a nation of citizens into a nation of consumers is inimical to such historically held values as democracy, self-determination, and even consumer sovereignty. Advertisers even co-opt and make use of our attachment to these values in a way that cheapens and trivializes them, as in the Seven-Eleven convenience store's slogan, "America Likes the Freedom!" Here, of course, the freedom is that of choice among brands of cigarettes, soft drinks, and potato chips (and, of course, the freedom to drive up to the store). The constant celebration of the consumer's freedom is in proportion to his or her unfreedom -- to the shaping of his or her desires, fears, likes and dislikes through advertising. This process is finally one of infantilization, but as Durning argues (1992), it is not a happy state, either for individuals, communities, or the environment. As Ekins (1991) suggests, a "sustainable consumer society" is a contradiction in terms.

The disintegration of community and family ties that has accompanied the development of technologically advanced industrial capitalism has led to increased crime, preoccupation with personal security, and anxiety. Moreover, the "creative destruction" of capitalism -- the constant need to recreate itself, to replace the existing with the new (thereby making the existing obsolete), to introduce new products to meet new needs, indeed to create new needs which can then be met through profitable products -- has resulted in a culture of impermanence in which "all that is solid melts into air." (Berman 1982). This culture of impermanence, along with the previously noted mobility of capital, has real, tangible manifestations in abandoned factories, derelict neighborhoods, and the ever-growing mountains of garbage that litter the landscape.

While it is not entirely an economic phenomenon, according to Jackle and Wilson (1992, p. 91),

our present economic system invites short-term profit taking whereby maintenance in old locations is discouraged in anticipation of new investments elsewhere. Government policy assists this process. Plant owners are accorded the right to relocate. Tax policy encourages new plant construction. Workers are believed protected by their ability to migrate and follow employment patterns; footloose industrial practices are purportedly beneficial to economic productivity. They are, in effect, given a hand to plunder communities and labor on behalf of "the general economic good." In the process, landscapes are despoiled, built environments allowed to decay, and household subsistence made contingent on entrepreneurial profit decisions.

In such an environment, it is not surprising that sociability, accountability of neighbors to one another, and moral inhibitions are eroded. Jackle and Wilson see dereliction as assuming the status of a major social problem in its own right, as well as being a disturbing symbol of social pathology in the United States. The longstanding pattern of dereliction, described in their book in terms of industrial landscapes, center cities, abandoned neighborhoods, and declining rural communities -- all, in some sense, left behind by "the march of progress" -- is fundamentally incompatible with sustainable use of the land; indeed, it almost defines the problem. One of the more innovative of the planning cases studied in Chapter 6 -- Regional Planning Association's plan for the New York Area, in conjunction with the New Jersey state plan -- explicitly addresses the reclaiming and restoration of abandoned urban and industrial land.

Summary

In this chapter, the mainstream theoretical model of environmental planning is shown to be subject to fundamental theoretical challenges. The corrosive, subversive impact of postmodernism is beginning to be felt throughout the social sciences and beyond. The validity of a universally applicable, decontextualized science is questioned. The public sphere in human affairs disappears, as do public spaces and the public interest. Authority in all forms is undermined. Meanwhile, ecofeminism is reconstructing the human/nature relationship at the same time as ecological theories are being overturned.

The world in which planning takes place is changing rapidly, too. Communism has collapsed and taken much of central planning's viability with it; meanwhile civil society has reemerged from the wreckage of the legitimacy of nondemocratic regimes. The world's economic systems have evolved rapidly into a truly global system. However, much of the world fails to benefit from it and the gulf between the rich and the poor countries seems to be deepening. Complexity and interconnectedness as well as unpredictability of both natural and social systems threaten to overwhelm governments. Finally, there is a steady erosion of community, civility, and morals under the onslaught of a global consumer culture. It is in this context of both theoretical reconstruction and rapid social and environmental change that whatever response planning makes to the challenge of sustainable development must be constructed.

Chapter 4: Growth and Development at the Local Level

Introduction

In the United States, from its very beginnings as a nation, the subjugation of the landscape, the development of the continent's resources, and the pursuit of economic growth were pursued with a moral fervor. Benjamin Lincoln, a Revolutionary general and statesman, stated in 1792 that "civilization directs us to remove as fast as possible that natural growth from the lands" in order to replace it with cultivated fields and human habitations (quoted in Keohane 1982, p. 24). At times the rush to develop seemed anything but moral; rather, it seemed to some as more akin to a frenzy of greed and rapacity. The French political scientist, Emile Boutmy, remarked in 1891 that Americans' "one primary and predominant object is to cultivate and settle these prairies, forests and vast waste lands. The striking and peculiar characteristic of American society is, that it is not so much a democracy as a huge commercial company for the discovery, cultivation, and capitalization of its enormous territory. ...The United States is primarily a commercial society ...and only secondarily a nation" (quoted in Snow 1991). An Illinois pioneer, Morris Birkbeck (quoted in Wolf 1981, p. 52), made this observation on journeying through the Northwest in 1817: "Gain [in the form of land speculation] is the beginning, the middle, and the end, the alpha and the omega of the founders of American towns."

The observations quoted in the preceding paragraph serve to emphasize the long-standing values and attitudes associated in this country with economic growth and land development at the level of local communities, cities, and towns. Historically, local governments, with the blessing of the populace, have actively promoted growth and resource development. For example, property taxes, infrastructure financing methods, the desire of local governments to increase their tax base and expand their

services, as well as the whole range of federal funding for infrastructure, all contribute to local and regional economic growth.

Benjamin Lincoln's exclamation, quoted earlier, reflects the fact that development in the United States, as in most of the world, has a physical, concrete manifestation that consists of the replacement of the "natural growth" with cultivated fields, pastures, tree plantations, mines, factories, houses, roads, parking lots, buildings, reservoirs -- a multitude of land uses, nearly every one of which must necessarily replace what was there before, and which more than likely will soon enough be replaced by something else.⁵⁷

Development of land does not include only conversion into a more intensive use. Very often the land converted into another use is not kept in that condition for long; rather it is used up, degraded and abandoned, sometimes reclaimed either by nature or with human intervention. Any development strategy that does not consider land to be an inexhaustible resource (which it is clearly not, although how close one feels to the limits may vary a great deal according to the local and regional context) must concern itself with reclamation, restoration, or redevelopment.

Development in the sense of conversion of land from its natural state to human use, be it urban or agricultural, can be done with varying degrees of sensitivity to the needs of the natural ecosystems which a particular place supports, as well as to its impacts upon the human community in which it takes place. Landowners and developers, seeking to maximize profits, are often motivated to develop land in such a way that the undesirable impacts -- traffic increases, noise, air pollution, aesthetic degradation, need for community services -- are borne by others. These others exist in varying degrees of proximity both in space and in time; i.e., some impacts, such as exposure to radiation from the dismantling of a nuclear power plant, may be shunted onto future residents of an area.⁵⁸ Attempts to impose controls which prevent such offloading of costs to the biosphere and to communities take place in the context of a legal and cultural tradition that until relatively recently conceived of land owner-

⁵⁷ Even those areas that are left undeveloped -- mainly federal but in some cases state parks and forests -- are viewed increasingly as needing *management* -- wildlife management, stream habitat management, fisheries management, forest management. Indeed it sometimes seems that some public lands are so intensively managed that everything with fur, fins, or feathers must have a tag identifying it or a radio collar for tracking.

⁵⁸ This strategy, which Dryzek (1987) calls displacement, was discussed in Chapter 2.

ship as conferring absolute rights to do with the land and its inhabitants as one wished. This pervasive idea -- that land owners "feel the land is theirs, to do with as they please" (Popper 1981, p. 212, cited in Collins 1988) is perhaps the major obstacle to the use of land use controls such as zoning to protect resources.

Development as the conversion of land and nature into something useful for humans, or at least into something profitable for its owners, carries the same kind of tension between growth and the possibility of some other, yet-to-be realized meaning as does the more general use of the term. In the following chapters (Chapters 5 and 6), I describe the ways in which planning has responded to the question of the sustainable development of land. What development possibilities might there be for the land and for local communities other than growth, physical extension of human occupation and use of the land? Are there forms of development in which humans and nature could symbiotically use the same place, could coevolve in a way that would maintain biological and cultural diversity and the life spaces so important to people? Is preservation of local ecosystems and communities fundamentally at odds with the "creative destruction" of the modern capitalist system, or with the private interests of developers and landowners? However, in order to understand what planners are responding to, it is necessary to review the dynamics, the causes, and the consequences of urbanization and the growth of urban areas in the United States. The remainder of this chapter is concerned with the description and interpretation of urban growth in the United States. What are its mechanisms? What are the characteristics of urban expansion in the late 20th century, and what is responsible for these characteristics? Is it the particular forms of development characteristic of American cities that may be unsustainable, or is it their economic growth?

Urban Sprawl as the Problem

Most criticism of such growth, both academic and popular, and most efforts to manage or control growth have been aimed, not at population growth per se, nor at increases in economic activity, but at the form of growth and the technologies employed in increasing economic activity. Low density, automobile-centered, suburban and exurban growth is widely (although not exclusively) viewed as undesirable. In a sense, U.S. cities have been the victims of historical timing: with much of their area built during the era of abundant fossil fuels, the patterns of settlement are now such that private cars are necessary for almost every purpose, from grocery shopping to getting to schools and churches. These patterns of settlement made possible by

unrestricted and practically universal use of the automobile are what we know as *urban sprawl*.

There can be little doubt that U.S. cities are sprawling. Not only does the growth of populations in urban areas continue, but the per capita conversion of land to urban use around many U.S. cities increased greatly from 1960 to 1980, especially in the latter decade. For example, the density of population on urbanized land was about 19 persons per hectare (ha.) in Detroit in 1960, but the density of population on land urbanized around that city over the next 20 years was less than one fifth of that at 3.3 persons per ha. In Denver, density in 1960 was 18.6 persons per ha.; density of land urbanized over the next 20 years was less than half that (calculated from data in Newman and Kenworthy 1989). According to the New York Regional Planning Association (RPA), during the past quarter century the population in the New York metropolitan area increased by 6 percent, but the urbanized area grew by 60 percent (Yaro 1993), consuming, according to Lowe (1992, p. 121) "nearly a quarter of the region's open space, forests, and farmland" in the process. In an already densely populated region, such a pattern of growth has ominous implications for the public values associated with open space, as well as for the remaining vestiges of natural biological communities.

The patterns of growth seen recently in U.S. metropolitan areas have contributed to a growth in the percent of U.S. land designated as "metropolitan" from 5.9 in 1950 to 16 percent in 1980 (U.S. Department of Commerce, Bureau of the Census 1986). Estimates of the area under urban use in 1980 range from 19 million to 25 million hectares (Conservation Foundation 1987, p. 203). Rural land in the mid-1980s was being converted to urban and transportation uses at an estimated rate of 364,225 hectares per year (Gustaffson and Biles 1984).

Because of the historical tendency for settlements to locate on flat land and near water bodies, much of the land being converted to urban uses is good agricultural land. Concern over loss of farmland is evident in many places, and in a number of states programs have been implemented to help preserve it from urban development (Daniels 1990). The concern that fuels agricultural and forestal land preservation efforts is generally related not to diminution of farm production capability (although this argument is often used) but rather to the loss of the aesthetic, amenity, ecological, and social values associated with farming and forests.

There is considerable and continuing debate over exactly what constitutes urban sprawl. Audirac and others (1990, p. 475) argue that although most growth management efforts are based on the belief that urban sprawl is “ugly, fiscally inefficient, and environmentally harmful,” there is no precise definition of what exactly sprawl is. However, this may be a case where precision would be spurious. The definition adopted by the Florida Department of Community Affairs (quoted in DeGrove 1992, p. 18) seems adequate for most purposes: “scattered, untimely, poorly planned urban development that occurs in urban fringe and rural areas and frequently invades lands important for environmental and natural resource protection. Urban sprawl typically manifests itself in one or more of the following patterns: (1) leap frog development; (2) ribbon or strip development; and (3) large expanses of low-density, single dimensional development.”

According to an influential study performed by the Real Estate Research Corporation in the early 1970s, sprawl development increases capital costs for infrastructure provision, increases the energy costs of both space heating and transportation, and results in increased pollution as compared with more compact development (RERC 1974). Sprawl development has long been a central issue for planners, and the RERC study provided environmental and fiscal grounds for opposing it. But a major tradition in what Knox (1987, p. 302) calls the “ideology” of urban planning has long argued against uncontrolled, unplanned land development on moral and aesthetic grounds. The basic arguments in this tradition -- that certain urban forms are aesthetically superior to others, and that the quality of life is enhanced by certain urban forms and diminished by others (especially sprawl) -- have their roots, according to Knox (1987, p. 303) in a “crude environmental determinism” as well as “moral righteousness and professional paternalism.” It is this tradition that, according to Audirac, Shermyen, and Smith (1990), primarily informs Florida’s state growth management program, as well as those of many other states and localities. Audirac and Zifou (1989) have assembled an impressive collection of studies critical of many of the findings of the RERC study and of the “conventional wisdom” among planners that sprawl is something to be avoided and that compact development is to be preferred. Audirac, Shermyen, and Smith (1990) argue on economic efficiency lines that low-density housing and suburban sprawl is in effect the “people’s choice” -- that Floridians, like most Americans, prefer to live in low density suburbs.

The style of development seen in the industrialized nations, and especially North America, certainly raises profound questions of sustainability. It is becoming increasingly clear that the consumerist, energy-intensive, affluent lifestyle to which

most Americans aspire, and which many have achieved, is not a model that is generalizable to the rest of the world. In cities and towns in the United States (leaving aside the question of agricultural technologies and agricultural land uses), this unsustainable development is most visibly and concretely manifested in urban and suburban growth. However, there are differences of opinion regarding whether what is unsustainable is economic growth in the sense of an increase in population, jobs, capital accumulation, or income per capita in urban areas; or the form and patterns of the growth of urban areas. Furthermore, the competing value sets (or “political/ideological paradigms”) described in global terms in Chapter 2 can be seen again to influence the way problems are defined, causes of problems identified, and solutions proposed at the local or community level.

Competing explanations of sprawl

In the preceding chapter, I described a mainstream planning practice and argued that its theoretical and ideological underpinnings could be found in the paradigm I called the “dominant social paradigm.” This paradigm is constructed of a psychology of possessive individualism; an anthropocentric/instrumentalist environmental ethic; neoclassical economics; a politics of pluralism; and a view of development as being roughly equivalent to technological progress and economic growth.

In an extreme position within the DSP, following the logic of market economics, the decentralizing pattern of growth seen in many if not most American cities is viewed as stemming from the self-interested choices of consumers based on their irreducible preferences. In this “technological determinist” model,

[e]veryday change gets mediated through a neutral and value-free marketplace. Consumer choices are expressed and society allocates resources to permit realization of preferences. Social harmony rather than conflict characterizes the market. Constraints on access, including position in the housing market and institutional barriers, are subsumed under household wishes. Diverse market agents ostensibly allocate resources to meet consumer preference; they are apolitical operatives that conform to a societal role. Suburbanization unfolds as a consumer-directed process informed by repugnance for urban living. (Jakle and Wilson 1992. p. 99)

Certain schools of human ecology, particularly that associated with the University of Chicago, analyze urban form in terms of transportation technologies and networks. While the importance of, e.g., the automobile for the development of sprawling forms of development is undeniable, the analysis offered rests upon certain assumptions of market ideologies, such as consumer sovereignty (Hawley 1986). Thus, roads and

infrastructure are built in response to consumer demand and locational preference. The decisions and actions of various institutions -- banks, developers, transportation agencies -- are of secondary importance and derive from popular demand. This model informs many of the critics of growth controls and planned, compact development (e.g., Audirac and others 1990; Gordon and others 1991).

It is of course possible to criticize the market model from within the DSP without espousing a historical/materialist explanation. Indeed, the theoretical basis for much land use planning relies on such a critique, one that basically assumes the legitimacy of many neoclassical, pluralist assumptions but sees markets, especially land markets, as operating imperfectly. Thus, for example, Bourne (1992, p. 512) points out that several Canadian city plans he examines are "based on the... philosophy that the markets for urban land and housing frequently do not operate efficiently or equitably, at least in the real world."

A competing explanatory model for the decentralizing development of North American cities is informed by historical/materialist, political economic assumptions of structural inequalities, conflict among socioeconomic classes, and the dominance of wealthy elites. It can thus be located within the Marxian paradigm described in Chapter 2. In this model (of which there are many variations), consumers are no longer seen as the driving agents of urban change; rather, "their tastes and preferences represent social constructions that permit others to realize capital accumulation" (Jakle and Wilson 1992, p. 103). The imperatives and movement of large-scale capital favor suburbanization, the development of new land, over reinvestment in central cities (Jakle and Wilson 1992), resulting in sprawl on the one hand and the dereliction of urban and industrial landscapes on the other. As Lake (1993, p. 89) puts it, "[a] fundamental requirement to maintain the rate of profit in land development is land consumption. ...Mass consumption of land, houses, office space, and shopping malls is ...required to support the rate of profit." Investment and disinvestment in the pursuit of short-term profit, while fueling aggregate economic growth, creates development that is highly spatially uneven and whose costs and benefits are unevenly distributed.

Suburbanization and sprawl are also encouraged by local coalitions of land owners, builders and developers, bankers, and others who stand to gain from the growth of their community. Such local growth-promoting elite coalitions have been termed "growth machines" (Logan and Molotch 1987).

The second is the role of local businesspeople and landowners in promoting the growth of their communities for their own profit; as Logan and Molotch (1987, p. 12) put it, “[p]eople dreaming, planning, and organizing themselves to make money from property are the agents through which accumulation does its work at the level of the urban place.” Logan and Molotch are the most prominent exponents of the “growth machine” perspective, in which communities are identified on the basis of their shared interests or similarities regarding the future use of land. The issue of growth “consistently generates consensus among local elite groups and separates them from people who use the city principally as a place to live and work” (Logan and Molotch 1987, p. 50). For these politically organized elites, the city is a growth machine. Molotch (1976) distinguishes two groups, one of which (the “Advocates” -- landowners, speculators, investors) stand to gain directly from growth. The “Statesmen” -- bankers, realtors, builders, and businessmen in general -- benefit indirectly; “their interest in development is defined by the economic returns of overall growth and is not tied to specific development alternatives” (Canan and Hennessy 1989, p. 228). Together, these elites attempt to control the local and (in matters affecting their interests) regional and state political agendas.

Rudel (1989) has elaborated and refined the growth machine analysis of Molotch and Logan by studying the land use and development decisionmaking process in four different types of communities: rural, rural-urban fringe, suburban, and urban communities. He found growth coalitions in all four types of communities, but their composition as well as their interaction with other interest groups, such as homeowners, varied considerably.

The concept of a community of interest actively seeking to enlist local government in making policies that will benefit them at the expense of other communities of interest helps in understanding how the desire for progress and development in a locality becomes subsumed by and is used to legitimate policies aimed at quantitative economic growth. Power (1988) has offered a very insightful analysis of the differences between growth and development at the local level, showing how “folk economics” is used ideologically by the members of the growth machine to emphasize “growth in the gross volume of income and population as a measure of economic improvement” (p. 124) and development. Their arguments support the type of economic change most likely to benefit those in the local economy who own resources that are fixed in supply: “private real estate, established banks, and well-located businesses” (p. 124) -- i.e., themselves.

Power is not asserting that the interests of the growth machine are always at odds with the rest of the community -- as some of the growth machine theorists might. What he wants to point out is that policies based on the ideology of economic development as growth of the commercial sector bear little relation to the economic welfare of the community, and may very well undermine it. Moreover, belief in this ideology leads communities to pursue smokestacks and build industrial parks, and in the process "to sacrifice the very things that make them attractive places to live and work. Business taxes are lowered, and public services and schools are starved for funds. Environmental standards are relaxed, and the natural environment deteriorates" (p. 18). Most communities are not successful in their pursuit of large industries, but make themselves poorer by seeking to maintain a "favorable business climate."

Power also faces the question of why some areas face population pressures and others decline in population, in a country (the United States) in which population is growing slowly. Evidence to support the widely held notion that workers go where the jobs are is ambiguous at best. While this happens, it also is the case that people move to where environmental and social qualities (access to recreation, low crime) that they want exist, and that job creation accompanies this movement. Communities should pursue strategies that make them better places to live for the people who already live there, Power claims, rather than try to attract new people by sacrificing the livability of their communities. Power's work suggests that it may be possible to usefully differentiate development and growth at the community level, and to target strategies to promote development without necessarily promoting growth.

The study of theories of development at different levels of aggregation should warn us of the danger of simplification in any explanation of growth at the local level that ignores the influences of national and global economic trends, multinational corporations, international movements of capital, and the like. Some economic and financial factors, like many environmental influences, are simply beyond a community's control. Still, as Power suggests, a community does have some degree of choice in the extent to which it lays itself open to, or attempts to insulate itself from, such variables. This is one aspect of thinking globally and acting locally. A community also has some degree of choice, and thus some responsibility, with respect to aggravating or alleviating global environmental problems, however tiny its contribution may be. It appears that some strategies, such as increasing nonrenewable energy utilization efficiency and developing some degree of energy self-sufficiency, might serve both

to help insulate a community from exogenous influences and make a positive contribution to the global situation.

The sprawling, resource-hungry, polluting cities of North America are seen from within the radical/critical paradigm as both the embodiment and the source of further reproduction of a culture that is deeply exploitative, has no sense of appropriate scale or limits, is predicated on relations of dominance not only between social groups but between humans and nature, and in which people are alienated not only from “outer” nature but from themselves as well. Lewis Mumford, one of the luminaries of planning thought, has been outspoken in his contempt for “megapolis,” the urban form (or rather, he would say, the negation of urban form) of industrial capitalism. Megapolis, he says (Mumford 1961, p. 546) is

a collective contrivance for making this irrational system [industrial capitalism] work, and for giving those who are in reality its victims the illusion of power, wealth, and felicity, of standing at the very pinnacle of human achievement. But in actual fact their lives are constantly in peril, their wealth is tasteless and ephemeral, their leisure is sensorially monotonous, and their pathetic felicity is tainted by constant, well-justified anticipations of violence and sudden death. Increasingly they find themselves “strangers and afraid,” in a world they never made: a world ever less responsive to direct human command, ever more empty of human meaning.

Mumford, of course, is not necessarily representative of the entire spectrum of radical/critical thought, which is heterodox indeed. In the breadth of his work, however, he does anticipate a number of the positions later articulated within this decidedly countercultural paradigm.

Recently published analyses of the changing American landscape have emphasized the decentralizing impetus of the shift from an industrial, production-oriented capitalism to one that is information-based, service-oriented, and organized around consumption. Several draw upon post-Marxist political economy, critical theory, and some concepts of postmodern cultural criticism and so may be appropriately placed within the radical/critical paradigm. They emphasize the increasing mobility of capital and the increasingly dominant role of centralized decisionmaking within multinational corporations and financial institutions (Peters, 1993). Sorkin (1992) has assembled a collection of critical descriptions of the new places being created in the American landscape that draws heavily on the language and concepts of postmodernism -- appropriately so, since it is the postmodern landscape that is being described. These new places are increasingly decontextualized, displaying little regard for either local nature or local culture. The increasing polarization of America

into haves and have-nots results in an almost obsessive concern with security and exclusion. Zukin (1991) brings a postmodernist concern with the play of power and symbol in shaping landscapes to her analysis of the changing American landscape. She argues (p. 4) that “abstract market forces that detach people from social institutions have overpowered specific forces of attachment identified with place.” In the rapidly restructuring economic system, in which consumption becomes more important than production, the places that remain tied to production, where people “produce a physical product for a living” (p. 5) decline (and, as Jakle and Wilson (1992) would agree) suffer dereliction, while those places that are connected with information and finance thrive. While Zukin’s use of critical theory and postmodern concepts is at times more confusing than enlightening, she does lend additional support to the general themes of the centralization of economic power, the shift to consumerism and general restructuring of the economy, and resultant changes in the landscape that the Sorkin collection as well as Jakle and Wilson describe.

Jakle and Wilson (1992), whose post-Marxist political economic approach places them somewhere between the Marxist and radical/critical paradigms, are concerned with the description and explanation of the processes that lead to landscape dereliction. This they see as the inescapable accompaniment, the shadow side, of the creation of the new built landscapes described in Sorkin’s collection. Abandoned industrial facilities in the Rust Belt, rural towns and villages declining with the demise of the small-scale farm, and central city neighborhoods are the inevitable result of the dynamism of capitalism. As both the mobility of capitalism and the scale of its dynamism increase, dereliction of both built environments and natural resources (as in soil erosion and land degradation) through disinvestment, lack of maintenance, and abandonment becomes increasingly relevant to the problem of sustainable development. The costs of dereliction represent externalities, to be paid by those left in the abandoned factory towns, decaying central cities, and declining rural areas. Furthermore, the strategy of disinvestment in developed areas and investment in new development of previously undeveloped land fuels sprawl, consumes land that provides habitat for plants and animals, and wastes previous infrastructure investment.

While structural, institutional, and market forces all influence the decentralization of North American cities, there are other forces at work as well. In yet another self-reinforcing social trap, the concentration of poor minority populations in central cities spurs the exodus to the suburbs. Jakle and Wilson (1992) have described the complex interactions between race, poverty and its attendant problems (crime, poor schools), neighborhood dereliction, and the decisions and policies of local, state, and

federal government and investors in producing simultaneously the decline of central cities and the growth of suburbs. Robert Yaro, explaining his motivation for moving from rural landscape preservation to directing the New York Regional Planning Association, put it bluntly: the reason that land conversion and growth pressures are felt in rural areas like the Connecticut River Valley is because the cities are increasingly dysfunctional (Yaro 1993).

The proliferation of automobiles in the cities and suburbs is self-reinforcing, in the sense that even where walking or bicycling would suffice (for example, for children getting to school), car traffic makes it unpleasant at best and frequently unsafe to do so. As cities become choked with cars, air and water quality deteriorate, public spaces become hostile to the senses and hazardous to pedestrians, and transportation becomes less and less efficient. Moreover, there are a number of other unintended consequences of reliance on (and promotion and subsidization of) private automobiles.

Economic growth as the sustainability problem

At first glance, it might be thought that the problem for land use planning in communities in the United States concerned only the form of development, which is increasingly automobile-dependent low-density sprawl. The growth of cities, in terms of population at least, will continue into the foreseeable future, both in North America and in the rest of the world. It can be argued that North American cities, like cities throughout the industrialized core countries, have made progress in relation to local and even, in some cases, regional environmental problems. Certainly the potential exists for land development that is more compact, more sensitive to the landscape, both physical and biological -- that is, the knowledge, technologies, and capital are available (which is not to say that they will be used for sustainable development). However, the Brundtland Commission among others is quite firm on the necessity for considering the global context for sustainability.

In the previous chapter, I described one of the aspects of the changing context of planning: the globalization of the economic system and the increase of international trade. Although conventional economic wisdom tends to see trade as being of positive net benefit (and certainly there *are* many benefits), still the unequal terms of trade between the industrialized countries of the North and the LDCs (or, alternatively, between core and periphery) mean that the economic growth and profligate resource consumption of North American cities comes, to some extent, at the ex-

pense of the poor countries. Goodland and Daly (1992) criticize the “traditional view” that economic growth in the North is the solution to poverty in the South. They argue instead that the North should “stabilize” its resource consumption and reduce its damage to global life-support systems.⁵⁹

The geographic concept of the hinterland may be useful in further illuminating the implicatedness of the growth of North American cities (and of all First World cities) in ecological and cultural transformations throughout the world. Referring to the relationship of the metropolis, Chicago, with the “Great West,” its hinterland, the environmental historian William Cronon (Cronon 1991, p. 265) describes a process in which “its influence extended farther and farther to the west, [drawing] every local ecosystem into the web of its markets, so the environmental dynamics of western places eventually had as much to do with their hinterland status as with their ecology.” Cronon painstakingly and in great detail reconstructs the historical linkages between “the commodities of our economy and the resources of our ecosystem” (Cronon 1991, p. xv), describing how “[o]n the farms of Illinois and Iowa, the great tallgrass prairies would give way to cornstalks and wheat fields. The white pines of the north woods would become lumber, and the forests of the Great Lakes would turn to stumps. The vast herds of bison on which the Plains Indians had depended for much of their livelihood would die violent deaths and make room for more manageable livestock” (Cronon 1991, p. 93), all to feed the markets in which Chicago figured so prominently.

The needs and habits of consumption of city-dwellers, acting through financial and commodities markets, have historically had a determining influence on the ecological and social transformations of the areas on which cities depend. In today’s increasingly global economy, the reach of cities, especially those of the industrial nations, extends to the farthest corners of the earth. Hazardous wastes from the industrial centers of Europe are disposed of in Africa, while tropical hardwoods from Malaysia are transformed into furniture for consumers in the rich countries. Perhaps most important, oil from a few richly endowed areas for the most part outside the developed countries fuels their economies.

White and Whitney (1992) have related the concept of the hinterland to carrying capacity. Preindustrial cities, they argue, were limited in their carrying capacity by the

⁵⁹ Daly, of course, has repeatedly argued that reducing resource consumption does not necessarily imply reducing economic welfare or even economic development.

territory they controlled and the technologies available both for production and transportation. The limitation was manifested in both number and population of cities in a region. However, with the agricultural and industrial revolutions of the late 18th and 19th centuries, European (and later other cities in the expanding core) were able to accumulate sufficient wealth and power to enable them to dramatically expand their hinterlands, appropriating, first through colonialism and more recently through unequal terms of trade, multinational corporations, and indebtedness, the resources and assimilative capacity of Third World peoples.⁶⁰

Such a system, in which the First World expands its population, its consumption of resources, and its production of wastes, could conceivably be sustainable for a time (and in fact has been) as long as there was unoccupied territory to expand hinterlands into.⁶¹ This is far from the case today. Third World cities are expanding at hitherto unseen rates to hitherto unimaginable size. Third World populations are increasing much faster than those in the First World. Unlike the European cities undergoing the industrial revolution, which were able to send waves of emigrants to the "New World", the Third World's cities will have to pursue other strategies for dealing with what are essentially carrying capacity constraints.

North American cities, therefore, are deeply implicated in -- and reflect spatially -- patterns of production and consumption that are characterized by nonsustainability. This is particularly true of suburban and subrural sprawl made possible by the availability of cheap oil.

Summary

In Chapter 2, the meaning of development was shown to be fundamentally put at issue by the concept of sustainability. In this chapter, development in its most concrete manifestation, as land conversion and urbanization, was examined. It is this meaning

⁶⁰ That the affluence of the First World has been constructed at the expense of all but the elite minority in the Third World has not been lost on many in the Third World (see, for example, Shiva 1989; Kothari 1989; Alvares 1992). This perception underlay many of the conflicts apparent at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil.

⁶¹ That the territories that were expanded into -- the Americas, Australia, Africa -- were never in fact unoccupied was seldom allowed to penetrate the consciousness (and conscience) of the colonial powers.

of development that is commonly understood by land developers and land use planners alike. As with the meaning of development explored in Chapter 2, the spatial patterns of urbanization in the United States are subject to different interpretations both in terms of driving forces and solutions. There is general agreement, however, that in many areas urban sprawl is accelerating and that some of its impacts are detrimental. Economic growth in the cities of the U.S. and other industrialized nations, regardless of its spatial patterns, has also been implicated in the global *problematique*. Chapter 5 examines the ways in which mainstream planning practice has addressed uncontrolled urbanization and its local and regional effects, both on ecosystems and communities. Planning has begun to deal theoretically and (to a much lesser degree) practically with the implications of potential global crisis; these responses are the subject of Chapter 6.

Chapter 5: Mainstream Land Use Planning Approaches for Sustainable Development

Environmental planning includes more than land use planning (e.g., water resources planning, environmental assessment, endangered species protection), just as the environment is more than merely land considered as *terra firma*. Still, land use is central to most environmental concerns and is certainly a central and abiding concern of planning as a profession. A great deal of environmental planning is concerned with location: the identification of hazards, facilities siting (especially dangerous or undesirable facilities such as power lines, landfills, transportation corridors, and energy production facilities); the delineation and protection of wetlands, critical habitat, and other “sensitive areas” from which development is to be excluded or in which development practices must be modified.

Development, of course, has its spatial aspect in which changes in land use figure prominently; indeed the popular meaning of the word means a change in the use of land from a wild state or an agricultural use to a more urban use.⁶² Mainstream environmental planners frequently seek spatial solutions to the contradiction between environment and development. They use rationales based on public safety, biology, hydrology, and earth science, as well as economics, to differentiate between appropriate uses of areas. Political power is never absent from the dynamic that leads to

⁶² Castells (1992), on the other hand, has described a recent spatial phenomenon he attributes to recent developments in the “technological informational revolution [that] constitutes the material basis of the new global economy” (p. 75). This phenomenon is a fundamental transformation in “the predominant logic of functionally dominant organizations (e.g. multinational corporations and financial institutions, as well as major political agencies)” from a spatial logic of places to one of *flows* of information. To characterize this phenomenon as a transformation is perhaps misleading; rather a spatial logic of flows has been superimposed by global capitalism onto the older geography. As Castells admits (p. 75), although this new geography of flows has come into existence, “[y]et, places do not go away. People live in places.” To which should be added that living nature dwells in places as well.

land use decisions, whether they be for the designation of wilderness areas and wetlands or for the placement of landfills and roads. In areas where the pressure of development is great (i.e., the economic value of intensified land uses is high and/or political agendas require certain uses in certain places) but the perceived environmental, aesthetic, or other value of the place in its undeveloped state is also high, preservation or full development may each be unattainable. In such cases, there are several approaches that are sometimes taken. Compartmentalization -- drawing boundaries and creating zones of mutual exclusion -- is one frequently used solution. In other cases, design or engineering solutions may be proposed; e.g., clustered development that alters the distribution of development, leaving significant portions of sites in a natural or semi-natural state; or creation of wetlands to substitute for those destroyed. In others, uses are managed to limit impacts to those compatible with protection of habitat areas or other environmentally significant features.

In Michael Colby's (1990) conceptual scheme, environmental management in development is seen as moving toward a deepening integration of ecosystems and systems of production/consumption ("Ecodevelopment"), primarily because of the inadequacies and limitations of responses from within the paradigms of Environmental Protection and Resource Management. Similarly, land use planning practice, if it is fully to engage the challenge of sustainability, will need to move beyond the mainstream responses and roles available within the dominant social paradigm. What are the mainstream responses available within the DSP in land use planning? What definitions of sustainable development do they assume?

In this chapter, I will describe four strategies of land use planning that have been developed within mainstream environmental planning that serve as attempts to operationalize sustainable development according to differing definitions and in different contexts.

All four are mainstream in that they tend not to threaten existing structures of power and wealth, they do not depend upon a rethinking of the relationship between humans and nature, and they do not require a new consciousness. Human economies and ecosystems are seen as in opposition, and resource protection and development are seen in terms of a zero-sum game, with no or very limited possibilities for solutions or management regimes that could benefit both. Moreover they are mainstream in the sense of their incorporation of the logic and worldview of instrumental rationality and reductionist science, a worldview that is aimed at control and management of nature.

This is not to argue that such approaches are inherently wrong, misguided, or inappropriate in every context; rather that they are limited and that the context is changing. Among the mainstream approaches there are many important differences in problem definition, scale (spatial and temporal), degree of management/control, and role of technical expertise. Just as some authors (e.g., Pearce 1987, Colby 1990) either discern or argue for a movement toward greater integration of models of human activity and models of natural ecosystems, either at the theoretical level or at a more practical, management-oriented level, land use planning for sustainable development can be viewed in terms of the degree of integration of human activities and natural ecosystems.

Mainstream approaches have tended to attempt to resolve the problem of sustainability (defined implicitly as ecological sustainability) by spatially separating out areas to be developed and areas to be preserved. This strategy of compartmentalization has been pursued at various scales and with different legislative and institutional means by land use planners, but it remains a hallmark of the mainstream approach to planning for sustainable development of the land. Ecosystems and habitat conservation planning and greenline or regional planning attempt to preserve natural (or at least non-urban) areas directly by spatial means. Another category that is also mainstream but is tending toward greater integration of human and natural systems is that of “environmental mitigation,” by which I mean the whole spectrum of human manipulation of biological systems for the purpose of lessening or compensating for the impacts of development. Finally, growth management attempts to impose a higher-level order on development, preserving valued areas both directly and indirectly by pacing and limiting growth, and by channeling it toward desired areas.

Operationalizing Sustainable Development Through Compartmentalization

Compartmentalization -- the spatial sorting out of land uses -- has been a dominant strategy of land use planning, and it should not be surprising to find it used in environmental planning for sustainable development. Traditional zoning is basically the spatial separation of different activities in an urban or jurisdictionally delineated setting. Euclidean zoning, which made only residential districts exclusive of all other uses, was gradually replaced with zoning arrangements that make industrial and ag-

ricultural zones exclusive of other uses as well. Although in recent years there has been a trend toward greater flexibility and mixing of uses within zoning districts, the spatial sorting out of uses into exclusive areas characterizes much environmental planning. Such spatial sorting out may be for purposes of environmental protection (e.g., designation of environmentally sensitive areas in which development may not be undertaken or may only be undertaken under certain conditions) or for risk reduction (e.g., floodplain delineation and zoning). The spatial sorting-out may be at several scales. At the site level, local government planners may require, or developers may propose, that part of the parcel to be developed be left as open space -- to protect, for example, a wetlands or stream corridor -- or dedicated as parkland. At the jurisdictional level, zoning districts and special overlays traditionally channeled development into some areas and away from others on the basis of some definition of suitability for development (generally a function of soil type, slope, access to utilities). As urbanization expands to cover more and more of the landscape, certain landscape features believed to be of importance to maintaining such valued environmental qualities as clean water and abundant wildlife are delineated and "set aside" for protection and even preservation.⁶³ Within the national forest system, even multiple-use management was operationalized by using essentially a zoning approach, at least among incompatible uses: timber production in certain areas, visual resource protection in others, and wilderness in yet other areas. At the regional, national, and even global level, certain large ecosystems still relatively functionally unimpaired by human (or at least modern) intervention are defined spatially and preserved as lands from which development, or at least certain forms of development, are excluded.⁶⁴

⁶³ In areas where development pressure is great, and land values for development purposes are high, the delineation of such areas is conflictual and controversial. The struggle over the official federal definition of wetlands during the Bush administration, which potentially rendered either developable or undevelopable hundreds of thousands of acres throughout the United States, is one example of this fact.

⁶⁴ In tracing the history of the sustainable development concept, I showed in Chapter 1 how environmental management of game preserves in the tropics evolved from attempts to exclude humans to increasingly considering the development needs of local populations.

The paradox of preservation

There is a sense in which preservation of natural ecosystems has always been an unattainable goal. Preservation in the sense of prevention of change through time is itself unnatural when applied to ecosystems. Although the “classical paradigm” (Christensen 1988, p. 62) in ecology described ecosystems in terms of “a model of community succession as a directional, deterministic, and autogenic process of change converging toward a globally stable climax,” several of the qualities attributed to natural ecosystems (e.g., equilibrium tendencies, stability, the existence of a “climax” state) are now seriously in doubt, as was explained in Chapter 3.

The management of ecosystems to preserve a particular species mix, for example -- to in effect freeze it in a certain stage -- may require greater and greater levels of intervention. Norton (1991, p. 158, quoting the National Parks Act of 1916) describes the U.S. Park Service’s struggles to meet its two management mandates -- to “conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for future generations” (or, preservation and tourism, in Norton’s words) -- simultaneously in Yellowstone National Park. A focus on tourism in the early years led park managers to increase ungulate populations through winter feeding and predator control; several decades later thousands were rounded up and shot because their numbers had increased to the point where the ecological balance was disturbed. More recently, the reintroduction of the wolf to the Greater Yellowstone Ecosystem (GYE) has been discussed as a means of restoring “ecological integrity.”

Exactly what it is that ecosystems preservationists seek to preserve is increasingly questioned by environmental managers (e.g., Agee and Johnson 1988) as evidence of the dynamism and unpredictability of natural ecosystems mounts. As Christensen (1988, p. 76) points out, “more often than not, selection of sites for preservation was determined by political, economic, and aesthetic considerations more than ecological criteria.” Unfortunately, since the demise of the guiding concept of climax communities, ecologists have had a difficult time determining what criteria should guide the choice and delineation of ecosystems for preservation. The preservationist approach is based on the myth of ecological constancy. Scientific uncertainty has made it extremely difficult to justify withdrawing potentially economically valuable lands from productive uses, even where they are in public ownership.

Preservation efforts, as noted above, are undertaken for a variety of reasons. Both instrumental (“think of all the useful substances likely to be found in rainforest biota!”) and moral (“we have no right to destroy species”) arguments are used in support of preservation. Implicit in many of these arguments is a perspective that might be called ecocentric. If so, it would be used in a narrow sense to refer to ecosystems that are primarily valued and conceived of as nonhuman ecosystems, not in the expanded sense that includes both human and nonhuman systems. They tend to be valued for their wildness, for a variety of recreational and aesthetic purposes and functions, and for the provision of a flow of valued (but not extracted) services and resources (e.g., clean air and water). In some cases limited resource extraction may be compatible with maintenance of ecosystem integrity and function, but the current difficulties faced by the U.S. Forest Service in managing forests are illustrative of the dilemmas of management for both.

One of the often-overlooked truths about natural ecosystem preservation is that there are in fact very few natural ecosystems left in the U.S.; none, in fact, if *any* human disturbance is counted as a disqualification. All or nearly all terrestrial ecosystems, for example, are subject to changed carbon dioxide levels and levels of ultraviolet radiation from ozone layer thinning. Moreover, before Europeans transformed the North American landscape, indigenous cultures were influencing ecosystems (see, for example, Merchant 1989). Even Yellowstone National Park and the area surrounding it cannot be considered natural. It is a managed ecosystem, one in which the human presence is limited but still pervasive in its effects.

However, the GYE is still sufficiently undisturbed that “natural regulation” can be considered as a management goal. Natural regulation, according to Norton (1991), must be carefully distinguished from whole ecosystem management, which, he says, is merely an approach to management that emphasizes the larger ecological context of management decisions. Management for natural regulation, on the other hand, aims to create the conditions in which the autonomous (or wild, natural) processes that regulated the ecosystem prior to human (or at any rate European) intervention can maintain themselves to the maximum extent. Thus, in the GYE, the advocacy of wolf reintroduction and uncontrolled fires by some environmentalists and resource managers.

There are many problems with large-scale ecosystem preservation as a goal, even in as relatively pristine an environment as Yellowstone National Park. The technical and scientific knowledge required even for drawing the ecosystem boundaries prop-

erly is daunting (Cawley and Freemuth 1993). The spatial requirements for self-sustaining populations, particularly of large mammals and some birds, varies considerably but is in some cases quite large. Jurisdictional boundaries do not coincide with ecosystem boundaries, but are jealously guarded, even between two resource management agencies such as the U.S. Forest Service and the Park Service (Cawley and Freemuth 1993). Humans and local human impacts can never be completely excluded, and many local communities have development aspirations which lead them to oppose preservation efforts politically. Moreover, transboundary human impacts such as acid rain, ozone layer depletion and attendant increases in ultraviolet radiation, and climate change cannot be excluded even if people could be.

The delineation of protected areas for ecological preservation (the compartmentalization approach continued) is not limited to large-scale systems. Ecosystems exist on many scales; the decision as to where to draw boundaries, on what phenomena to focus, is always arbitrary in a sense and cannot be separated from purpose. Besides the large-scale (e.g., tens of thousands to millions of acres) setting aside of natural areas (which may or may not be large enough to be considered functioning ecosystems) that national parks and wilderness areas represent, there are many small-scale (less than ten to several thousand acres) "set-asides" of natural ecosystems or ecosystem fragments. These are often driven by concerns unrelated to ecosystem viability and integrity, for example aesthetics or recreation, but where the impetus is provided by concern for ecological functioning and integrity, they can be considered a variation of the compartmentalization approach to sustainability. The delineation and preservation of such areas carries on the environment vs. development opposition, but involves a finer sorting out spatially. There are many hundreds of specific examples of this approach, which is frequently driven by federal statutes that provide for protection of particular types of habitat (e.g., wetlands) or of particular species. Land acquisition by such groups as The Nature Conservancy (TNC) also would be classified here. Although their approach is different, the goal is the same: the protection of the habitat of endangered species or rare biological communities from development.

Although different authors treat the problem of the protection and conservation of biological diversity in the context of sustainable development differently, there is no doubt that ensuring the continued viability of natural ecosystems is central to any reasonable approach to sustainable development. Indeed, the rapid decline in biodiversity that is apparently in process (see, e.g., Wilson 1988) is one of the primary pieces of evidence giving rise to the entire problematic of sustainability. There are

a number of arguments that can be made in support of the preservation of biological diversity. They fall into four general categories: moral and religious arguments that human beings have a stewardship obligation toward other species; right-based arguments that species have a right to exist; utilitarian arguments that stress the direct and indirect, actual and potential benefits to humans; and arguments stressing the obligate dependency of humans on functioning ecosystems and the necessity of biological diversity to that functioning. The paradox of preservation is that there are no ecosystems unaffected by human activity, so that the goal of preservation is unattainable. Moreover, even in the absence of human influence ecosystems apparently are in constant flux, with equilibrium tendencies only relative to scale.

Habitat Conservation Plans under the Endangered Species Act

The Greater Yellowstone Ecosystem is an example of ecosystem management at a large spatial scale. It indicates the problems and limitations of ecosystem management even in a large area in which development is relatively limited. A greater degree of spatial integration of development and “set-aside” nature preserves is found in habitat conservation plans (HCPs) prepared to comply with a federal mandate to preserve endangered species. In the United States, the Endangered Species Act⁶⁵ (ESA) is the federal law that provides a legal basis for protection of species threatened by economic growth and development nationally. According to Murphy (1988, p. 74), the ESA “with its mandate outlawing the ‘take’ of any endangered species is the best tool for protecting biological diversity in urban areas of this country” primarily because it does not condition protection on land ownership.

Following the Tellico Dam/snail darter fiasco, Congress amended the ESA to provide for *ex ante* consultation with the U.S. Fish and Wildlife Service (FWS) to ensure that endangered or threatened species will not be jeopardized by federal projects (including private projects needing a federal permit) and, perhaps more importantly, to ensure that large commitments of resources will not be undertaken only to be stopped by the unanticipated presence of an endangered species. A ‘take’⁶⁶ ap-

⁶⁵ 16 U.S.C. Sections 1531-1541 (1982).

⁶⁶ According to Webster (1987, pp. 244-245), “[t]he meaning of ‘take’ encompasses ‘harm’ and ‘harass,’ thereby precluding significant alteration of habitat and disruption of normal behavioral patterns such as breeding and feeding.”

proved through the consultation is considered incidental and is not subject to the prohibitions of Section 9 of the ESA.

The 1982 amendments to the ESA amended Section 10(a) to entitle private landowners concerned with the possibility of an incidental taking of an endangered species during development of their land to consultation with the U.S. Fish and Wildlife Service, even where no federal permit is required. Most large industrial, transportation, or water resource development projects, no matter who the funder, require some type of federal permit; residential and commercial developments, on the other hand, often need only local permission.

The 1982 amendments to Section 10(a) were introduced to codify a process designed to resolve a conflict over the development of endangered species habitat on San Bruno Mountain in the San Francisco area. The San Bruno Mountain Habitat Conservation Plan (HCP) concerned a large (several thousand acre) tract of privately held land that was found to be home to two species of endangered butterflies, as well as several proposed endangered species. Briefly, the plan was created through a three-year collaborative planning process by a steering committee made up of state and local government representatives, the landowners, a conservation group, and the FWS (Webster 1987). It represented the culmination of two decades of struggle over the fate of what was in essence the last large undeveloped tract on the San Francisco peninsula. The developer and the San Mateo County government had finally agreed upon a development plan that would allow construction of 2,235 housing units along with the conveyance of 1,711 acres of open space to the county, when the FWS notified the developer of its intention to list a particular butterfly species as endangered. The FWS's proposed critical habitat delineation was practically coextensive with the areas approved for development. When, after some political maneuvering, a protracted legal battle seemed inevitable, the various parties to the dispute met and decided to try to negotiate a settlement that would allow development and also provide sufficient habitat to ensure survival of the endangered species.

The formulation and ultimate approval by FWS of the plan turned on the results and validity of scientific studies of the target species. Although the methodology of the studies, which were paid for by the developers, was challenged in court, the challenge was rebuffed (Webster 1987).

Ultimately, although the rare butterflies remained the focus of the HCP, preservation of ecosystem integrity while allowing development became the real objective. The

plan preserves 80 percent of the mountain as open space, and 90 percent of the habitat of the rare butterflies is protected (Marsh and Thornton 1988). The plan goes beyond simply setting aside preserves, however, and provides for permanent conservation funding, and ongoing management of both public and private habitat. The funding would allow the county as land manager to stop the invasion of exotic plant species and also protect the area against off-road vehicles, two threats to the viability of the species that were not directly related to the impacts of the proposed development. The plan also specifies the limits of liability of landowners and developers for mitigation or compensation.

Since the San Bruno Mountain plan, several others have also been approved and many more are in preparation.⁶⁷ The presence of endangered species has forced several county governments in California to reconsider the issuance of development permits. Thornton (1990) quotes at length a letter from the FWS to a California city that proposed to zone property within the habitat of an endangered species; the letter warned of possible civil penalties against city officials of up to \$10,000 and up to one year imprisonment for violating Section 9 of the ESA. As a result of similar threats, local governments and developers in Riverside County, California, began in 1988 a process to develop a regional HCP for the Stephen's kangaroo rat. An interim HCP for the rat prohibited development on 79,000 acres. In December, the *Los Angeles Times* reported that during the conflict-ridden course of the HCP planning process, Riverside County had spent approximately \$10 million, of which half went to attorney's fees. Beatley (1992) reports that habitat acquisition for the Stephen's kangaroo rat may cost between \$50 million and \$250 million. Similar processes are occurring in other California localities and elsewhere. Thornton (1990, p. 51) notes that such jurisdiction-wide endangered species planning marks the first time in the history of the ESA that local governments have played a lead role in land use planning for species preservation. He points out (p. 51) that local governments bring to the task "a wealth of land use planning experience, the legal and political authority to impose fees and exactions on development to finance endangered species planning, and the regulatory ability to control development within the habitat of an endangered species pending the development of a conservation plan."

Beatley (1992) reports on another HCP in Riverside County, the Coachella Valley Habitat Conservation Plan. This plan, prepared for the Coachella Valley fringe-toed

⁶⁷ According to Butler (1993), there were 77 HCPs in process, with more than half in California.

lizard, was only the second HCP formally approved by the FWS and has been widely touted as a model for resolving development-conservation conflicts (Beatley 1992). As with most of the situations giving rise to Section 10(a) HCP planning, the proximate cause of species' jeopardy is urban development; specifically in the Coachella Valley case, the sprawl of greater Los Angeles. Although the lizard was listed as "threatened" by the U.S. FWS and as "endangered" by the State of California in the 1970s, with approximately 20 square miles of critical habitat designated, conflicts with urban growth did not develop until the 1980s.

Like the San Bruno Mountain case, a working group comprising most of the stakeholder groups was formed to develop an HCP whose key strategy was the establishment of one or more lizard preserves (Beatley 1992). The plan involved delineation of an area within which any development would be assessed a per-acre mitigation fee to pay for the preserves.

As Beatley describes it, the various local governments (there were ten involved, including Riverside County) that were party to the agreement were not particularly concerned about the fate of the lizard; rather, they were motivated to resolve what they saw as an obstacle to further growth and development. Like many local governments, they "could be characterized as pro-growth and pro-development, and the attitude was by and large one of either indifference or antagonism toward the lizard issue" (Beatley 1992, p. 11). Indeed, newspaper accounts from areas in which HCPs are being prepared are replete with stories of local landowners and politicians outraged over "putting animals above people." Ultimately, what support for the preserves eventually developed among local elected officials did so because of a desire to preserve some of the land for future generations, not to preserve the lizard. The system of preserves established by the HCP, when acquisition is complete, would set aside almost 17,000 acres, of which about 8,000 is lizard habitat. This preserved lizard habitat, however, is only about one-tenth of all the lizard habitat in Coachella Valley (Beatley 1992).

Beatley, in evaluating the results of the planning process, points out that the negotiated solution did have several advantages. First, it enabled the "marshalling of financial and political resources" to establish the preserve system, which might not have been possible any other way. Second, it provided a "once-and-for-all" fix for the developers, ensuring that they would not have to deal with a constantly changing regulatory environment. Most participants, too, saw the HCP as a win-win solution. However, there are problems. The scientific base for the HCP is scanty, and there is

no real assurance of long-term survival of the species. Long-term studies are needed, but the development community's operative time-frame is short. There are many uncertainties involved in the delineation of the preserves, as to whether the conditions for survival of the lizard can be assured. Moreover, there is little control over land uses on adjacent parcels, some of which may adversely affect the lizard. According to Beatley, the most serious obstacle to the effectiveness of HCPs may be the high cost of habitat conservation in urbanizing areas. The Coachella Valley HCP required \$25 million to set aside the habitat and implement the plan. With a fixed mitigation fee, as land prices rise the ratio of protected habitat to developed habitat will fall. There are also questions about who should pay for the plan. Although the federal government contributed a considerable proportion, it cannot be expected to do so for every endangered species. Ultimately, says Beatley, the Coachella Valley HCP, held up as a model for resolving development-biodiversity conflicts, raises grave questions about whether endangered species preservation can possibly succeed. Webster (1987), in his review of the San Bruno Mountain and North Key Largo HCPs, is also skeptical over the prospects for HCPs to meet the substantive conservation goals of the ESA. He cites the willingness of FWS in the North Key Largo case to defer the designation of critical habitat during the HCP planning process as an example of a desire for a politically acceptable solution overriding the requirements of the ESA and of sound biological science. Moreover, he says (p. 268), in considering alternatives to the proposed action (part of the Section 10(a) process), "HCPs too quickly dismiss the 'no action' alternative as leading to a steady worsening of the status of the endangered species. Implicit in the rejection of the 'no action' alternative is the assumption that the FWS will not enforce the prohibitions against taking." Also implicit in this rejection is the expenditure of large sums by the federal government for additional affirmative conservation measures, which according to Webster the FWS, accustomed to meager budgets, does not consider realistic.

HCPs (and, for that matter, the ESA) attempt to implement a safe minimum standard (SMS) strategy toward biodiversity. One may criticize the effectiveness of the process and its results, but in principle at least, that is what HCPs represent. The SMS decision criterion was proposed by Ciriacy-Wantrup (1968); under this strategy, a resource, such as a critical habitat area, species, or natural community, is presumed to be worth preserving unless the costs of doing so are prohibitively high. Although in the ESA Congress originally declined to take economic costs into account in making species preservation decisions, in practice -- that is, in the real world of limited resources both political and economic -- if the costs are "too high" the habitat will be taken. According to Randall (1987, p. 414), while "the SMS decision criterion is

clearly incomplete, ...it is useful in that it draws attention to the huge and often unquantifiable uncertainties in irreversible change and to the desirability of a risk-averse decision strategy when considering such changes.” It is a strategy that is risk-averse, but not risk-free: there is no *ex ante* way to know if the value placed on species preservation will turn out to have been high enough to prevent ecological catastrophe, or even as high as future generations would place on them.⁶⁸ The safe minimum standard says little about the intragenerational distribution of costs.

In the reported cases, a substantial portion of the money necessary to pay for scientific studies, habitat delineation, and habitat preservation is paid by the developer. One frequently advocated strategy for implementing sustainable development is that of “getting the prices right” so that development pays its full social and environmental costs. Although these costs can never be calculated in advance, and perhaps can never be represented in dollar terms, the HCPs reported do at least represent a move in the right direction (that is, in the direction of protecting biodiversity).

The HCP process, in brief, attempts to implement one conventional approach to sustainable development, development with ecological sustainability. This approach can be placed within Colby’s (1991) framework as belonging to the Resource Management paradigm, although (like most practice) it does not fit neatly into a theoretical box. Although it is driven by a law -- the ESA -- that expresses values that might be termed biocentric (and thus compatible with Deep Ecology, again in Colby’s scheme), the process does not involve any fundamental values change on the part of its participants. Rather, the development community tends to see the need to preserve habitat as a constraint (the Environmental Protection paradigm), while the environmentalists involved would likely be pleased to see development, manifested as sprawling urbanization, halted altogether. Too, were it not for the threat of civil action by the federal government, local governments and developers might not be inclined to undertake the arduous and expensive task of designating and developing financial mechanisms for management of wildlife habitat, although there are other reasons for wishing to preserve open space (which will be explored in the section on growth management). This seems to confirm a general hypothesis that, in the absence of value change, attempts to achieve ecological sustainability will depend upon increasingly pervasive controls and limitations.

⁶⁸ Just as no strategy for sustainable development can be risk-free, since sustainability can only be ascertained in retrospect.

The ESA is pushing local governments in some rapidly-developing, rare species-rich areas, toward landscape- or regional-scale planning for biodiversity. Thus HCPs are becoming increasingly important in planning for sustainable land use on a landscape or regional scale, particularly in rapidly urbanizing areas. Landscape- and regional-level planning to manage ecosystems in which the human presence is entrenched and pervasive has been undertaken in several areas in the U.S. before the advent of HCPs, but the focus was on preservation of a large-scale ecosystem or valued natural area that is, however, not in state or federal ownership. Several cases that exemplify this approach are described in the next section.

Regional Land Use Planning for Sustainability

Opportunities for the preservation of large-scale ecosystems in the U.S. are rapidly diminishing. In the relatively undisturbed areas that still exist, management problems abound, even when present human impacts can be controlled. Preserves by definition can only accommodate a modicum of development. Preservation can only be considered a sustainable development strategy if sustainability is defined as ecological sustainability. Even then the argument is tenuous, given the ambiguities inherent in the concept of an ecosystem.

Habitat conservation plans prepared to satisfy the requirements of the Endangered Species Act in the face of urbanization and development are practical planning efforts to reconcile one of the requirements of ecological sustainability -- preservation of biological diversity -- by in effect drawing boundaries based upon biological (but also, in practice, economic and political) criteria and excluding development from habitat. However, from a larger, landscape- or regional-level perspective, what appears as compartmentalization at a smaller scale can become a patchwork, a mosaic of the developed and the undisturbed.

It is questionable whether such a mosaic can be ecologically sustainable -- can allow enough of the functional elements of the existing ecosystem to remain unimpaired that their relationships can continue and thrive -- while also allowing a process of development to continue. This question will not be answerable for decades, if at all (since sustainability can only be known for certain *ex post facto*). There are, however, a number of large-scale, regional land use planning efforts underway across the country that aim to protect and preserve either unique ecosystems, or areas valued for aesthetic, cultural, recreational, cultural, and other reasons. The Adirondacks,

coastal regions, and a number of watersheds and other “special areas” around the country are all examples of a kind of regional scale, inter- or multijurisdictional planning efforts. In this section I examine two cases that have been prototypes for this type of planning and continue to serve as models: the New Jersey Pinelands and the Lake Tahoe watershed.

These cases represent attempts to manage large areas in which there is considerable private ownership of land as well as long-standing human habitation and/or resource extraction. The planning efforts in the New Jersey Pinelands and the Lake Tahoe watershed are driven by the desire to preserve some aspect of the natural landscape or ecosystem. In the former case it is the combination of a unique bioregion or “ecoregion” and a distinctive regional culture; in the latter, a uniquely and stunningly scenic watershed surrounding a lake of legendary clarity.⁶⁹ In each, landownership and existing settlement patterns (as well as politics and historical contingency) required that development be accommodated while preservation was pursued. Thus, “ecological sustainability with development” (Brookfield 1991) becomes the goal.

The New Jersey Pinelands Reserve

The New Jersey Pinelands is the largest sparsely settled area in the mid-Atlantic megalopolis that stretches roughly from Boston to Norfolk. The Pinelands, or Pine Barrens, comprises roughly one million acres of forests and wetlands. According to the New Jersey Pinelands Commission (NJPC 1989a), the Pinelands is home to 54 threatened plant and 39 threatened animal species, is underlain by a largely unpolluted aquifer system of about 17 trillion gallons, and supports about a half-million year-round residents in seven counties and 56 municipalities.

The Pinelands is an ecologically unique landscape, a patchwork of uplands, wetlands, and aquatic environments supporting a rich variety of plants and animals. Frequent fires in some areas have resulted in unusual pygmy forests dominated by pitch pines and scrub oaks. Soils are sandy and porous, so that infiltration of precipitation is high and nutrient content low. Water tables are very high in many areas and because of

⁶⁹ The U.S. Environmental Protection Agency (EPA) defines ecoregion as an area or region “of relative homogeneity in ecological systems that are delineated according to the spatial distributions of environmental factors, such as soil type, vegetation, climate, geology, and physiography.” (U.S. EPA 1993).

the high hydraulic conductivity of the sandy, porous soils, groundwater is highly vulnerable to contamination. Such conditions are not favorable to onsite septic systems or certain types of industry. Of greater significance is the dependence of many Pinelands ecosystems on the high water table. While several nearby urban jurisdictions have made no secret of coveting the very pure, abundant water available in the Pinelands' two major aquifers, major withdrawals could lower the water table sufficiently to disrupt not only natural ecosystems but also certain economic operations such as cranberry farming. Thus Pinelands preservation supporters are put in the position of advocating land use measures to protect a groundwater resource which, though celebrated for its purity and extent cannot be put to use except locally. Mason (1992, p. 52) points out that "[m]any of the Pines' contemporary resource conflicts are defined by geology and hydrogeology."

The Pinelands is by no means a pristine natural landscape. One-third of the vascular flora is introduced (Forman 1979), and the land bears testament to three centuries of human uses. Iron and glass manufacturing thrived in the nineteenth century, and although not a major industry now, timbering at one time was practiced extensively. Many bogs and wetlands in favorable locations were developed as cranberry and blueberry plantations and berrying is still an economically viable business. There is some conventional farming in the western part of the Pinelands.

Although both the iron and glass industries brought population to the region, neither they nor any of the other industries was sufficient to attract or support large numbers of people, which accounts in part for the sparsely populated and largely undeveloped character of the region. However, the proximity of the megalopolis, the development of casino gambling in nearby Atlantic City, and the popularity of the area as a location for retirement communities has brought significant residential development pressure to bear upon the Pinelands. As Good and Good (1984, p. 170) put it, as development pressures mounted "it became increasingly apparent that the Pinelands would not continue to exist as a functional ecological unit indefinitely without a regional plan" to balance these housing needs with the ecological preservation of the Pinelands. The history of development in the Pinelands (or anywhere else) gives no reason to think that, without intervention, a viable, functioning regional ecosystem would be preserved.

The Pinelands has been the object of an extraordinary intergovernmental planning effort over the past twenty years. It has been described as a model for regional planning in several respects. Lillieholm and Romm (1992) and Mason (1992) have

contrasted the “Pinelands model” with several other large-scale or regional planning efforts on the United States that rely on ownership and management of land by one level of government (like the Greater Yellowstone Ecosystem and the Redwood National Park). Collins and Russell (1988, xv) call the Pinelands National Reserve “the first federal attempt to protect a sizable area outside the national park system.” The Pinelands National Reserve was also identified as an outstanding natural area when it was included as part of UNESCO’s International Network of Biosphere Reserves under its Man and Biosphere Program in 1983. Mason (1992) sees the Pinelands planning effort as, among other things, an outstanding example of greenline planning, which he defines as “an intergovernmental planning partnership that relies on a variety of land-management techniques to protect a regional landscape” (p. 16). Finally, the NJPC itself (New Jersey Pinelands Commission 1991) describes the Pinelands Comprehensive Management Plan (CMP) as “a model for environmental protection efforts throughout the nation.”

The New Jersey Pinelands was originally defined as a region on the basis of its unique assemblage of plants and its very poor, sandy soils, which were first studied and delineated by naturalists in the early decades of this century. As scientific interest in the Pinelands’ flora and fauna grew, so too did the population of New Jersey and the New York to Philadelphia metropolitan area, which in the decades after World War II sprawled across New Jersey. Recognizing the need for facilities for outdoor recreation for this burgeoning and increasingly leisured and mobile population, the State of New Jersey purchased, in 1955, 100,000 acres in the central Pine Barrens, which then became Wharton State Forest. Increased recreational use helped to establish a growing statewide and regional constituency for Pinelands preservation. Several groups of environmentalists, such as the Pine Barren Conservationists, the Ocean Nature and Conservation Society, and the New Jersey Audubon Society, also worked hard to promote preservation efforts.

Local governments in the Pinelands were anything but preservation-minded, however, and in the mid-1950s, Burlington County officials were promoting the Pine Barrens as an ideal site for a jetport facility that would serve the New York - Philadelphia area (at that time, jet passenger aircraft needed extraordinarily long runways). A few years later, in 1959, the New York - New Jersey Port Authority eyed the Pine Barrens as a possible jetport site. Local elected officials in Burlington and Ocean counties created the Pinelands Regional Planning Board to promote comprehensive planning for the development of the Pinelands, with a 32,500-acre jetport (the largest in the world!) as its centerpiece (Collins, 1988a). That the first attempt at regional planning

in the Pinelands would be directed toward massive development of much of the land area, with little attention to existing natural features. provides an ironic counterpoint to the comprehensive management plan (CMP) that was, only 16 years later, to be adopted.

In the meantime, however, the struggle over the jetport continued for a decade, and ended only when the FAA and the Port Authority judged the site unsuitable. As it was, the threat of this major land conversion in the Pinelands, which would have obliterated much of Lebanon State Forest, provoked an increasingly vocal opposition that was able to interest the National Park Service in preserving some part of the Pine Barrens.

The federal government, in the persons of several congressmen as well as the Department of the Interior, began to consider how the values associated with the Pinelands as a unique place -- scientific, ecological, aesthetic, recreational, and cultural⁷⁰ -- could be preserved in the face of considerable development pressure. For both financial and political reasons, outright purchase and ownership by the federal government was never considered. Rather, several approaches were proposed through legislation that combined land acquisition and regulatory control over private uses, the difference being primarily in the amount of local control allowed (Russell 1988).

What finally passed the federal legislative process was a bill (Section 502 of the National Parks and Recreation Act of 1978) that established the Pinelands National Reserve along the lines of the "greenline" concept. The greenline strategy involves drawing a boundary around an area that includes both public and private land, as well as significant human activities, and then applying special management to that area through legislation and the creation of a regional body to administer its directives. Greenline proponents (e.g., Corbett 1983) celebrate the mix of public and private and the cooperative endeavors among federal, state and local entities that greenline planning supposedly encourages.

The greenline concept had been previously applied to the Adirondack Park in New York and was originally proposed (and the term coined) by Charles E. Little of the

⁷⁰ Mason (1992), addressing the question of whether the Pinelands can be defined as in any sense a culturally coherent region, concludes that such claims are hardly justified. Economically and culturally, the Pinelands is better considered in terms of subregions.

Congressional Research Service during legislative hearings for protection of the Santa Monica Mountains in California (Russell 1988). As proposed, the strategy aimed to preserve recreational landscapes near urban areas (Carol 1987). Mason (1992, p. 17) contends that in practice much greenline planning “is afflicted with a confusion of goals [whereby] the preservation of open space and scenery -- basically aesthetic concerns -- are transformed into ecological imperatives.”

In the Pinelands case, the federal legislation gave the state government the lead in resource evaluation and planning, while the federal role was primarily one of providing money for land acquisition. The state passed the Pinelands Protection Act in 1979 to implement the federal act by establishing boundaries for the region (the boundaries were not exactly the same as those in the federal legislation) and creating the New Jersey Pinelands Commission to prepare and implement a comprehensive management plan (the CMP). The New Jersey Pinelands Commission consisted of state and local appointees and a federal representative. Local jurisdictions participated in the design of the planning process initiated by the Commission through their representatives on the Commission. The local role in developing the CMP was in many cases (though not all) one of resistance and grudging cooperation. As Russell (1988) points out, “local” was an ambiguous concept in this context, with both local developers and speculators and their elected allies as well as environmentalists claiming to represent the local interest. The local role in plan implementation is an important one. Essentially, municipalities are to develop ordinances, regulations and procedures to implement the CMP. There is a process of certification by the NJPC of municipalities’ programs. Municipalities with certified ordinances assume responsibility for reviewing development proposals and making permitting decisions under NJPC oversight. In uncertified municipalities, the NJPC makes development review and permitting decisions. There is a waiver process to grant exemptions in hardship cases or where a compelling public need overrides strict compliance (NJPC 1980, Subchapter 4, Sect. 7:50-4 *et seq.*)

During the development of the CMP, the Pinelands Commission sought input from local publics and local governments. Local cooperation was crucial, since the plan would be implemented through the zoning authorities of local governments. Mason (1992), examining the politics of Pinelands protection in three different Pinelands communities, argues strongly that subregional social and political diversity must be taken into account in understanding the development and implementation of the CMP. He found that some local interests, in particular local elites in certain jurisdictions, were able not only to force the Pinelands Commission to accommodate them, but

were actually beneficiaries of the planning process. "Powerful local interests adapted well to regional planning, in the process bending the Pinelands plan a little bit, and forcing the external interests represented by that plan [federal, state, and regional interests] to adapt to local concerns" (Mason 1992, p. 152). Other groups and localities were less successful in asserting their interests or were more supportive of environmental protection.

The Comprehensive Management Plan

The CMP (NJPC 1980, Sect. 7:50-5.12 *et seq.*) divided the Pinelands Reserve into eight "land capability areas," with preservation areas and protection areas being the primary distinction. Spatially, the plan roughly follows the core-buffer layout typical of biosphere reserves (Batisse 1985), in which a central protected area (the core, or in the Pinelands case, the Preservation Area) is surrounded by one or more buffer zones in which some productive land uses are allowed if they are compatible with the ecological preservation goals of the reserve. The core-buffer strategy attempts to balance preservation with some accommodation of the local communities that have historically used the reserve area.

The Pinelands Preservation Area is 337,000 acres that includes the pristine Pine Barrens rivers as well as the pygmy forests and numerous wetlands. Within this district most development is prohibited, with the exception of some forestry, berry and native plant cultivation, and recreational facility operation permitted in certain designated areas (e.g., agricultural production areas). No new residential development is allowed in the Preservation Area District, with a few exceptions for long-standing residents and their families. Strict controls are also imposed upon some existing settlements and developments within the Preservation Area, including a number of traditional Pinelands villages and several military installations.

In the Pinelands Preservation Area, according to the NJPC (1989b), there was considerable agreement that any significant new development would be unwise, so the Commission's task was relatively simple. In the Pinelands Protection Area, the New Jersey Pinelands Protection Act called for encouraging development in and around already developed areas, and discouraging sprawl and scattershot development. Sub-districts were defined in the Protection Area according to existing predominant land uses, which were essentially to be accorded protected status. These included forest areas, agricultural production areas, regional growth areas, and rural development areas. New residential, commercial, and industrial development was to be

discouraged within the forest and agricultural areas and channeled into the regional growth areas. Modest development is allowed within the rural development areas, and municipalities are given more flexibility to determine the location and character of the development than in the forest and agricultural areas. The NJPC (1989b, p. 7) describes these rural development areas, which comprise 145,000 acres, as “transitional zones” and “safety valves” that will absorb development that the adjacent growth areas can no longer accommodate.

The channeling of new development to the regional growth areas is accomplished by means of a system of transferrable development rights, the Pinelands Development Credit Program (NJPC 1980, Sect. 7:50-5.41 *et seq.*). The NJPC allocates on request Pinelands Development Credits (PDCs) to landowners whose land lies in the Preservation Area; these credits can then be purchased by developers in the growth areas in order to increase their allowable density. The number of credits that a landowner can be allocated varies according to the zone in which the land lies and the environmental characteristics of the land. After credits are sold, a deed restriction that permanently extinguishes certain use rights is applied to the property. Credit holders may then sell the PDCs themselves or sell them to either of two institutions established for that purpose. Assessments of the PDC program have been mixed. Mason (1992) sees the PDC program as being of limited effectiveness in promoting inter- and intraregional equity, but relatively effective in channeling growth to designated receiving areas. Carol (1987) questions whether the greater densities permitted by credit purchases will overwhelm the designated growth areas' service capabilities and result in inappropriate or undesirable development in those areas.

Although the CMP regulates nearly all land disturbing activities in its jurisdiction, there are provisions for exemptions. As is the case with nearly all restrictive zoning measures, the CMP provides for a significant number of “grandfathered” uses. For example, in the Forest, Agricultural Production, and Rural Development areas, exemptions from density limitations for those areas were granted for new home construction for one year or longer (depending on the municipality) to owners of one acre or greater lots. A more controversial exemption is that referred to as the “Piney exemption” or sociocultural exemption. This allows a person who can demonstrate longstanding cultural, social, or economic ties to the Pinelands to build, for their own use, a home on 3.2 acres in the more restricted areas -- even within the Preservation Area (Collins and Russell 1988).

The Pinelands CMP sets performance standards for development that are to be met (again, through incorporation in local ordinances) no matter what the management area. There are strict water quality standards for all potentially polluting activities except agriculture. Maximum nitrogen levels for groundwater at the lot line for residential development without connection to central sewer systems are set at 2 ppm., a level that is in many cases the limiting factor for lot size (no standard residential septic system may be located on a parcel of less than 3.2 acres (Collins and Russell 1988b)). Guidelines for wetlands identification are detailed, and activities within wetlands areas are tightly regulated. Other standards apply to protection of vegetation and fish and wildlife (NJPC 1980, Subchapter 6, Parts 2 and 3); the conduct of forestry and agricultural operations (Parts 4 and 5); resource extraction; air quality; waste management; historic, cultural, and archaeological resource preservation; fire management; and scenic resources (“to ensure that development will take advantage of and enhance the visual character of the Pinelands” -- Part X, Sect. 7:50-6.101).

Assessments of the Pinelands Reserve

After more than a decade of implementation of its CMP, the Pinelands Reserve program appears to be well established and highly regarded, at least by planners (e.g., Steiner 1986). The NJPC reported that in the CMP’s first ten years of implementation, 25,872 new homes were approved for construction in the Pinelands; only 74 were to be built in the Preservation Area District (NJPC 1991a). All but one of the 43 landfills operating in the Pinelands in 1981 had shut down by 1991 in compliance with the CMP regulations (NJPC 1991a).

As early as 1984, one assessment held that the fact “the commission was able to adopt a plan that is truly comprehensive in the short period of time allotted by the enabling legislation is remarkable. Equally remarkable is that the commission has encountered little resistance from local governments” (Rielley and others 1984, p. 148). Collins (1988c, p. 275) offers a somewhat less optimistic perspective on the local reception of the plan: “there was initially a great deal of local hostility both to the reserve concept in general and to the Comprehensive Management Plan in particular.”

More recently, Lilieholm and Romm (1992, p. 340) assert that “[e]nvironmental and development groups, involved parties, landowners, and agencies generally agree that the commission has successfully balanced the various interests in the area, protecting the region without placing excessive burdens on any particular groups.

County and local planning boards have complied with the CMP to a degree that surpasses all previous regional planning efforts in the United States, and the plan has successfully channeled development away from environmentally sensitive areas.” Collins (1988c) would agree with the latter point, but in general is more cautious in his optimism concerning the success of the program. Both he and Mason (1992) point out that some of the growth receiving areas had neither the infrastructure nor the financial resources to provide the infrastructure to service the growth. Although the state legislature in 1985 took measures to correct the problem, some environmentalists now worry that the provision of low-cost infrastructure financing may stimulate growth (Collins 1988c). Collins points out too that development review standards have been lax in the 221,000 acres of the Pinelands outside the jurisdiction of the NJPC but inside the Pinelands National Reserve.

The Commission’s efforts to protect living cultural resources have been the object of considerable criticism. Not all of the CMP’s standards are connected to ecological preservation, and the more tenuous their connection to that purpose, the more they are open to criticism as being an unnecessary intrusion or usurpation of people’s right to choose their lives.⁷¹ Mason (1992, p. 102) is critical of the CMP’s standards for vegetation, signage, and mandatory undergrounding of utilities; their “bases are purely aesthetic.” The commission has been accused of applying elitist aesthetic standards as well (Berger and Sinton 1985, cited in Collins (1988c); Mason (1992)).

The CMP has not resulted in significant aggregate economic hardship. Its impacts have been mixed. New housing construction declined in the Pinelands relative to the rest of the state. Agriculture has remained viable. This is not surprising in view of the fact that agriculture was exempted from many of the CMP’s performance standards and that many of the CMP’s provisions were designed to protect farming as a way of life from the effects of land speculation. Nonetheless, the farm bloc has complained of declines in the value of their land, which adversely affects their credit. The tax base of some communities was eroded slightly, but the state legislature provided compensation. Average residential property tax rates in Pinelands municipalities rose between 1972 and 1984, but less than for the state as a whole; thus the effect of the CMP on residential taxes was not significant (Conant and Pizor 1988).

⁷¹ Mason (1992, p. 102) reports that in a 1979 report of the Governor’s Pinelands Review Committee, incentives for low-tech, “ecotopian” lifestyles were seriously contemplated. “In this ecotopian Pinelands, one would have found energy-efficient homes, ‘sonic clothes washing,’ and industrial activities limited to such pursuits as weaving, potting, and woodworking.”

Despite its relatively mild aggregate economic impacts, despite state compensation programs for affected localities, despite the transfer of development rights program, the CMP by all accounts has resulted in inequities. Individual landowners have continued to complain about restriction on their use of their property, leading Collins (1988c, p. 288) to conclude that “the equity (or justice) issue has not been squarely faced in the Pinelands where the benefits of protection are enjoyed by many who do not as yet share the costs.”

Mason (1992) is concerned with the inequitable effects of the CMP both within the Pinelands and between the Pinelands and the urban megalopolis. He argues that the Pinelands as a region to be protected and preserved is an artifact of the urban expansion nearby (p. 190):

[t]he restructuring of space to satisfy urban needs and desires defines -- in fact “creates” -- places like the Pinelands. ...What was formerly a lot of pine trees is now seen as a largely unspoiled, though threatened, wilderness -- this despite the fact that the Pines have been thoroughly exploited for their resources for three centuries.

This is consistent with the notion of the necessity of hinterlands to sustainability of metropolitan areas; in this case the hinterland is not for resource extraction or waste disposal (Philadelphia’s solid wastes and sewage sludge, for example, travel considerably further than the Pinelands), but rather for recreation and aesthetic enjoyment. Mason argues that the metropolitan interests that have predominated in the Pinelands planning process have reaped most of the benefits, while the costs have been borne by those within the Pinelands. He is particularly critical of the loss of local control and self-determination to the state and federal governments, particularly insofar as the extra-regional interests attempt to “museumize” (i.e., freeze into a particular pattern and lifestyle) the residents of the Pinelands. Even in Mason’s rather critical, localist-oriented account, however, it is admitted that the question of equity is a very complex one. Some Pinelands residents, in particular certain local elites, have benefitted handsomely from the CMP’s regulations.

In terms of its near- and middle-term prospects, the Pinelands Reserve’s greatest threat by several accounts (Mason 1992, Collins 1988c) comes from the prospect of large water withdrawals from its aquifers to serve surrounding metropolitan areas, some of whose water supplies are contaminated. The pressure of population growth in the megalopolis in which the Pinelands is situated makes inevitable future conflict not only over the Pinelands’ water, but also its land. The development potential built into the CMP, though ample in the near term, is ultimately finite. Although there may

be no limits in the conceptual space of some economic thinking, in a particular region the limits to the development it can accommodate and still preserve certain landscape and ecological values are only too real. How these limits are dealt with when they are reached will depend upon unforeseeably changing attitudes, politics, and the unpredictable course of events. Although it is widely cited as a model for large-scale environmentally-oriented land use planning, as a model of sustainable development it is flawed, since it merely puts off the inevitable collision with regional population growth.

Controlling Growth at Lake Tahoe

The history of planning for environmental quality at Lake Tahoe is a history of conflict, of struggles for control between two states, between local communities and larger interests, between preservationists and growth-minded developers and businesses. It has been above all a struggle over the type and amount of development that would be allowed in the basin, but this overarching conflict was manifested in one arena after another: state legislatures, the Congress, various interstate and regional bodies, and government agencies responsible for transportation; utilities; air quality; water quality; recreation; national forest management; and county, city, and regional planning. In terms of the contemporary sustainable development discourse, the issues raised by Lake Tahoe are about the carrying capacity of an area, but carrying capacity is not defined (as in biology or wildlife management) in terms of the basic necessities of biological life: food, water, energy. Although it is sometimes couched in terms of ecology (e.g., Goldman 1989: "Preserving a fragile ecosystem"), what is really at issue is arguably aesthetic, not ecological, and to the extent that the tourist trade (which is the basis of the area's economy) is based upon aesthetics, it is economic as well.

Although the object of preservation may not be specified in exactly the same way, there are certainly interesting parallels to the usual terms of the sustainability debate, which takes as its central problematic the undermining of the ecological/environmental (and in some accounts social and moral) bases of economic production by economic activity. One observer of the Lake Tahoe basin, limnologist Charles Goldman, has stated that "Tahoe represents in microcosm the environmental problems of the 20th century, both on a national and international basis." (U.S. Congress 1972, quoted in Strong 1984, p. xiv). And the sources of the environmental problems at Lake Tahoe are the same as that of many of the problems

that raise the issue of sustainability globally: urbanization, population increase, and energy use. Because of the conceptual parallels with the global situation as described by some sustainable development theorists, it is not surprising that the concept of carrying capacity has been central to environmental planning in the Tahoe basin, as will be described in a later section.

At Tahoe, the very success of the industry that has grown up to profit from Tahoe's unparalleled scenery and clear water is in danger of undermining its own base. The views and vistas afforded by the clear mountain air are increasingly blocked by signs and buildings, or obscured by air pollution trapped in the basin by inversions. Although the San Francisco Bay and Sacramento metropolitan areas to the west contribute some of the airborne pollutants, most is from the cars that increasingly jam the Tahoe basin's roads. The famous clarity of the lake has declined annually since large-scale urban development in the basin began in the mid-1950s.

Casting the struggles over growth and its control in terms of an effort to save an ecosystem is, as I argued above, somewhat misleading. Although the water quality changes that affect the lake do comprise a process of eutrophication, such that algal growth has increased considerably over the past 35 years, the integrity of the aquatic ecosystem *per se* is probably not important to most people who visit the Lake. The native fisheries were important economically only briefly, in the late nineteenth century; since then populations have remained low (Strong 1984), although a number of introduced species thrive.

The Lake Tahoe basin has seen two major anthropogenic environmental disruptions in the 150 years since its discovery by whites. Between 1870 and 1900, the basin was extensively logged to supply timber and fuelwood for the nearby mining operations in Virginia City, Nevada. The second event was the post-World War II boom in population and construction at the lake. The number of residences in the Tahoe basin has grown exponentially since about 1960 (Goldman and Byron 1986), from less than one thousand to 19,000 in 1980. The TRPA reported in 1991 that there were 24,500 single-family homes, 14,100 multifamily units, 12,000 "tourist accommodation units," and 2,000 campground units in the basin (TRPA 1991), so it appears that the exponential growth of residential development continued during the 1980s.

The number of permanent residents was less than 3,000 in 1956, 12,262 in 1960, and twice that in 1970. By 1980 it had doubled again, to almost 50,000; that year, the average summer day had over 90,000 people in the basin, with a seasonal peak esti-

mated at over 200,000 (figures from various sources cited in Ingram and Sabatier 1987). According to lake bottom sediment core sample studies, the deforestation of much of the basin contributed very little to the eutrophication of the lake in comparison with the dramatically increased human presence of the postwar period (Goldman and Byron 1986). The increases in population and activity in the basin occurred in spite of a scrutiny of their environmental effects probably unsurpassed in any other region (Gilliland and Clark 1981), and in the face of repeated efforts by a multitude of public institutions and private organizations to slow the influx.⁷² The 1990 resident population, however, was 51,775, according to the TRPA (figure from Brenda Mahern of TRPA (May 7, 1993), based on 1990 Census data). This represents a significant decline in the rate of increase of population increase, no doubt in part because of the increasingly stringent controls placed upon new development, particularly residential development.

Scientific evidence of environmental degradation at Tahoe

The intense scrutiny of environmental impacts and the unusual efforts to control growth evident in the Tahoe Basin are not unrelated. Although originally based on aesthetic concerns, recent growth management efforts in the Tahoe basin have been based upon, legitimized by, and expressed in terms of scientific evidence. The unusual level of scientific scrutiny of the watershed, of the biological and physical systems operating within it, and of the impacts of development may be attributed to three factors: the unsurpassed quality of the resource; the federal interest in the process (which provided not only technical and financial resources but also the NEPA process); and the intensity of the conflict between the pro-growth and preservationist factions at Lake Tahoe.

The water quality of the lake has been the center of most of the attention of scientists and bureaucrats. However, as those concerned with the quality of the nation's waters are continually rediscovering, the water quality of a receiving body of water cannot be understood in isolation. Lake Tahoe receives sediment and nutrients from a number of streams, the atmosphere, and groundwater; levels of sediment and nutrients in these tributary waters are in turn related to land use. Thus land use management in the Tahoe basin has been largely driven by water quality considerations.

⁷² The Tahoe Regional Planning Agency, in a partial listing, names 33 cooperating federal, state, local, and regional government agencies (TRPA 1991).

The first measurements of the transparency of the Lake's waters were made by LeConte in 1873 (Goldman 1988). Intensive limnological studies of the lake, funded by the National Science Foundation, were begun in 1959, during the early years of rapid urbanization. A major limnological study was conducted as part of the planning for a wastewater disposal system (McGauhey and others 1963). Numerous additional studies made since have described in considerable detail over several decades a process of eutrophication in Lake Tahoe caused by human activity in the past four decades (these studies are reviewed in Goldman (1988) and summarized in Goldman and Byron (1986)). Because of the availability of data from well-designed studies conducted over a long period, the scientific conclusions have been sufficiently robust to withstand the scrutiny and criticism that is an inescapable part of planning and policy-making in a contentious area.

The limnological studies have established two disturbing trends. One is a steady increase in the rate of growth of algae in the lake since the late 1950s. The second, and correlary trend, is that the transparency of the lake is steadily declining as increasing populations of algae cloud the waters. The growth of algae has been spatially related to parts of the lake closest to areas of development, and is associated with increased nutrient inputs to the lake.

Nutrient inputs to the lake are increased by a variety of mechanisms (Goldman and Byron 1986). Phosphorus and trace metals have been found in algae-stimulating quantities in sediment entering through streamflow. Increased stream sediment loads are caused in turn in the Tahoe basin by a variety of soil-disturbing activities, including construction, road cuts, unpaved road surfaces, grazing, off-road vehicle damage, and channel erosion due to higher flows induced by deforestation and impervious surfaces. Atmospheric deposition is another significant source of nutrients, which enter the lake through streamwater, groundwater, and direct deposition on the lake surface. Removal of vegetation in watersheds in the Tahoe basin allows nutrients which would otherwise be taken up by plants to be flushed directly into the lake, and even accelerates the release of nutrients from soils in the watershed. In most of the watersheds studied (Goldman and Byron 1986), phosphorus was carried with sediment from soil erosion and nitrogen was supplied by atmospheric deposition. Direct atmospheric deposition measured at different points on the lake surface over time showed a clear correlation with urban development and areas of traffic congestion. Thus the most important sources of airborne nutrients to the lake are within the basin.

The Tahoe basin environment is the object of an intensive monitoring program in which a number of agencies participate. There are nearly 30 permanent water quality monitoring sites and five air quality monitoring sites which cost approximately one million dollars per year (TRPA 1991, p. 10). In addition to this monitoring network, there are numerous ongoing studies of various aspects of the environment. In 1981, Gilliland and Clark (1981, p. 397) wrote that "the Lake Tahoe Basin has probably been studied more than any other single area of the U.S.," and this probably is still the case.

Sources and nature of development in the Tahoe basin

The first movements toward regional controls over land use and land development in the Tahoe basin came well before scientific studies had established the decline of the lake's water quality and pinpointed its causes. As the pace of urbanization and population increase in the basin quickened, the contrast between the natural beauty of the lake and its surrounding mountains and the tacky, haphazard development typical of the period (Strong 1984) was jarring to many permanent residents and longtime visitors. However, there were many in the basin who benefitted from the enhanced land values, commercial and employment opportunities, and increased tax revenues offered by development. This latter point was of particular interest to officials of the local governments in whose jurisdiction the basin lay.

Much of the development was specifically aimed at serving tourists who had come to enjoy the lake's attractions. However, as urbanization intensified and a commercial constituency formed in the early 1960s, a number of industries were introduced and indeed encouraged that arguably could just as well have located elsewhere. Perhaps the most egregious intrusion into the basin in the eyes of Tahoe preservationists was the casino gambling trade that was established on the Nevada side of the basin, and that contributed significantly to the service employment base in the Tahoe region.

Ingram and Sabatier (1987, pp. 10-11) cite events that occurred prior to the mid-1960s that account in their view for the explosive economic and population growth in the Tahoe basin in that decade and since. World War II exposed numerous troops passing through the basin to its scenic charms. Several new highways and an airport were built, the gambling industry expanded, snow removal became more effective, and the 1960 Winter Olympics were held nearby. To this list one might add several trends on a national level that have generally fueled the postwar boom in this country.

First, the general increase in affluence and consumerism that is reflected in increased demands for second homes and recreation in general. Second, the baby boom, which has increased the pool of potential visitors to the Tahoe basin. Finally, the great expansion in automobility that followed World War II (Flink 1975), which put Lake Tahoe within easy reach of an enormous number of people.

Beginnings of attempt to control growth: The rapid urbanization of the Lake Tahoe environs was unwelcome to many of those who had grown to love the lake as it had been. As early as 1913, citizens had formed a preservationist organization (the Lake Tahoe Protective Association), and later the Max Fleischman Foundation laid a foundation for later growth-control efforts through the Lake Tahoe Area Council's funded studies (Ingram and Sabatier 1987). As the pace of growth exploded, however, many saw a need for a more activist organization. The League to Save Lake Tahoe (LTSLT) was founded in 1957 to fill this need, and it remains by all accounts the most politically potent and influential of the preservationist nongovernmental organizations focusing on Lake Tahoe. The League, which has over 3,000 members, is dedicated to "preserving the environmental balance, scenic beauty and recreational opportunities of the Tahoe Basin" (LTSLT 1992). It has long pushed for more stringent controls on development and more effective regional planning.

The League has traditionally occupied one end of the range of values regarding development and its control in the Tahoe basin. At the other extreme are the various business organizations and property owners, who tend to believe strongly in the role of the market in optimizing development, in a leading role for local government, and in the ascendancy of property rights over public values. Such organizations include the local Chambers of Commerce, in particular the South Lake Tahoe Chamber of Commerce, and a number of *ad hoc* committees and groups. Perhaps the most important of the nongovernmental organizations representing the development interests is the inaptly-named Tahoe-Sierra Preservation Council. The Council was organized in 1980 to protect the rights of private property owners in the face of increasingly stringent development controls. Its primary function, according to Ingram and Sabatier (1987, p. 51), has been to "intervene on behalf of private landowners before the TRPA [Tahoe Regional Planning Agency], the California SWRCB [State Water Resources Control Board], and the Lahontan [Regional Water Quality Control] Board."

The Council has also filed a number of lawsuits challenging various land use policies and decisions.⁷³

The geography of the Tahoe basin: Planning in the Lake Tahoe basin cannot be understood apart from the physical and political geography that it addresses. It is the physical attributes of the lake and its environs that have attracted development and occasioned so much scientific and policy attention. The lake lies within a graben between the crest of the Sierra Nevada and the Carson Range. The mountains that rise steeply from its shores to a height of 2,000 to almost 5,000 feet above the lake level were deeply scoured by glaciers and are now covered with mostly coniferous forests.⁷⁴ The basin's land area occupies approximately 207,000 acres, of which about 75 percent is in public ownership (TRPA 1991), including most of the undeveloped land. Federal and state land acquisition programs are active in the basin, and public land ownership is increasing (TRPA 1991). While most of the basin is steeply sloped, there are some moderately sloped or nearly flat areas in which most development has taken place. Urbanization is concentrated on the south end of the lake, in and around South Lake Tahoe; at intervals along the western (California) shore, including especially Tahoe City; at Crystal Bay, in the northeastern corner of the lake, and at Zephyr Cove in the southwest. Besides the City of South Lake Tahoe, there are about 20 distinct towns and communities.

The lake itself has a surface area of 192 square miles, with 71 miles of shoreline; it is approximately 12 miles wide and 22 miles long. Lake Tahoe is one of the deepest lakes in the world, with a maximum depth of 1,645 feet. It is also one of the largest alpine lakes in North America, with a surface elevation of about 6,229 feet. The lake is famous for its clear, cobalt-blue water, which has historically been nutrient-poor due to its high elevation, the parent materials of the watershed, and its limited drainage area (Goldman and Byron 1986).

One of the peculiarities of Lake Tahoe, and the source of much of the wrangling associated with attempts to control growth, is that it lies on the border of California and

⁷³ E.g., *Tahoe-Sierra Preservation Council, Inc. v. Tahoe Regional Planning Agency*, 911 F.2d 1331 (9th Cir. 1990).

⁷⁴ These forests are now suffering from the combined effects of logging (mostly in the last century), which changed the species mix; drought; and insect infestation. According to the *San Francisco Chronicle*, August 6, 1992, the U.S. Forest Service reported that 25 percent of the trees on its lands in the Tahoe basin were dead or dying.

Nevada. Before regional planning, land use control, to the extent that any was exercised, was fragmented among the federal government (in the national forest area) and the governments of Douglas and Washoe Counties and Carson City in Nevada, and Placer and El Dorado Counties and the City of South Lake Tahoe in California. The county seats of those counties, and much political power, resided outside the Tahoe basin, which may have encouraged a view of the basin as a tax base “cash cow.” Complicating attempts to impose order upon the chaos emerging from numerous localities all furiously pursuing boosterist growth strategies in the 1960s was the fact that the state governments of California and Nevada had quite different visions of what was appropriate and desirable for the Tahoe basin. On the basis of the legislation and policies actually put forth it is probably safe to say that in general, California was more inclined to strictly control urban development in the basin, while Nevada tended (although inconsistently) to take a more pro-growth stance.

The Tahoe Regional Planning Agency: Regional planning in the Tahoe basin, then, developed in an atmosphere of deeply conflicting values; of shifting alliances, conflict and consensus; of interstate, regional, and local interests which sometimes were congruent but often collided; and finally of deepening concern over the fate of Lake Tahoe. The history of Lake Tahoe planning is long and convoluted; it has been well chronicled elsewhere (Ingram and Sabatier 1987; Strong 1984) and the summary that follows is drawn primarily from those works. Very briefly, failures of local and state governments to agree on growth control measures led, in the face of accelerating and well-documented environmental degradation, to interest on the part of some federal agencies and local individuals and groups in federalizing the Tahoe basin (e.g., the 1971 Bureau of Outdoor Recreation draft study that recommended creating a Tahoe national lakeshore (Strong 1984 pp. 158-159) or at least dramatically increasing the federal role in land use control in the basin. The desire to avoid such a development powerfully motivated even those who did not want regional controls to accept first the formation of a regional planning agency, the Tahoe Regional Planning Agency (TRPA), and then increasingly stringent controls on land use adopted by that agency (Strong 1984).

Formation of a regional planning agency with bi-state jurisdiction (although very limited powers) was one of the recommendations that emerged in 1967 from a bi-state study committee with legislative mandates from both states.⁷⁵ This did not happen

⁷⁵ This and the following discussion of TRPA history is from Ingram and Sabatier (1987).

immediately, however; rather, each state produced its own regional planning agency with jurisdiction limited to that state. Both agencies survived constitutional challenges, but were soon superseded by an official bi-state agency, the TRPA. In 1971, in the midst of constant court challenges, the TRPA hired a planning staff led by J. K. Smith which set to work on a regional plan.

The Smith plan was based upon a land capability rating system (the “Bailey System”) that classified land according to its capacity to support development without significant erosion. Thus, slope, soil type, and hydrology were the important factors. The plan distinguished seven capability classes, shown on a map of the basin, and assigned a maximum allowable impervious cover (as a percent of land area in the lot) to each, ranging from one to 30 percent. The plan was deemed unacceptable by TRPA’s governing body, at that time composed primarily of local elected officials, because it represented a departure from established planning practices and because it effectively downzoned a great deal of land in the basin. It also attempted to calculate a maximum population capacity of the Tahoe basin, which it set at 136,000.

The governing body of the TRPA set up a special subcommittee, led by local planning directors, to draw up a new plan. The “Heikka” plan (produced under the leadership of Richard Heikka) continued to use the land capability classification as the basis for planning. However, it did not downzone as much land and it put the population capacity of the basin at 280,000. Moreover, the plan grandfathered in proposed projects which had received permits and created a number of exceptions and exemptions.

While the plans were being prepared and debated, the TRPA asked federal agencies to use their authority to slow growth in the basin (Ingram and Sabatier 1987). Both the U.S. Army Corps of Engineers and the Department of Housing and Urban Development soon followed suit. The TRPA’s request recognized the importance of the federal role in the Tahoe basin. As Gilliland and Clark (1981, p. 401) wrote a dozen years ago, “Federal activity accommodates growth at Tahoe to a greater extent than it does nationwide.” They cited Commerce Department figures to show that between 1970 and 1977, federal spending for public construction in the basin was 2.6 to 5 times greater than the national average, and that this spending preferentially encouraged gambling over outdoor recreation (p. 401). Through many individual decisions, taken in isolation and with no analysis of cumulative or interacting impacts, federal agencies aided and abetted growth at Tahoe. “[T]he intentions of each agency [were] laudable, but the cumulative effect of all agency actions ...produced a poor environmental result” (Gilliland and Clark 1981, p. 401).

In 1974, at the behest of California Senator John Tunney, the Environmental Protection Agency (EPA) released a report concluding, among other things, that federal agencies needed to better coordinate their activities in the region. The Western Federal Regional Council undertook an environmental study of the basin in order to establish “environmental thresholds.” In late 1979 the Council released its “Lake Tahoe Environmental Assessment,” which concluded that urbanization in the basin had caused all of its environmental thresholds to be met or surpassed. A federal council was formed to pursue carrying capacity studies, but the election of Ronald Reagan put a halt to the council.

The 1980 California-Nevada Compact: The revised bi-state compact⁷⁶ that had been approved by the California and Nevada legislatures, ratified by the U.S. Congress, and approved by President Carter in 1980, however, called for TRPA to adopt environmental thresholds carrying capacities and then adopt a plan for the Tahoe region that would achieve and maintain those carrying capacities. The compact defined environmental threshold carrying capacity as “an environmental standard necessary to maintain a significant scenic, recreational, educational, scientific or natural value of the region or to maintain public health and safety within the region.” (TRPA 1982c, p. 1). Establishment of thresholds “ultimately is adoption of environmental standards” (TRPA 1982c, p. vii). The TRPA’s monumental study report on environmental thresholds (TRPA 1982b) includes numerical (e.g., maintain ozone concentrations at or below 0.08 ppm averaged over one hour) and policy and management standards (e.g., “reduce traffic volumes on the U.S. 50 Corridor by 7 percent during the winter from the 1981 base year”). The governing body of TRPA adopted standards on the following environmental attributes in August, 1982.

- Water quality. Specific standards for pelagic and littoral zones of Lake Tahoe, tributaries, surface runoff, groundwater, and other lakes in the basin, calculated to limit algal growth in Lake Tahoe.
- Soil conservation. Standards for impervious cover and protection and restoration of Stream Environment Zones (SEZs).

⁷⁶ Tahoe Regional Planning Agency Compact. 94 Stat. 3233 (P.L. 91-148, 83 Stat. 360 (1969), amended by P.L. 96-551, 94 Stat. 3233); Cal. Gov’t Code Sections 66800-66801; Nev. Rev. Stat. Sections 277.190-.200. The TRPA is still operating under this compact.

- Air quality. Standards for carbon monoxide, ozone, nitrate deposition, odor, and regional and subregional visibility.
- Vegetation preservation. Standards for common vegetation, uncommon plant communities, and sensitive plants.
- Wildlife. Standards for special interest species and habitats of special significance.
- Fisheries. Thresholds for stream habitat, instream flows, Lahontan cutthroat trout (an indigenous species extinct within the basin but available for reintroduction), and lake habitat.
- Noise. Standards for single noise events and cumulative noise events (background levels of noise associated with particular types of land uses).
- Recreation. A general policy to “preserve and enhance the high quality recreational experience.”
- Scenic resources. Standards for roadway and shoreline segments (based on a ranking system), a management standard for bike paths and recreation areas, and a policy statement for design aspects of the built environment.

The environmental threshold carrying capacities provided the rationale and direction for subsequent TRPA planning. Besides the environmental thresholds, the 1980 bi-state compact states strongly the national interest in the Lake Tahoe basin and authorizes TRPA to adopt and enforce a regional plan. The compact placed a moratorium on certain types of construction and also prohibited further permitting of casinos in the basin. Moreover, for all projects “leading to significant environmental impacts” a detailed environmental impact statement was to be prepared. Finally, the 1980 compact changed the voting procedures of TRPA’s governing body to make it more difficult to have proposed development approved.

The 1984 Plan Amendments: It took TRPA four years from the passage of the 1980 compact to produce an implementing plan.⁷⁷ According to the compact, the plan was to “achieve and maintain” the adopted environmental threshold carrying capacities.

⁷⁷ The following discussion is based upon Ingram and Sabatier’s (1987) description of the 1984 plan.

Moreover, “[e]ach element of the plan shall contain implementation provisions and time schedules for such implementation by ordinance” (Article V, Section (1)(c)).

The 1984 plan, like the Pinelands plan, was designed to give local governments a front-line role in land use planning and enforcement. Local governments were to draw up plans for each of the 175 planning areas designated by TRPA, for TRPA approval. Overall, the regional plan sought to encourage infill and redevelopment in already developed areas. It put into effect a transfer-of-development-rights mechanism, and included a point system for project proposal evaluation that encouraged off-site mitigation in the form of “retiring” developable land elsewhere in the basin. It permitted some development in environmentally sensitive land capability areas.

No sooner did the governing body vote to adopt the new plan than both the League to Save Lake Tahoe and the State of California filed suit against TRPA. They claimed that the plan would not ensure that the environmental threshold carrying capacities would be met in the face of future development. The State of Nevada, the Tahoe-Truckee Sanitation Agency, and the Tahoe Shorezone Representation all entered the legal fray as intervenors. One result of the litigation was the extension of a building moratorium that TRPA had imposed in 1983, since the State of California had asked the court to enjoin TRPA from approving any projects until the litigation was settled. The court did so, and its injunction was upheld on appeal.⁷⁸

The next three years were marked by complicated legal maneuverings and the continuation of the building moratorium that resulted from the injunction. The Nevada legislature threatened to end its participation in the bi-state compact (Ingram and Sabatier 1987, p. 65). In 1985, TRPA’s new director undertook a round-table-type consensus-building process with the major stakeholders in growth control at Tahoe. The consensus group produced an agreement that maintained the primacy arrangement between local governments and TRPA (whereby local communities would draw up their own plans, subject to TRPA approval). It provided for a significant expansion of commercial floor space over the next decade, allowed modest growth in residential and tourist accommodation construction, and called for implementation of a land evaluation system that had been developed for TRPA in 1986 (the Individual Parcel Evaluation System). It also called for a virtual ban on new subdivisions.

⁷⁸ *California v. Tahoe Regional Planning Agency*, 766 F.2d 1308 (9th Cir.1985).

The consensus group agreement was adopted in principle by TRPA's governing body, and provided the basis for the settlement of the suit filed by California and LTSLT against the 1984 plan. That suit was settled after TRPA adopted new plan amendments in September 1986 (TRPA 1986, cited in Fink 1991) and an implementing ordinance in 1987 (TRPA 1987). TRPA's Water Quality Management [Section 208] Plan (TRPA 1988, cited in Fink 1991), which set out an ambitious, \$300 million program of erosion control and restoration of wetlands and Stream Environmental Zones (*Los Angeles Times* March 6, 1989) completed TRPA's land use regulatory scheme. It was approved in 1989 by California, Nevada, and the EPA.⁷⁹

The regulatory program that emerged from this contentious process requires the agency to adopt indicators for each of 31 thresholds, along with attainment schedules, compliance measures, and provisions for evaluating effectiveness (League to Save Lake Tahoe, January/February 1991). The thresholds "guide virtually all aspects of TRPA's planning and operating functions" (TRPA 1991, p. 2). Development of private land is strictly controlled and rationed, with only 2,000 new residential units to be constructed in the first six years of the program. Commercial development other than hotel/motel accommodations and recreation facilities is limited to one percent growth per year for ten years (Fink 1991, p. 509). Adjustments to permitted growth levels could be made if progress toward achieving the environmental thresholds could be demonstrated (LTSLT October 1989). In order to assess progress and provide a basis for course changes, the 1986 plan requires TRPA to evaluate the thresholds and the regional plan package (including the 208 plan) at least every five years, with the first review in 1991.

The regulatory program recognizes the contribution to water quality preservation and ecological health of the lake made by wetlands and riparian corridors, or SEZs, which SEZs were to be afforded special protection. Methods for identifying SEZs were refined and no further land disturbance would be allowed in SEZs, with very limited exceptions. However, because about 75 percent of Lake Tahoe's wetlands had already been lost to urbanization (LTSLT January/February 1991), the 1986 plan goes far beyond most wetlands protection and nonpoint source protection programs in

⁷⁹ In 1991, LTSLT criticized TRPA for failing to meet the terms of federal approval of the plan. Specifically, according to the League, TRPA had missed two deadlines and still had no financial plan demonstrating where the \$300 million would come from and no contingency plan in the event that funding could not be found (LTSLT January/February 1991). The League also criticized TRPA for falling behind in delineating, protecting, and restoring SEZs.

committing TRPA to an ambitious program of SEZ restoration. The target for the 1991 review was to have completed SEZ delineation, restored all disturbed SEZs in undeveloped areas, and restored at least 25 percent of disturbed stream zones in urbanized areas (LSTLT January/February 1991).

The program incorporated the new land classification plan as recommended by the consensus group. The Individual Parcel Evaluation System (IPES) requires a team consisting of a soil scientist, a watershed expert, and a planner to field evaluate every vacant residential lot in the Tahoe Basin (TRPA 1986, cited in Fink 1991, p. 510). The team then assigns a numerical score, and only those parcels ranked highest in terms of suitability for development (according to criteria based largely on the Bailey land capability classification system) in each municipality may apply for development permits (TRPA 1986, cited in Fink 1991, p. 510).

The final TRPA regulatory program abandoned the inflexible impervious surface limits originally proposed in the Smith plan, substituting a system of base land coverages, transferable coverage rights, and mitigation, including offsite mitigation, applied on an individual parcel basis. Currently there is a \$1.29 per square foot mitigation fee applied to all new construction. The fees collected are held in trust by TRPA and are used for erosion control projects such as streambank stabilization and sediment ponds (Hill 1993). A land bank operated by the California Tahoe Conservancy facilitates the marketing of transferable coverage rights. The system, according to Fink (1991, p. 511), "is designed to provide the regulatory agency and property owners with flexibility while still mitigating land use and water quality problems consistent with the environmental thresholds."

Because of the importance attached to controlling siltation (e.g., Goldman 1989), best management practices (BMPs) for all types of land disturbing activities had been promoted by TRPA since the late 1970s. Following the adoption of the 1986 Regional Plan, not just large developments but all new single family homes were required to install all appropriate BMPs. These include drip-line infiltration trenches, slope stabilization, driveways with adjacent infiltration trenches, and restoration of all disturbed soils (LSTLT Spring 1992).

One final aspect of the 1986 regional plan that is worth mentioning is that TRPA is to monitor economic conditions in the Tahoe basin as well as environmental conditions. TRPA must report on the state of the economy at intervals, consider the economic

impacts of its policies and plans, and consider plan adjustments to ameliorate these impacts “consistent with attainment of the threshold standards” (TRPA 1991, p. 2).

The 1991 Evaluation: In accordance with the regional plan package, TRPA issued its first five-year evaluation late in 1991. According to the evaluation document (TRPA 1991), many of the thresholds were not met. Some specific findings included the following:

- Lake clarity was still diminishing, although the rate of decrease had slowed.
- Algal productivity, one of the key indicators of eutrophication of the lake, was still increasing and the rate of increase showed no signs of slowing.
- Nitrogen and phosphorus levels in tributaries exceeded the threshold values most of the time, while suspended sediment concentrations exceeded thresholds on three tributaries.
- The majority of samples of surface runoff showed water quality had not improved.
- Only 25 percent (100 acres) of the SEZ restoration target was met, while the BMP implementation goal appeared to have been met.
- Agency spending standards for erosion and runoff control projects were met by only two of eight agencies. However, TRPA concluded that public agencies were making “good progress” in implementing capital improvements for erosion and runoff control, despite the fact that financing was “a constant challenge.” (p. 14)
- Vehicle miles traveled increased by ten percent, and TRPA notes that attaining and maintaining the threshold standard “will take time, large capital investments, and major shifts in the way people travel...” (p. 17)
- In spite of increased vehicle miles traveled, air quality met almost all standards.
- Lake fish habitat decreased over the period.

Other environmental thresholds either were met or the results were mixed. It should be pointed out that the lake clarity and algal productivity are measures that one would not expect to change quickly, given that the retention time in the lake is on the order of 700 years. Still, it is disturbing that the tributary water quality has not improved.

The fact that so many of the threshold indicators fell short of the mark, particularly the water quality-related ones, which are of central importance, leaves TRPA with some difficult decisions. As the LTSLT (LTSLT, Winter 1992, p. 7) asked after the results of the 1991 evaluation were released,

Now what? After 1700 single family building permits and some commercial construction, including a casino parking garage, the water quality of the lake and the streams has not improved. And most of the 400,000 square feet of new commercial construction that the League [in the settlement of the lawsuit described above] agreed to in 1986 has yet to be built, construction that may lead to more damage to water quality, especially if TRPA allows the community plans to escape implementing water quality improvements.

LTSLT's last point refers to the Community Plan process, by which localities undertake major commercial zone redevelopments that are intended to concentrate commercial uses and begin to remove strip developments. TRPA is requiring communities to undertake such planning as a condition of receiving allocations of new commercial development. Incentives for businesses include more floor space and greater land coverage than ordinarily allowed through the Bailey land classification system. In return, capital improvements intended to improve the environment, reduce automobile use, and improve aesthetics are included, presumably to be financed through new commercial activity. Typical improvements would include stormwater collection and treatment facilities, stream restoration, installing sidewalks, and creating open space as areas outside nodes are de-developed. LTSLT (Winter 1992, p. 5) has criticized this process, pointing out that TRPA has not received sufficient guarantees that the public benefits will be built: "When businesses find out how expensive implementing the plans can be, improvements will almost certainly get watered down."

Whether this assessment is correct or not, business conditions at Lake Tahoe have been difficult for the past few years, which could affect the basin's ability to generate financing for environmental improvements. According to the December 14, 1992, *Sacramento Bee*, Lake Tahoe's ability to attract tourists from Northern California has declined as hotels and other facilities have aged. Noting the lackluster economic performance of the Tahoe basin, a subcommittee of the Nevada state legislature is drafting legislation that calls for TRPA to consider economic as well as environmental issues in its planning. The subcommittee also urged TRPA to allow residential growth (*Sacramento Bee*, January 21, 1993).

TRPA has made several policy changes in response to the 1991 evaluation (Hill 1993). In order to meet the thresholds for tributary water quality and urban runoff, for example, TRPA is implementing a program that will require *existing* homes to retrofit with BMPs. This requirement is in stark contrast to the vast majority of environmental regulations applied to individual homeowners, which almost without exception grandfather existing uses and practices, and apply only to new development. TRPA has prioritized watersheds in the basin according to their susceptibility to erosion. The highest priority basins, which includes several in Incline Village, must have BMPs implemented by the end of 1995. Priority 2 and 3 watersheds must do so by 1997 and 1999, respectively.

Another category of retrofitting is paving driveways. Although TRPA had discouraged such paving for years, it reversed its position after the 1991 evaluation. According to Hill (1993), the paving is required not only for new development but for any renovations or additions that need a TRPA permit. However, in some cases, the paved driveway is counted toward the impervious cover limit, causing problems for some homeowners.

The number of permit allocations for residential construction was not changed as a result of the 1991 evaluation results. Currently, an IPES score greater than or equal to 726 is required to apply for a permit, but if targets are met for implementation of BMPs and other water quality improving measures, the qualifying IPES score may be dropped to 705 (Hill 1993).

Comments on growth control at Tahoe: Tahoe is a model for regional land use planning that could be replicated only in very unusual circumstances, if at all. Unique scenic and recreational attributes make Tahoe by all accounts a national treasure, and were it not for the recognition of that fact outside the region, it is unlikely that effective regional planning could have been implemented there. It was difficult enough as it was, and it may ultimately prove to have come too late.

Fink (1991, p. 511-12) cites several authoritative opinions of the protection of the basin under the 1969 compact as “notably unsuccessful” and even “disastrous.” Most of the region’s growth occurred in the 1960s and 1970s, before the more effective 1980 bi-state compact and its implementing program were in place. Indeed Fink argues persuasively that regulation alone could never have stopped the environmental degradation of the Tahoe basin. Despite numerous scientific studies and a relatively well-developed causal model of the pathways of environmental degradation, resulting

in identification and specification of thresholds (or limits to growth, defined in term of the local environment); despite stringent development controls, limitations on sewage capacity, and lengthy building moratoria, TRPA was ineffective in controlling growth. In large part this was due to the political power of the forces of development, which effectively countered that of the conservationists, even in the larger political arenas in which many important battles were waged.

What has made a significant difference in the Tahoe basin, according to Fink (1991), is public land acquisition through both federal and state programs, particularly the acquisition efforts of the Tahoe Conservancy. It seeks to protect environmentally sensitive lands, particularly those which, if developed, would exacerbate the water quality problems of the lake. According to Ingram and Sabatier (1987, p. 51), one effect of the stringent controls over development of private land in the Tahoe basin has been increased support for public land acquisition programs within the basin: “a consensus began to emerge that the owners of such property [previously developable land] had the right to be compensated at fair market value for their land.” The federal program under the Burton-Santini Act⁸⁰ directed the Department of Agriculture to purchase environmentally sensitive land in the basin, and authorized almost \$100 million for that purpose. Significant land acquisitions programs were also created by the California and Nevada legislatures in the 1980s. In California, the Lake Tahoe Acquisitions Bond Act⁸¹ authorized the issuance of \$85 million in bonds for land purchases by the California Tahoe Conservancy, which it created. The Tahoe Basin Act⁸² provided \$31 million for land acquisition and environmental protection in Nevada. Moreover, much of the basin was already publicly owned by 1980, with the Forest Service by far the largest land holder (Strong 1984); public ownership by 1991 accounted for about 75 percent of the basin (Fink 1991). Such massive expenditures would hardly have been politically feasible were not Tahoe such an outstanding resource.

The Tahoe case is an example of sustainability narrowly defined and pursued. The implicit definition of sustainability is more than just preservation of the ecosystem and the landscape in a relatively pristine condition, because a significant part of the

⁸⁰ P.L. 96-586, 94 Stat. 3381 (1980).

⁸¹ Cal. Gov't Code Sect. 66950, 66953, 66956 (Deering 1990).

⁸² 1985 Nev. Stat. 585, amended by 1987 Nev. Stat. 444 Sect. 2, 3.

financial means for restoration and preservation must be generated from economic activity within the basin. Thus it is sustainable development that is pursued, not mere sustainability. Still, it is a definition of sustainable development that takes into account only environment and economics. Social justice, community or the lack thereof, are not at issue in the rarefied atmosphere of the Tahoe basin. Moreover, neither the development in the basin nor the program to preserve it are self-sufficient. Both receive massive subsidies: of materials, food and fiber, energy, and assimilative capacity (all sewage is exported from the basin) in the first case; of financial resources, in the second.

Environmental Mitigation and Restoration

Mitigation of the environmental, social, or fiscal impacts of development is a mainstay of mainstream environmental planning's (MEP) approach to sustainable development. It has been increasingly adopted in the United States as a strategy for making development environmentally acceptable and politically palatable. Mitigation can be viewed in terms of environmental economics as an attempt to internalize the costs of development. It accomplishes these purposes by reducing offsite impacts of development and/or substituting, as compensation, artificial resources or modified environments for wild, self-maintaining ones destroyed or impaired by the development. In some cases, mitigation involves ecological restoration: the recreation of the structure and functions of the damaged ecosystem (Jordan and others 1987).

In the Lake Tahoe basin, where strong development pressure and environmental protection meet head-on, mitigation measures are applied to almost every ground-disturbing activity. Mitigation is an integral part of federal and state strategies for preserving the nation's wetlands. With mitigation, fish passage devices and fish hatcheries are operated to allow the continuation of valuable fisheries where hydropower development has blocked access of anadromous fish to spawning grounds. Trout streams have been developed to compensate for inundated bottomland forests. Wetlands are purchased, rehabilitated, or constructed in one place to compensate for filling wetlands in another. Best management practices are widely prescribed to mitigate the impacts of land disturbance for agriculture and urban development. In some cases, public "goods" unrelated to ecological functions and values lost to development -- such as public parks or boat ramps -- have been offered and accepted as mitigation.

Mitigation can be viewed as a site-level (or, occasionally, regional) application of Colby's (1990) Environmental Protection paradigm. The Environmental Protection paradigm, as Colby describes it, is a "first-generation" institutional response to concerns over the environmental effects of development. Its agenda is defensive and remedial: environmental management under this paradigm is seen in terms of damage control. Because there is neither perceived need nor attempt to fundamentally rethink or radically modify development practice, mitigation and its associated technologies, ecological restoration and ecological engineering (Mitsch 1991), are compatible (as is Colby's Environment Protection paradigm in general) with the dominant social paradigm (DSP) described in Chapter 2. Many mitigation projects also may manifest the attitude towards nature that was described earlier as characteristic of the DSP: that it is right and good to manipulate nature to suit human needs and desires.⁸³

Mitigation measures are often found in proposals for development projects, be they dams and reservoirs, flood control projects, or large land developments, primarily because of the requirements of federal and state regulations governing waters and wetlands. Mitigation has become a familiar concept to land developers, primarily through the wetlands protection programs operated by the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.⁸⁴ It is through the Section 404 permitting process that numerous mitigation measures affecting wetlands and water resources are undertaken.⁸⁵ Aside from regulation of wetlands, land developers are also familiar with the general concept of mitigation from the local government practice of requiring development exactions to offset public and fiscal impacts of urban development.

⁸³ It could be argued, however, that with ecological engineering -- defined by Mitsch (1991, p. 429) as the "design of ecosystems" -- one moves from a human/nature relationship of domination to one of "wooing" (Dubos 1980), since effective design of ecosystems requires respect for nature. This approach has recently been extended by, for example, the work of the Gaia Institute, described in the following chapter.

⁸⁴ 33 U.S.C. Sections 1251-1376.

⁸⁵ For a review of the impacts of Section 404 on the private development of wetlands, see Nerikar 1990.

Development projects proposed by federal agencies or requiring federal action may be required to mitigate impacts under the National Environmental Policy Act⁸⁶ (NEPA). The Council on Environmental Quality (CEQ) regulations for implementation of NEPA specify that “[m]itigation and other conditions established in the environmental impact statement or during its review and committed as part of the decision shall be implemented by the lead agency or other appropriate consenting agency” (Section 1505.3). The regulations go on to direct the lead agency to include the appropriate conditions in grants, permits, or other approvals; condition funding of actions on mitigation; inform cooperating or commenting agencies on progress in carrying out mitigation measures which they proposed and which were adopted by the agency making the decision; and make the results of relevant monitoring of such progress available to the public (Section 1505.3). Some states have enacted legislation requiring environmental impact statements with mitigation requirements similar to those of NEPA.

Laws and regulations notwithstanding, mitigation measures are not always implemented (Andreen 1989). In a discussion of the mitigation of fish and wildlife losses resulting from U.S. Corps of Engineers projects, Smythe (1989) states that “by any objective measure, relatively little mitigation actually has been accomplished. ...[T]he Corps has consistently either failed to fund, or seriously underfunded, actual implementation of significant measures to protect, preserve, and enhance natural ecosystems destroyed during project construction.” From the developer’s point of view, mitigation measures (like impact fees and exactions) represent an added cost for something inessential to the purpose of the project. Mitigation plans are a form of good intentions; when the time comes to pay, the most well-intended may be tempted to cut corners.

The NEPA process has been supplemented and, in the opinion of some observers, superseded by procedures and requirements of other laws, such as the Fish and Wildlife Coordination Act and Section 404 of the Clean Water Act. Mitigation measures are incorporated into projects under these laws and permits are made conditional upon their implementation, even in cases in which there is a finding of no significant impact under NEPA. In such cases, the permitting agency is responsible for monitoring the implementation of mitigation. Here again, however, there is considerable doubt whether mitigation is uniformly implemented; and if it is, whether it

⁸⁶ 42 U.S.C. Sections 4321-4347 (1982).

is effective (see, for example, Brady 1990; Johnston and McCartney 1991; Krohe 1989; Race 1985; Rouvalis 1988; Zedler 1991). Many mitigation projects replace self-maintaining ecological systems with artificial systems that need ongoing management in perpetuity. But the institutional means for assuring that such perpetual management will be provided are lacking in many cases (Eglick and Hiller 1990). The result may be that mitigation becomes a short-term compensation of dubious effectiveness for a long-term, perhaps permanent loss of ecological functions or environmental values.

In Section 1508.20 of the CEQ regulations implementing the National Environmental Policy Act (NEPA), mitigation is defined to include:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree of magnitude of the action and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

The CEQ definition of mitigation includes a very broad range of possibilities, some of which arguably should not be called mitigation at all. Ashe (1982, p. 16), for example, defines fish and wildlife mitigation as “a process resulting in specific actions, designed to compensate for the *unavoidable* loss of fish and wildlife resources which accompanies human activity. [footnote omitted]” Ashe distinguishes this type of mitigation from a number of other mitigation strategies permitted by the Corps of Engineers, including the use of BMPs and similar measures, “good planning” to minimize impacts, provision of public use/public access, acquisition and protection of existing habitat, single-purpose mitigation (e.g., fish hatcheries), and “in-lieu” payments. These, Ashe argues, either are not mitigation or fail to meet his criteria for ecologically sound mitigation.

A simple listing of possible definitions of mitigation, like those in the CEQ guidelines above, obscures other issues that are as important as definition, and on which federal agencies have important disagreements. One is the relative ranking of the different approaches. Thus, the EPA has maintained that compensatory mitigation should be considered only after the others (i.e., avoidance by not taking the proposed action, minimization of impacts through careful planning and project modification) have been found to be untenable in specific instances. The U.S. Fish and Wildlife Service (FWS) has also taken this position, viewing compensation as the least protective mitigation alternative for fish and wildlife habitat. So, too, has the National Wetlands Policy Forum, convened by the Conservation Foundation (1988). Compensatory mitigation, therefore, should only be used to offset *unavoidable* impacts. EPA, in its guidelines for the Section 404 program administered by the Corps, requires for compensatory mitigation that proposed projects must be water dependent and that there be no practicable alternatives. Mitigation has been central to efforts to stop the conversion of wetlands in the U.S., and the issues and concerns associated with mitigation have been acute in the case of wetlands.

Wetlands Mitigation: For at least a decade, planners and policymakers in state and federal governments have been searching for ways to stop and even reverse the loss of wetlands in the U.S. (Conservation Foundation 1988; Dahl 1990; Leslie and others 1990). The use of constructed or restored wetlands as mitigation, to compensate for the loss elsewhere of naturally-occurring wetlands, has emerged as a major element in this endeavor. Berry (1992, p. 2) has stated in this regard that “the appeal of the mitigation process is that it seems on the surface to satisfy the requirements of all concerned. On the one hand, it allows the developer to proceed with the proposed project; on the other, it meets the requirement that there be no net loss of wetlands.” However, the mitigation process adds time, uncertainties, and financial burdens to development projects; at the same time, what is gained environmentally is questionable. Berry (1992, p. 2) calls the track record of wetlands mitigation projects “dismal.”

In part this is because the science and technology of wetlands creation and restoration is not well developed (Kusler and Kentula 1990). Race (1985), reviewing all San Francisco Bay marsh restoration and establishment efforts between 1977 and 1982, found that few if any of the sites could be described as completed, active, or successful efforts. Zentner (1988), reviewing wetlands projects and plans undertaken by the California State Coastal Conservancy’s Enhancement Program, found mixed results that, among other things, showed the importance of monitoring for success.

The issues arising from the use of mitigation as a strategy for making development environmentally sustainable are evident in the case of wetlands:

- identification of an ecosystem type (wetlands) deemed highly valuable in terms of its ecological services (usually stated in terms of “functions and values”) and the targeting of regulatory policies to protect it;
- presence of unquantifiable risks to terrestrial and aquatic ecosystems in relying on a “technical fix,” albeit one for which the knowledge base is increasingly ecologically sophisticated;
- implied or attempted balancing of incommensurate future risks against present benefits (Lothrop 1986);
- potentially inequitable distribution of present costs/benefits and present and future costs/benefits;
- development of science and technologies for wetlands creation and restoration (see Kusler and Kentula 1990) that will be useful in any sustainable future and may be essential if, for example, sea levels rise with global warming;
- process for weighing mitigation plans in overall project environmental impact assessment (Brady 1990);
- optimum scale (site, watershed, basin) at which to address wetlands mitigation;
- design of institutional arrangements for monitoring and perpetual maintenance of created, protected, or restored wetlands, if necessary; and
- adequate funding for agencies charged with responsibility for seeing that mitigation measures are installed and maintained.

Creation of wetlands as compensation where none existed previously is increasingly recognized as a high-risk strategy (Krohe 1989). Wetlands *creation* usually replaces a self-maintaining natural system with a manmade system that requires ongoing management. However, *restoration* of degraded wetlands on- or off-site may reduce risk to ecosystems (which are, after all, already degraded), thereby increasing acceptability as mitigation.

In New Jersey, a 300-acre development by Hartz Mountain Industries in the Hackensack meadowlands involved the restoration of a 126-acre tidal wetland called Harmon Meadow. The Hartz Mountain project required the filling of wetlands to create developable land; in order to gain the approval of the U.S. Army Corps of Engineers (the Corps) under Section 404 of the Clean Water Act,⁸⁷ Hartz worked cooperatively with regional, state, and federal agencies to develop a mitigation plan.

The wetlands to be filled were severely degraded from their original condition (a freshwater cedar swamp), having been isolated hydrologically and subjected to saltwater intrusion that facilitated the invasion of a non-native reed. The site had also been used as a waste disposal site. Phillips (1987) suggests that the plan probably would not have been permitted had the existing wetlands not been so severely degraded. Initial restoration costs were high (on the order of \$65,000 per acre) and although initial results were encouraging, long-term viability is an open question (Phillips 1987). Nonetheless, this case shows that development with mitigation requirements can provide resources for ecological restoration that may not have been available otherwise under current legal and property rights regimes.

Although much mitigation is proposed, evaluated, permitted, and implemented on a case-by-case, site-by-site basis, some states are turning to larger-scale planning arrangements. Mitigation banking, for example, is an institutional arrangement that allows for regional planning for wetlands and habitat needs. The U.S. Fish and Wildlife Service defines mitigation banking as the intentional creation, restoration, or enhancement of a wetland to protect a habitat for the purpose of compensating for unavoidable, necessary losses from specific future development actions (U.S. Fish and Wildlife Service 1988). As of 1990, at least twelve states had a statute, regulation, or policy allowing mitigation banking (Brady 1990). The California Coastal Conservancy, for example, uses mitigation banking as one of its tools for wetlands preservation and restoration.⁸⁸ The use of mitigation banks has potential for large-scale, comprehensive ecological planning (U.S. Fish and Wildlife Service 1988), but there are many

⁸⁷ 33 U.S.C. Section 1344(c) (1982). See also 40 C.F.R. Section 230.2(c) (1988), setting out the co-implementation of the Section 404 guidelines by the U.S. Environmental Protection Agency and the Corps.

⁸⁸ The Conservancy is a public entity established by law that acquires, designs, and constructs both new and restored wetlands projects (Brady 1990, p. 950).

concerns which must be addressed (Brady 1990; Zentner 1988; Sokolove and Huang 1992).

Large-scale wetlands restoration efforts are proceeding or planned in a number of states. The State of Delaware announced, in 1992, plans to rehabilitate roughly 10,000 acres of urban wetlands to improve habitat and water quality. The Northern Delaware Wetlands Rehabilitation Program will involve landowners, local governments, and the state in a cooperative effort. The former wetlands were drained by early settlers and then contaminated by the effluent of urbanization and industrialization. Planned measures include installation of water-control structures; management of water levels; clearing of impediments to tidal flow; habitat restoration and enhancement; and establishment of fish populations to control mosquitos (Barrette 1992). Other large-scale ecological restoration efforts are planned or underway in a number of locations: the Chesapeake Bay, the Great Lakes, the Everglades, and various lesser estuaries and river systems. Such efforts have met with political resistance by property owners, technical problems, and financial problems.

Cairns (1991) argues that the theoretical science of restoration ecology is poorly developed. Applied restoration ecology is sometimes successful, although success in the sense of "resetting the ecological clock" (Cairns 1991, p. 192) has not been achieved; indeed it has rarely been attempted. Most applied restoration ecology has had limited objectives, e.g., revegetation of mined lands, and most do not appear to be self-maintaining (Cairns 1991, p. 193). The compatibility of the restored area with the larger landscape of which it is a part is often not a design consideration. Finally, the scope of restoration activities is dwarfed by the number of acres being destroyed or converted to human use (Cairns 1991). Restoration is expensive and difficult, and one may doubt that those whose interests lie in developing land can ever be persuaded to pay for much of it. Nonetheless, the practice of ecological restoration is developing rapidly and must be considered essential to any strategy for sustainable use of land.

Assessment of mitigation: Within the assumptions and values of the DSP, mitigation should be an acceptable way of making development pay its way, socially and environmentally. However, there are a number of problems and limitations to reliance on mitigation. First, there is the well-documented problem with implementation, particularly within existing regulatory and property-rights regimes. Two separate problems can be distinguished, one administrative and the other technical. The administrative problem revolves around the difficulties in forcing sometimes-reluctant

developers (and their customers) to pay “extra” for something that does not benefit them directly. At one remove from the administrative level (and in part responsible for its implementation problems) there is the reluctance of legislators to appropriate sufficient funding for monitoring and enforcement of mitigation in private developments and for implementation of mitigation with state- or federally-funded projects (Andreen 1989). The technical problems associated with the design, engineering, creation, and restoration of ecosystems have been amply documented (Kusler and Kentula 1990; Cairns 1991).

Development with mitigation requirements attached has potential to provide financial resources for ecological restoration and even preservation.⁸⁹ In practice, mitigation usually depends upon new development; it is an adjunct to the development process. There are occasional exceptions to this rule. At Lake Tahoe, for example, some mitigation measures are being retroactively imposed because all the measures being applied to new development were insufficient to meet the relatively strict mandates for water quality improvements (personal communication with Kevin Hill, Tahoe Regional Planning Agency hydrologist, May 6, 1993). However, Lake Tahoe can hardly be taken as a model for most areas in the U.S.

Growth Management as a Strategy for Sustainable Development

One of the enduring contributions of certain sustainable development theorists, in particular Herman Daly, has been to call attention to the *scale* of human activity in relation to what is left for the rest of life. Daly (1992) argues that, although it remains recognized by relatively few, we (that is, human beings) have rather abruptly reached a historical turning point. Existing for all of history in a world “relatively empty of human beings and manmade capital” (p. 23), we find ourselves in the late twentieth century in a world relatively full of same. Among the reasons Daly cites for this enormous change to have escaped notice (so far), at least among academics and policymakers, is the “deceptive acceleration” (p. 24) of exponential growth. However, in some localities and regions, the rapid and accelerating conversion of open

⁸⁹ Here too there are concerns over the net impact of allowing purchase and preservation of wetlands in one place in return for being allowed to destroy wetlands in another place.

space to roads, housing developments, and malls has alarmed residents. In such areas, growth control or growth management programs have been undertaken.

In Chapter 4, I cited evidence that the area of land annually converted to urban uses is growing relatively rapidly in certain regions of the U.S., at rates considerably higher, in fact, than the rate of population growth. For the U.S. taken as a whole, it would be difficult to argue that there is a shortage of land imminent. Nonetheless, in some regions (e.g., Florida), and especially around fast-growing metropolitan areas (for example, Southern California or the greater New York City metropolitan area), rates of growth are high enough to have generated considerable concern on the part of local residents. It is perhaps not so much the rates of growth that alarm but the patterns of growth and the changes it brings. Where before town and cities existed in a context of agricultural land and forest, in some areas the “figure-ground relationship” has been altered such that urbanized and suburbanized areas are the context in which disconnected, isolated pockets of agricultural land and forest remains.

Local and regional concerns with the (local and regional) limits to the growth of urban development -- a phenomenon usually labelled urban sprawl -- show that sustainable development is not a concept that is meaningful only at a global scale, or even a national or statewide scale. At the level of local communities, ultimate limits to natural resource carrying capacity may seem less relevant than, for example, the capacity of roads to carry additional traffic, or the capacity of local governments to provide services to rapidly growing populations. Thus, for many local communities, sustainable development may be defined, not necessarily in terms of the preservation of biodiversity or the natural resource base, or even the more obvious environmental quality attributes as clean air or clean water, but rather as development that does not erode some aspect of the quality of life that is important to the community.

There are connections between local sustainability in this sense and the global concerns that underlie the discourse on sustainable development. Thus, when a local jurisdiction excludes a polluting industry or a landfill, the result is to displace the problem onto someone else less able to fend it off, while the patterns of consumption that generate the need for the industry or facility continue. On the other hand, when growth management results in more compact urban forms, public investments in infrastructure are likely to be less costly, transportation systems are likely to be more efficient, energy costs will probably be lower, and open space will be preserved for farming, forestry, habitat, air quality improvement, water quality and quantity im-

provements, recreation, and aesthetics.⁹⁰ If there is one thing that sustainable development thinkers tend to agree upon, it is that industrialized countries such as the United States need to reduce their consumption of energy and resources.⁹¹ Thus, if growth management programs result in more compact urban forms, save open space from urbanization, encourage infill development and redevelopment of derelict lands, there is good reason to suppose that global sustainability will be enhanced, however incrementally.

Localities are not homogeneous with respect to their interests in environment and development. As Logan and Molotch (1987) and others have pointed out, the interests of different groups within a jurisdiction may be in conflict, particularly with respect to growth. The interests of owners of downtown real estate and those of the commercial proprietors who rent from them are likely to be in direct conflict with those of the developers of a new shopping mall on the suburban fringe. Similarly, the interests of existing residents in a locality may be at odds with those of developers and the growth machine (Logan and Molotch 1987; Rudel 1989).

Political struggles over local growth (and such struggles are usually at the local level, because as a rule control over land use resides at that level in the U.S.) reflect unique mixes of interests and circumstances. There are many reasons for the adoption of growth management strategies by localities: to avoid overtaxing infrastructure; to match the pace of new residential construction with the ability of the locality to expand services such as schools, police and fire protection; to preserve agriculture and open space as well as wetlands and other sensitive environments such as aquifer recharge areas.

The preservation of rural land and rural character in regions experiencing rapid economic and population growth is an important factor in many efforts to manage growth. Watson (1989) describes a rural conservation effort in Oley, Pennsylvania. According to Stokes and others (1989), rural conservation extends the Pinchotian definition of conservation as wise use to include preservation (where appropriate) and also to

⁹⁰ For a summary of studies documenting these benefits of urban containment, see Nelson (1992), p. 485.

⁹¹ This could be accomplished either value changes favoring a simpler, less consumption-oriented lifestyle; through improvements in energy and resource efficiency, in both production and consumption; or both.

embrace “the idea of *community* as a resource, from individual farms or landholdings, to social institutions, to the local economy as a whole.” In Oley, grassroots organizing with technical assistance and encouragement from a regional conservancy resulted, through a comprehensive planning process, in the designation of an 8,000 acre agricultural preservation district. The perceived threat resulting in the citizen action was encroachment of sprawl from Philadelphia and Reading, Pa. upon a rural township with a longstanding farming economy.

In Jackson Hole, Wyoming, another rural conservation planning effort was undertaken when rapid change in the form of land subdivision and development, driven by tourism, was perceived as a threat by some existing landowners. According to Watson (1989), grassroots organizers working with both federal agencies and non-governmental conservation groups established a national scenic area in which the federal government would purchase easements on private land.⁹² As of 1988, the Jackson Hole Land Trust had acquired 2,110 acres as well as conservation easements on an additional 3,229 acres. There was considerable opposition from some landowners and developers.

Stokes and others (1989) describe numerous cases in which local grassroots organizing preserved or protected, through various public and private institutional arrangements, certain locally valued areas or attributes such as open space, aesthetics, a way of life. The perceived threat is usually, but not always, urban sprawl (in one case, that of the Horsepasture River in North Carolina, the threat was a hydropower development). The cases document (and, to some degree, celebrate) local communities’ mobilization to fend off the creative destruction of place that is the correlary of market capitalism (Jakle and Wilson 1992; Sorkin 1992).

In California, according to Selmi (1991), the purpose of local growth control ordinances has shifted in the past two decades. In the early 1970s, most local ordinances were motivated by a desire to preserve agricultural landscapes and prevent urban sprawl. For example, Petaluma, California adopted a growth control plan designed to protect “small town character and surrounding open space” and to “prevent

⁹² The concern over loss of open space is somewhat surprising, considering that 97 percent of the land in the county in which Jackson Hole is located was already held by the federal government.

sprawl.”⁹³ Local growth control ordinances flourished in the 1970s and were generally upheld by the courts.

After a period of relative inactivity during the early- to mid-1980s, coinciding with a national economic recession, growth management has again become popular in some regions. The change in terms, from growth control to growth management, is significant. In many places the concern is not to stop growth, but to assure that growth does not outpace or overwhelm available infrastructure and services. Moreover growth *control* implies restraint, while growth *management* may entail restraining growth in one area while encouraging it in another. Friedmann (1989) argues that there may be optimal economic growth rates for regions; in some, further economic growth (long term capital accumulation) results in a net decrement in social welfare, while in others (he cites the aging cities of the Northeast), economic growth will result in improvements in social welfare. And, as Friedmann notes, any intentional reduction of economic growth rates will generate intense political struggles and raise difficult equity issues.

This is a point on which there is considerable concurrence. On the theoretical level, it is reflected in the political pessimism of Ophuls (1977), Ophuls and Boyan (1992), Schnaiberg (1980), and others in the sustainable development discourse who emphasize the dependence of existing political arrangements, especially large differentials in wealth and opportunity, on the expectation of continual growth. They arrive at a Hobbesian political solution -- strong, centralized authority -- to the “crisis of survival” (Eckersley 1992) that is their interpretation of the meaning of the environmental *problematique*. Blanco and Neuman (1989), writing from their experience with the New Jersey Office of State Planning, agree with Friedmann that “political and equity issues are of paramount experience in growth management” (p. 340). Critics of growth management (Danielson 1976; Plotkin 1988) point out that the same policies that preserve community amenities, character, aesthetics, environment can also function to exclude certain social groups, such as racial minorities and lower-income groups, and that indeed exclusion is a primary motivation for various local controls on development.⁹⁴

⁹³ *Construction Industry Association v. City of Petaluma*, 522 F.2d 890 (9th Cir. 1985), at 902; quoted in Selmi 1991.

⁹⁴ Sorkin (1992) argues that the new landscapes being produced in America demonstrate, among other

The experience of statewide planning in New Jersey is relevant here. A densely populated and highly industrialized state, New Jersey contains both deteriorating older urban centers and rapid conversion of farmland and open space at the expanding suburban fringe. Although many other states have laws to mandate or facilitate growth management by localities, New Jersey's is more comprehensive than any other (Gale 1992); it is the only one of the recent state growth management acts (those of Florida, Vermont, Maine, Rhode Island, Georgia, and Washington) to create a state land use plan (Porter 1991). The plan, called *Communities of Place*, (New Jersey State Planning Commission 1992), attempts to integrate planning for land use, transportation, economic development, and environmental protection with the equity-oriented goal of affordable housing.⁹⁵ The development and implementation of the plan relied heavily upon the use of consensual group process (Innes 1992), including a unique "cross-acceptance" process through which localities and the state planning agency negotiate to achieve consistency between local plans and state goals. Blanco and Neuman (1989, p. 340) state that in the process of implementing the state planning act, "equity issues have surfaced in at least three important ways: (1) in the competing claims for public investment from the older industrial cities and their surrounding suburbs and the newly developing suburban and rural areas; (2) in the affordable housing area; and (3) in the controversy generated by the strategy to limit development in some areas and concentrate it in others." The resulting plan stresses the imbalance between the "private benefit of developing in suburban and exurban areas" and the "costs to the public" of doing so while older urban areas are allowed to decay (New Jersey State Planning Commission 1992, p. 45). The state aims to correct this situation, in which "taxpayers are subsidizing suburban and exurban development at the expense of distressed urban communities" (p. 46) by encouraging economic growth in areas of existing development and infrastructure capacity, through the use of coordination and targeting of public resource investments.

things, new ways of achieving and ensuring social segregation as well as an obsessive concern with security, social management, and surveillance.

⁹⁵ The concern with affordable housing in New Jersey is an outgrowth of the two Mount Laurel decisions by the New Jersey State Supreme Court, which in effect mandated inclusionary land use planning. See Hagman and Juergensmeyer 1986, pp. 304-306. The affordable housing issue has also been used ideologically to undermine the entire enterprise of growth management (see Downs 1992 and Godschalk 1992).

Local - Regional Conflict and State Growth Management Programs: Besides conflicts over growth (its amount, type, and location) among local communities of interest, there are also conflicts of interest among localities and between localities and the larger regions of which they are a part (Bollens 1992). When localities control land use decisions, situations arise in which a locality's decisions may produce either negative or positive regional externalities. For example, a local government may pursue an aggressive growth strategy that enhances its revenue base but causes traffic congestion, air pollution, and water quality degradation in an adjacent jurisdiction. Alternatively, a locality may refuse to site a facility which, although causing local environmental degradation, may be a net benefit to regional interests. Mason (1992) analyzes the New Jersey Pinelands regional planning effort in terms of conflicts and contradictions between (among other things) local self-determination and the need of what he calls "megalopolis" (the New York City - Philadelphia conurbation) for accessible open space.

There is also a recognition that even where goals are shared, without coordination at a larger scale, efforts at growth management by localities may be ineffective and even counterproductive. If the objective is to contain urbanized areas in order to preserve open space, growth controls by close-in suburbs may simply encourage leapfrog development, ultimately consuming even more space (Fischel 1991).

One argument sometimes made by some environmentalists in favor of state (or even national) involvement in land use decisions is that local governments too often do not represent all interests in the community equally, but rather tend to be responsive to the interests of local elites which tend to favor growth. Logan and Molotch (1987) have presented considerable evidence in support of at least the premise of that argument, as has Power (1988). Mason (1992) cites several cases involving local government officials who were not merely incompetent or unethical, but whose actions indeed bordered on the criminal in attempting to "cash in" on land development. Certainly the pro-growth stance of local governments ringing Lake Tahoe did much to further the perception that supra-local controls were needed.

For a variety of reasons, then, states have undertaken statewide or regional growth management, developing a variety of approaches in the process. Oregon adopted a state planning law in 1973 that articulated a number of statewide goals for development and required that local governments develop plans consistent with those goals. Among the state requirements for local plans were urban growth boundaries (Porter 1991).

Florida is implementing a growth management program inspired by public concern over the loss and degradation of the state's unique natural ecosystems and open space, as well as overcrowding and pressure on transportation systems, schools, stormwater management, solid waste management, and other municipal infrastructure, all results attributed to sprawl. The state's growth management program takes a planning approach of comprehensive, statewide requirements for local government planning, including required implementation, based on three principles: control of coastal development, promotion of compact urban development strategies, and enforcement of concurrency (local governments may not issue a development order/permit unless it will not degrade mandated service levels for a range of public facilities: a "pay as you grow" mandate).

The basic rules are state-level, and implementation is through the local and regional governments, mainly the local. Regional planning commissions are required to review development proposals of regional impact (DRIs) and can appeal local government decisions to the state if their recommendations are refused. The concurrency policy (making growth pay its way, at least in some respects) is an intuitively sensible response to sprawl. Not everyone, however, agrees with the goals of the program. Audirac and others (1990) take issue with several fundamental premises of Florida's (and indeed most) growth management program. While conceding that the case against sprawl is convincing on environmental grounds, they argue that contained development resulting in higher densities may exacerbate environmental problems in the long run, particularly if population increases are unchecked. Audirac and her colleagues also muster considerable evidence that sprawl development is the inevitable result of land markets responding to consumer preferences: people want low densities and like living in rural environments. People who can afford it also prefer being segregated spatially from the poor, minorities, and the social ills that accompany poverty. Audirac and her colleagues accuse those who promote growth management as engaging in wishful thinking about the desirability and possibility of creating community, as well as attempting to impose their elitist ideals of urban form. Audirac and her colleagues, like many market ideologues, ignore the existence of externalities in arguing for consumer preference-based market solutions like low-density, long-commute living arrangements.

Politically the implementation of the Florida program has been a struggle (DeGrove 1992). For one thing, the legislature has not been forthcoming with the necessary funding to assist the localities with concurrency requirements. Secondly, the legislation is under attack from the development community and the whole program is

threatened with rollback, particularly in the face of a lingering recession. The comprehensive statewide program, like so many planning and design strategies, is only designed to deal with new development; existing development as well as vested development interests were generously grandfathered in, as they must be in most cases like this to gain the political support needed for passage. Innes (1992) attributes the Florida program's difficulties to its top-down approach and lack of consensus-building and negotiational processes. By comparison, she sees New Jersey's cross-acceptance process and the programs start-to-finish reliance on consensus-building as a model.

The recognition of intergovernmental inefficiencies and local-regional conflicts has stimulated statewide or state-mandated, regional growth management programs (e.g., the Chesapeake Bay Program). It has also revived an enduring discourse among planning intellectuals over the proper locus of land use control, one that is of some relevance to sustainable development (Jacobs 1989). Many of those writing in the radical/critical paradigm favor decentralization of decisionmaking in the area of development and environment, while certainly the orthodox Marxian and many of the DSP positions (e.g., those calling for large-scale or planetary ecosystems management with, at the extreme, the authoritative, Hobbesian solutions mentioned above) would seem to support centralized solutions.

The proponents of what Beckley (1992, p. 55) calls the "modern liberal reform movement in land use control," also known as the Quiet Revolution (Boselman and Callies 1972), have characterized the system of local control of land use as irrational, chaotic, and inefficient. They have argued instead for regulatory, top-down management of land use. During the early 1970s, there were even several attempts to pass national land use legislation (Plotkin 1987). Although these failed, a number of state and regional programs regulating the use of privately owned land came into effect in the 1970s, given impetus by the ascendant environmental movement. Such programs included the coastal zone management programs, the first generation of state growth management programs (Gale 1992), and such regional programs as the Adirondack Park Authority in New York and the Tahoe Regional Planning Agency in California-Nevada.

Although, as Beckley notes, the proponents of liberal land reform have spent considerable effort defending themselves from conservative, property-rights and market-solution oriented critics, there is a leftist critique of such programs as well. This critique suggests that the movement toward higher-level government control of

land use is inseparably bound up with the needs of large-scale capital. Geisler (1980) sees the centralization of land use control as parallel to, and required by, the increasing centralization of economic power in large corporations. Walker and Heiman (1981; cited in Jacobs 1989) are in essential agreement with this argument.

Beckley analyzes the formation of the Adirondack Park Agency and Maine's Land Use Regulation Commission in terms of the interplay of different factions of capital (e.g., large-scale real estate developers, the forest products industry, wealthy second-home owners). He concludes that planners and politicians ought to pay greater attention to who wins and who loses when land use control is taken from the local level and vested in regional agencies. Mason's (1992) analysis of the New Jersey Pinelands planning effort can be read as a confirmation of the thesis that the interests of large-scale capital benefit from larger-scale land use controls at the expense of at least some local interests. The history of the Tennessee Valley Authority, as told by McDonald and Muldowny (1982; cited in Geisler 1984), could also be read as a confirmation of this thesis.

At the same time, as Jacobs (1989) notes, the criticisms of local land use control, particularly those based on the need for environmental protection, are unrefuted. This leads, according to Jacobs, to a paradox for professional and academic planners, and for society as well: localism is fundamentally flawed as a locus of land use control; yet further progress in the move to centralize land use controls is (in this country at least) politically infeasible and (for the reasons cited by critics of land reform of both the left and the right) undesirable. Given the importance of control over land use to people's lives, there are good reasons to retain power over it as close as possible to those affected by it. Substituting the word "environment" for "land use" in many of the arguments of proponents of local land use controls shows the essential agreement between them and such radical/critical theorists who propose local, communitarian solutions to the dilemma of sustainability. Jacobs (1989), in fact, explicitly draws the connection between the critics of liberal land reform and centralization of land use control, and such theorists as Murray Bookchin and Lewis Mumford. Jacobs, like Bookchin and Mumford, advocates a system in which ultimate power over land use is concentrated at the local level, while higher levels of government act to facilitate (rather than compel) responsible action at the local level. This approach would emphasize the social construction (i.e., noninevitability and historicity) of patterns and trends of land use. It would base planning for "sustainable land use" on a "locally based federated network of governance" (p. 13). Such a system would recognize that there are larger interests and regional and global con-

sequences of local action. Accordingly, state and national action would be necessary to limit “the potentially exploitative or domineering actions of local and extra-local actors” (p. 13).

Assessment of Innovative Mainstream Planning

Approaches

On what bases can one evaluate the mainstream approaches? What are the criteria by which land use planning approaches to sustainable development can be judged? I have argued in Chapter 3 that the context in which planning takes place has changed and continues to change. The sustainability problematic is a part of that contextual transformation. However, just as the dominant social paradigm is based on assumptions (usually implicit) of a nonproblematic global, biospheric context for human activity, as well as a relatively stable social-political environment, so the epistemology, methods, and assumptions of the mainstream in planning are geared to accommodating development in such contexts.⁹⁶ While a mismatch between planning models and their context would not necessarily doom them to inadequacy, it must be cause for concern and reexamination.

Mainstream environmental planning tends to approach environmental problems as discrete entities, even though in theory it may recognize that “everything is connected to everything else.” More importantly, these discrete entities are incidental to development, which is viewed as a process to which planning may react but no more. Autonomous market forces direct the development process, and land use planners may only channel the creative force (in the best of circumstances), not stop or fundamentally alter it. To use the disease metaphor recently employed with respect to ecological health and its opposite (Costanza, Norton and Haskell 1992),

⁹⁶ In fact the cases examined in this chapter are mainstream in the sense in which I have used the term in Chapter 3, but this is not to say they are typical or representative of land use planning practice at the local level in the U.S.; rather, they are examples of innovative approaches within the mainstream. While there is a great deal of variety among localities, much of land use planning practice at the local level never rises above the level of nondiscretionary bureaucratic function: reviewing subdivision plans, requests for zoning changes, and the like.

mainstream environmental planning treats nonsustainability symptomatically; it does not and indeed cannot make a frontal assault on the causes of the problem.⁹⁷

This chapter has described a range of land use planning strategies as being mainstream planning responses to a basic contradiction between environment and development. Land use is relevant to sustainable development in at least two ways. First, land as space must be considered a finite resource. While there have been a few examples of new land being created (floating islands), in general, the amount of land is fixed. Therefore, simply reducing, or at least slowing the growth of, the “human footprint” is a move in the direction of sustainability in land development. Growth management, especially as it encourages or requires reclamation and redevelopment of derelict lands, becomes increasingly important. Growth management on a scale greater than that of the local jurisdiction allows growth to be channeled toward existing urban centers and away from nonurbanized areas (as in the case of New Jersey’s state plan). This can be accomplished through the coordinated local application of traditional land use controls, as well as through controls on the distribution of public investment in infrastructure. As Friedmann (1989) notes, the redistribution of growth from relatively wealthy areas (in which the value of environmental protection is high relative to further economic growth) to relatively impoverished areas (which are often older, higher-density urban areas in which the value of environmental protection is lower in relation to further economic growth) requires action at a regional, state, national, or even international level.

Slowing the spatial growth of urbanized areas is not necessarily tantamount to slowing economic growth as conventionally measured (e.g., by income per head), much less economic welfare as measured by a more comprehensive set of indices (for example, by Daly and Cobb’s (1989) Index of Sustainable Economic Welfare). It can be accomplished through more efficient, more intensive use of urbanized land. In general, this means more compact, higher density residential and commercial development. Better site design can contribute to saving both open space and the rural character of a landscape on the urbanizing fringe. For example, the clustered developments proposed by Randall Arendt (1991) are specifically designed for these

⁹⁷ The chief difficulty in attempting to assess the strengths and limitations of the mainstream approaches is that one is tempted to adopt a radical/critical perspective in order to gain critical distance. Yet it is possible to point up the limitations (as well as the strengths) of mainstream approaches without necessarily espousing an opposite position. For example, one may be critical of regional approaches without necessarily being blind to the limitations of localism.

purposes. At the scale of the locality, compact design can do much to allow economic growth, population growth, and new development without consuming as much land as traditional suburbanization.

Second, there is a sense in which land is virtually synonymous with nature, and in this sense, too, must be considered a finite resource. Studies like those of Vitousek and others (1986), while by no means conclusive, strongly suggest that the displacement, destruction, and appropriation of habitat and wild ecosystems by human activity is reaching a proportion of the total available biospheric space that is quite significant. This thesis, together with the exponential rates of growth in human populations and economic activities, suggests that unless ways are devised to stop and indeed reverse this expansion of human activity, there will in the foreseeable future be very little space and resources left for nature. Thus, long before any absolute limits of land availability are reached, a threshold may be crossed below which wild natural ecosystems cannot be maintained. Because ecosystems can be defined at various scales, these limits may be reached at various scales from the local to the global.

The strategy of compartmentalization, by which areas needed for species and ecosystems preservation are protected from development, is useful in addressing this sense of sustainability. Still, the preservation of isolated islands of mostly self-maintaining ecosystems is a high-risk strategy. This is because despite impressive advances in understanding ecology on a theoretical level as well as in understanding particular ecosystems, there is still a great deal of uncertainty involved in the identification of the spatial requirements as well as the resilience and resistance of ecosystems to perturbations such as air pollution, climate change, and alterations of the spectral composition of sunlight.

Planning strategies involving mitigation are useful and in many cases indispensable. There are many damaged ecosystems, restoration of which depends upon continued improvement of the techniques developed through mitigation. As our technical abilities in this are improved, however, it might be argued that managed or indeed created ecosystems could (in theory) eventually replace, locally, regionally, or globally, wild ecosystems with no loss of ecosystem services and therefore no threat to sustainability. Apart from the aesthetic and moral repugnance of destroying or taming all or most of nature in order to create a world of shopping malls and fast food restaurants, and notwithstanding the noted paradox involved in preservation of natural ecosystems, it remains indisputable that wholesale replacement of self-

maintaining wild ecosystems -- which provide many free services without which human survival would be very much more difficult if not impossible -- by artificial ecosystems (managed forests, farmland, created wetlands) is a high-risk, arduous path to sustainable development if it is indeed sustainable at all.

When urbanized areas grow, not so much at the expense of wild ecosystems as of landscapes valued for aesthetic and other reasons (as in the cases of Lake Tahoe and the Pinelands, as well as the many local growth management efforts in the planning literature), sustainability has a quite different meaning. Here it refers to the protection of a place's aesthetic qualities, its relationship to individual and community memory and sense of identity, and its ecological services (altered landscapes can also provide clean air and clean water, as well as quiet enjoyment). Regionalization, with centralization of land use control, can be useful and may be unavoidable as long as localities press for growth, creating a kind of tragedy of the commons at the regional and larger scales. Concomitant with such regional approaches, however, is the loss to some extent of local control and self-determination. The only way out of this dilemma is a responsible localism that moves local communities away from the pursuit of growth. Coincidentally, a responsible localism would represent a move in the direction many argue that industrialized nations need to go for global sustainability. This direction is toward greater energy and materials efficiency, reduction of pollution, and preservation of biodiversity, all goals served by eschewing growth.

Chapter 6: Alternative Planning Approaches

Introduction

Development, in the ordinary usage of land use practice, is practically synonymous with growth, both in economic terms and in spatial terms. In the preceding chapter I described, by examining a number of outstanding cases, several planning approaches that while not purposefully designed to implement sustainable development, comprise the mainstream responses to the basic contradiction between environment and development and are thus implicitly strategies for sustainable development. One resolution strategy is based on spatial separation: the land is “divvied up” between areas in which development is allowed or encouraged, and areas in which it is prohibited or discouraged. Growth management attempts to impose a supra-local, extra-market rationality upon development that deals comprehensively with sets of problems related to urban growth. Each of these mainstream resolutions is the product of a political process in which competing values and interests are traded off against one another. Mitigation and ecological engineering reduce development impacts offsite, but onsite the choices are either for development to annihilate nature, or for development to be precluded by nature.

Mainstream land use planning is reactive; it seeks to accommodate, to channel, to constrain urban growth. Outside the mainstream, however, a few planners and designers have attempted to redesign the built environment in order to integrate nature and human settlements into a mutually sustaining whole. Others, following the Radical/Critical Paradigm-inspired model of small-scale communities striving for self-sufficiency, have envisioned communities designed intentionally to harmonize *with* rather than dominate their natural surroundings, and to minimize displacement as a strategy for dealing with resource use. There are few cases actually in existence in the U.S.; the alternative planning approaches are mainly found in the planning literature, not on the ground.

Planning and Sustainable Development, Outside the Mainstream

Sustainable development is a relatively recent concept, and planning thought has only begun to use the term. However, sustainability in some sense was the primary intent of planning long before the currently fashionable interest in sustainable development, at least insofar as an enduring disciplinary orientation toward the future can be cited as evidence of interest in creating sustainable societies. If planning has stood for anything, it is the idea that society can be made better by the application of knowledge to action in the public sphere.

Castells (1992) points to several major societal problems with which planning has grappled historically that have shaped the intellectual foundations of planning. The ways in which planners approached these problems developed into major planning traditions that color the profession's response to sustainable development:

- Social reform to counteract or compensate for the "social imbalance generated by the spontaneous working of the market under the conditions of capitalist industrialization" (p. 75);
- the regulation of land use, either locally or regionally;
- the extension of the architectural tradition to metropolitan scales, leading to a "search for quality of life through the quality of spatial forms." (p. 76);
- the social model/good society tradition, representing the attempt to effect social change through planning, to implement a better society through manipulation of spatial forms or by new normative models (p. 76); and not least,
- the Utopian tradition in planning.

Planning thought on sustainable development reflects these major elements of the intellectual tradition of planning; it goes well beyond the mainstream of local or regional land use planning, as planning practice seldom does. By sustainable development here I refer to the specific concern with the natural environment as a development constraint or coevolutionary partner that is the central issue in the sustainable development literature. Those who reflect on planning have begun to explore the profession's role in defining and implementing sustainable development.

As in economics, where theorists have struggled to reconcile economic and ecological concepts, planning theorists and practitioners have labored to integrate ecology and the primary objects of their practice: human settlements and communities. Four major themes can be discerned in the literature on planning and sustainable development: *regulatory measures* (e.g., centralized, regional control of land use), *spatial solutions*, *sustainable cities*, and the (slippery) concept of *community*. The mainstream approaches described in the last chapter are for the most part variations on regulatory and spatial solutions. With sustainable cities and communities, planning thought on sustainable development moves away from the mainstream's attempts to accommodate and optimally locate development toward solutions that change the way development is done and that attempt to create development based upon a reconstruction of the human/nature relationship.

Sustainable Cities

The professional context for most land use planning activity is urban planning, so it is not surprising that much of the planning literature concerned with sustainable development focuses on ways to make cities sustainable. This focus is well-taken. Cities are at the crux of the relationship between human economies and nature; it is in cities and for cities that much of the production and most of the consumption of energy, materials, food and fiber, and water occurs, as well as the production of vast waste streams. In their 1972 volume *Only One Earth*, written for the United Nations Conference on the Human Environment in Stockholm, Barbara Ward and Rene Dubos agreed, saying that "[t]here is no single policy that deals more adequately with full resource use, an abatement of pollution, and even the search for more labor-intensive activities than a planned and purposive strategy for human settlements." (Ward and Dubos 1972, p. 180; quoted in Daly and Cobb 1989, p. 264). Planning has a long tradition of town and city design, going back to the Garden Cities of Ebenezer Howard.⁹⁸ Thus it is not surprising to see in the planning literature that one of the categories of responses to the problem posed by sustainable development is the design of sustainable human settlements.

⁹⁸ In recent years, however, planning has become less urban design-oriented for a number of reasons, among them the difficulty of creating new towns that are economically viable and attractive (Calthorpe 1986).

John Lyle (1991) sees both local and global environmental problems (“problems of depletion and pollution”) as consequences of how we have constructed our cities. In a passage reminiscent of the work of some human ecologists, he summarizes the characteristics of the nonsustainable city:

Cities of the industrial era have consciously excluded natural processes, substituting mechanical devices made possible by intensive use of fossil fuels. Rather than using the solar energy continuously falling on their streets and buildings, they dissipate it as excess heat. At the same time, they import immense quantities of concentrated energy in various forms, most of it derived from petroleum coaxed from the ground in distant landscapes. They rush the water falling upon their roofs and streets as rain out through concrete pipes and channels into the nearest bay or river and, at the same time, bring water in from distant landscapes through similar concrete channels. From outer landscapes, too, they import nutrients in the form of food, use it once, then send it out through pipes as sewage waste. (p. 17)

Lyle recommends the redesign of human settlements to more closely mimic ecological systems: “To be sustainable, that is, to break the degenerative pattern of one-way flows, future cities will have to become regenerative, that is, continuously self-renewing” (p. 20). Lyle cites three examples of what he is proposing: one involves a design to use a constructed pond and wetland system to treat wastewater in the Tijuana River Valley (Mexico and California). The second is a design for a community in California called Etiwanda that involves extensive water recycling as well as solar heating and cooling in the buildings. The third is a plan for an academic community and demonstration facility for “regenerative,” or self-renewing, practices and technologies for shelter, energy, water, waste and food.

The New Alchemy Institute on Cape Cod has been experimenting with the design and testing of small-scale, ecologically benign technologies for greater community self-sufficiency in energy and resources. John Todd, one of its founders, argues that “on a practical level, ecology can be the basis for a design science” (1986, p. 140). Todd and his colleagues have been experimenting for nearly three decades with the construction of ecological systems that he calls “living machines” that can produce food and process wastes using only solar energy as an input. John Todd, Nancy Jack Todd, and their colleagues are engaged in designing small-scale settlements “that would be beautiful, enticing, and economically feasible, and would also:

1. Provide their own power and electrical requirements from indigenous sources of energy, particularly the wind and the sun.

2. Provide year-round heating, cooling, and climate from solar-based technologies and design concepts.
3. Purify and recycle wastes, including sewage within the settlements, and reuse the nutrients in agriculture and gas production.
4. Provide a significant internal and adjacent agricultural and aquacultural base with its own economy.
5. Integrate manufacturing, housing, commerce, schools, and agriculture, and support technologies with each other into mutually reinforcing structural and social relationships (p. 146).”

Four new communities were designed by Michael Corbett (1981) to provide alternatives to unsustainable urban/suburban automobile dependent sprawl. The influences Corbett cites -- Lewis Mumford, E. F. Schumacher, Murray Bookchin, as well as Ebenezer Howard -- place him within the radical/critical paradigm ideologically. Corbett’s models of ecologically sustainable human settlements rest on twelve axioms or assumptions about human settlements (pp. 12-21):

1. All life is interconnected in complex, interdependent, self-regulating ecosystems. Humans too exist in a state of obligate dependency on the rest of the biosphere.
2. Human technology permits powerful interventions in the biosphere, for good or for ill. Substantial, irreversible, and disastrous consequences are possible if not likely; thus a conservative approach is indicated.
3. Diversity in ecosystems promotes stability and resilience; and this is true in human communities too.
4. Conversion to solar and other renewable energy sources will soon be necessary to avoid biospheric disruptions caused by fossil and nuclear energy.
5. Use of renewable resources should be based on sustained-yield principles, and nonrenewables should be recovered and re-used (recycled). A mix of resources is preferred over reliance upon a single resource (e.g., oil).
6. Human needs may be described in terms of potential levels of fulfillment. Environments can and should be designed to optimize human potential for “self-

actualization,” so the social environment is important and should be considered in planning human settlements.

7. Humans are not genetically adapted to mass society and many of the other manifestations of high technology. Smaller social groupings are better for us. Human settlements designed for cars are not good for people.
8. Humans both shape and are shaped by their environments. The design and scale of the built environment can encourage or frustrate community.
9. Humans are adaptable, but adaptation carries costs, mainly in terms of chronic stress. The noise and other stimuli of our urban, automobilized environments are deeply disturbing and inimical to human health and happiness.
10. Increasing the economic self-sufficiency of towns and regions would increase economic stability and security, both for the towns and regions and for the nation as a whole.
11. Political stability is enhanced by democratic self-determination of all people everywhere.
12. Huge conurbations, megalopoli, highly complex and interdependent technoeconomic systems that characterize modern industrial forms of human settlement are inimical to democracy and self-determination. They require every-increasing social control.

Corbett espouses a planning approach that is a slight modification of that proposed by Ian McHarg (1969): “design with nature for people.” Implementation of Corbett’s model depends upon the vision and initiative of a planner/developer. His approach is, like so much of urban planning and design, applicable primarily to *new development*, and therefore operates mainly at the margins of development, the outer suburbs, where open land is being converted. While it is true that a new town involves yet more conversion of open space to urban uses, the alternative is not necessarily undeveloped, open land but rather more low-density, automobile-dependent suburbs. Corbett does address, though relatively briefly, how existing cities and suburbs could be redeveloped to be more energy-efficient, community-oriented, humane, and self-sufficient. Basically it involves dividing them up into village-sized areas, converting some roads to pedestrian and bicycle use, freeing up open space for gardens, and retrofitting solar technologies. These observations notwithstanding, the fact remains

that Corbett's work is oriented toward changing the way new development is done. The limits of this approach can readily be seen: even if *all* new development were designed to be energy efficient and environmentally friendly, as well as community-enhancing, it still would leave unchanged the great majority of cities and suburbs in the United States. Furthermore, the communities thus formed might tend to be as exclusive as any other middle-class suburb.

The four cases Corbett presents are basically plans as blueprints. His designs are based on the natural features of the landscape and attempt to supply energy, waste disposal, and food production locally to the extent technically feasible. However, the new towns look not unlike many other suburban developments. Corbett's proposals could be considered an example of incrementalism in that they don't try to revolutionize lifestyles, but rather involve alternative designs and technologies. No "new man or woman" is posited, no values transformation is needed. While Corbett is not an environmental determinist, he clearly believes that environments can be more or less conducive to certain human qualities and values (e.g., cooperation, nonviolence).

Corbett's designs are for small-scale towns or villages, but he is aware of the regional context and the need for planning at that scale. Regional planning, he argues, must be undertaken in order to avoid the siting of infrastructure in places that will encourage inappropriate growth. At the local/town scale, Corbett is proposing synoptic planning at its most comprehensive. His plans are proposed as solutions to spatial, production, consumption, and social problems, which he views as interlocking. "Piecemeal" planning, the very definition of incrementalism, is rejected: "our tendency to try to deal with each goal or problem as if it existed in a vacuum, as if our attempts to deal with it had no impact on other values and problems." (p. 2). However, what is comprehensive planning at one spatial scale is incremental on another. The development of these new towns in a region would occur incrementally. Thus, comprehensive planning is required at one scale, incremental at another.⁹⁹

Sustainable Communities (Van der Ryn and Calthorpe 1986) focuses on the problem of sustainable human settlements, specifically cities, suburbs, and towns in the

⁹⁹ There is a superficially tempting analogy with ecosystems as described in hierarchy theory: "as a system of parts embedded in larger and larger wholes" (Norton 1991, p. 148). Watershed and other large-scale ecosystem planning and management efforts can be considered as attempts to operationalize an analogous management structure. However, the utility of this approach is limited by the difficulty of changing jurisdictional structures.

United States. The book presents the results of an intensive interdisciplinary workshop aimed at designing sustainable communities. The point of departure, the central problem for which solutions were to be proposed, was the anticipated near-term demise of cheap and plentiful fossil fuels. As with Corbett's work, the availability of cheap energy is seen as having shaped human settlements and economies in ways which are not merely unsustainable, but undesirable in themselves. However, the scope of the contributed papers is considerably broader than urban design. Local self-reliance, food systems for the sustainable city, and the reintroduction of human-scaled and human-centered design are among the concerns addressed. As the title indicates, the solutions proposed for environmental problems are designed to enhance "community." The specific goal of the workshop was

to design ways in which three prototype urban communities -- an older, inner-city Eastern neighborhood (in Philadelphia), a postwar Western suburb (Sunnyvale, California), and a piece of raw land within a growing metropolitan area (Golden, Colorado) -- could be "revised" into places that, over the next twenty years, vastly reduced their dependence on fossil fuel, and increased community self-reliance and livability (p. v)

Another design solution to automobile-dependent, suburban sprawl has been proposed by Peter Calthorpe (1989). His "pedestrian pockets" are small-town sized settlements that would be spaced along light rail lines connecting them to urban centers. As with Corbett's new towns, pedestrian pockets represent an alternative kind of growth, but growth nonetheless. They are proposed as an alternative to "the current round of suburban growth [which is] generating a crisis of many dimensions: mounting traffic congestion, increasingly unaffordable housing, receding open space, and stressful social patterns" (p. 3). This is primarily a design approach that incorporates important elements of incrementalism: while New Towns (Reston, Columbia) were planned and built (and financed) as wholes, pedestrian pockets would be allowed to spring up along new light rail lines as market forces demanded. The vision is relatively idealistic but no social engineering, no values transformation, no structural changes in the social distribution of power and wealth are involved. "In one way, Pedestrian Pockets are utopian -- they involve the directed choice of an ideal rather than of laissez-faire planning, and they make certain assumptions about social well-being. But by not assuming a transformation of our society or its people, they avoid the full label, and its subsequent pitfalls, of most utopian schemes" (pp. 19-20).

The scale at which Calthorpe's design is focused is local. Each pedestrian pocket is small (100 acres, 5000 inhabitants), being limited to the area a short walk from a light

rail station. However, their implementation, strung along a transit right-of-way, is intended to accommodate regional growth without adding traffic congestion and minimizing conversion of open space. Uses within the pedestrian pockets would be mixed, determined by market forces. The pedestrian scale would encourage walking, face-to-face encounters, community.

In contrast to the totalizing, universalizing, decontextualizing tendencies seen sometimes in the work of those in the more reductionist social sciences, planners and designers such as Corbett, Calthorpe, and the contributors to Van der Ryn and Calthorpe's *Sustainable Communities* claim a deep respect for the uniqueness of *place*. "Sustainability implies different solutions for different places," they contend (p. ix). This appreciation of the uniqueness of place makes an espousal of localism or (on a larger scale) bioregionalism (Sale 1985) natural: "Sustainability implies that the use of energy and materials in an urban area be in balance with what the region can supply continuously through natural processes such as photosynthesis, biological decomposition, and the biochemical processes that support life." (p. ix). Such an approach would seem to imply a rejection of current trends toward a deeply interdependent and interconnected global economic system (as described, for example, by Dicken (1992)), as well as a rejection of the search for ever-greater supplemental energy supplies, such as nuclear fission or fusion: "The immediate implications ...are a vastly reduced energy budget for cities, and a smaller, more compact urban pattern interspersed with productive areas to collect energy, grow crops for food, fiber and energy, and recycle wastes" (p. ix).

Much of the design work on sustainable cities is utopian in the etymological sense of "no-place"; that is, these are designs that have yet to be built. There are, however, a few examples of actually built developments designed upon at least some of the principles described above. While not attaining all the ideals of local self-sufficiency and independence from the automobile, they still represent a beginning and perhaps demonstrate a transitional urban form that advances us in increments toward sustainable development.

One such community is Cerro Gordo Ecovillage, which, according to its founder, Chris Canfield, is organized around the principles of "sustainable living" (Personal communication, February 10, 1993). Cerro Gordo is a planned community in eastern Oregon that began in 1974 when a group of people interested in environmentally sound community living formed investment groups to purchase a 1,200-acre former ranch on which to build. An extensive ecological inventory of the site, conducted by

a Corvallis, Oregon planning firm, indicated that it could support up to 2,500 people without “significant damage” to its ecosystem. Scale was an important consideration; the community’s planners wanted it to be small enough to have the feeling of a community, but large enough to have a relatively self-sufficient economy (Canfield 1981).

In 1976, the Cerro Gordo Cooperative was incorporated to provide a legal structure for community ownership of common space and for the operation of community facilities and utilities. By 1979, the community had zoning approved by Lane County, Oregon, for the first phase of development. However, conflicts between state and county planning agencies brought the development process to a halt several times during the 1980s. In 1989 the last obstacles to approval of the land use plan were overcome, and development could begin. As of 1993, only about 25 people actually reside in community, although the extended community includes a much larger number of financial supporters and future residents. Development activities are accelerating (C. Canfield, personal communication, February 10, 1993).

Cerro Gordo’s approach to sustainability in human settlements is similar to Corbett’s but with a greater emphasis on eventual economic self-sufficiency. Cerro Gordo’s guiding principles (C. Canfield, personal communication, February 10, 1993) include:

- Ecosystemic planning, based upon designing with nature, recognition of the limits to growth, and wildlife habitat protection;
- community, based upon a “life-affirming ethic” and participatory democratic self-government through the Cerro Gordo Cooperative (a democratic organization to which all residents belong and which meets to facilitate community decisions and activities);
- economic self-sufficiency, based upon organic agriculture, a diversity of companies and employment in manufacturing and service businesses;
- sustainable forestry, using a system of individual tree selection management on 450 acres of forest to produce enough lumber for 25 homes per year while preserving species diversity and ensuring a sustainable yield and employment base;
- ecological village design, which emphasizes healthy buildings, materials conservation, recycling, and solar power, as well as clustering of homes and businesses to maintain large common areas; and

- lifetime learning, which Canfield describes as including skills exchange, research and education, a community school, and global networking.

Another actually existing land development was inspired by the ideals of sustainable human settlements as expounded by Corbett, Van der Ryn and Calthorpe, and Canfield: Village Homes, in Davis, California. The planned community was designed and developed by Michael and Judy Corbett; however, it was not designed as an intentional community,¹⁰⁰ but rather as an alternative to conventional suburban development. Cerro Gordo, by contrast, is described by Canfield (1981, p. 200) as “not a commune, but neither is it a development”; it was planned and is being built by a group of people who wish to live in community.

Village Homes was designed to appeal to a broader spectrum of homebuyers who were not necessarily interested in major lifestyle changes (Van der Ryn and Calthorpe 1986, p. 62). It does, however, incorporate a number of design features that were made to reduce dependency on fossil fuels, encourage neighborliness and interaction, and reduce environmental impacts compared to a conventional suburb. The houses face south and incorporate passive and active solar energy features, which has allowed utility bills to average approximately 50% of those in a conventional development (Baldwin 1990, p. 74). Its layout accommodates automobiles but is primarily oriented toward bicycles and pedestrians. Houses have small lots and streets are narrow, allowing for a greater proportion of commons.¹⁰¹ A neighborhood association owns and maintains community gardens, a community center, a swimming pool, and greenbelts. Although the original conception called for the sale of vegetables from community-operated gardens to finance the upkeep of the commons, this was found not to be feasible; instead each of the 220 families pays a monthly fee to the Neighborhood Association. Although Village Homes is considered to be a success both in terms of fulfilling its original intentions as well as financially, it was

¹⁰⁰ By intentional community I mean a community founded with the intention of functioning cooperatively toward shared goals or in accordance with shared ideals. It is roughly synonymous with “commune.” Historically, intentional communities in American have been founded around three themes: religion, social justice and social reform, and the psychosocial growth of the individual in community (Kanter 1972).

¹⁰¹ The creation of common space other than that devoted to automobiles is an important feature of Corbett’s designs. Community needs common space. One feature of many large cities in the United States that actively undermines community is that much common space is either given over to automobiles or is rendered unusable, especially to children, by the presence of traffic.

difficult to build when it was built (due to the reluctance of lenders as well as inflexible building and design standards), and would be difficult now because the current litigious environment discourages innovation (Baldwin 1990). On the other hand, Village Homes had a major impact on building codes not only in Davis but throughout California; Michael Corbett went on to become the mayor of Davis.

Site- or town-scaled design solutions for sustainable development are limited in several respects: first, they apply only to new development (and, to the extent that they carry additional up-front costs, may be limited to only middle- and upper-class consumers); second, they depend, in a democratic, market-oriented society, upon consumer acceptability; and third, they do not necessarily take into account the regional context, either social or environmental. Too, although it has not been verified empirically, one can surmise that the environmentally friendly communities whose design is presented in works by planner/designers like Calthorpe and Corbett might be exclusive, not inclusive solutions. While adjusting the housing mix to ensure that some affordable housing is included could help, one may still question whether racial minorities and the poor would be likely to consider such communities a realistic option.

The challenge of regional equity: The limits of design approaches leave a major challenge: how to direct investment toward existing urban centers, with their problems of crime, poverty, poor schools, and deteriorating infrastructure, so that they become once again desirable places to live? It is the deterioration of the cities, according to Robert Yaro, the director of the New York Regional Plan Association (RPA), that is driving urban sprawl (personal communication, February 10, 1993). The preservation of remaining open space and ecologically important areas depends upon making cities work. The vision promoted by the RPA must be distinguished from the mainstream regional and growth management strategies described in Chapter 5 (except for the New Jersey state plan, which in some respects can be considered as implementing RPA's vision). It is distinguished from other regional and state growth management programs by its concern with equity, which it takes as a central focus. This concern goes beyond compensation for those adversely affected by, for example, downzoning; it explicitly considers the structural social disparities that drive sprawl. Yaro and the RPA recognize that without livable cities, sprawl cannot be stopped; and without social equity, cities cannot be made attractive place to live.

Sustainable development in the New York region is defined by the RPA in terms of economy, equity, and environment, which are seen as interrelated. In economic

terms, sustainable development involves positioning the region to be competitive in a global economy through investments in infrastructure (rail and telecommunications). The equity aspect of sustainable development entails revitalizing the older cities by connecting job growth (which is concentrated in the developing outer rings) with the unemployed population (concentrated in center cities). It involves investment in people (education, mental health care, housing the homeless), to reduce poverty and social stratification: much of the deconcentration that manifests as suburban sprawl is driven, according to Yaro (Presentation at VPI&SU, February 11, 1993), by people fleeing consequences of poverty: crime, poor schools, run-down neighborhoods. This is true not only of residential flight but business flight as well; security is an important issue in Manhattan's business district, which provides a fourth of the region's jobs (55 percent of New York City's jobs) and generates 40 percent of the nation's service exports.

With respect to the environment, sustainable development is defined for the region in terms of (1) protection of environment, which includes what RPA calls the 'natural infrastructure' of forests, airsheds, watersheds, rivers and coastlines as well as the countryside and its associated values (open space, aesthetics); and (2) "energy-efficient, resource-conserving metropolitan development, industry, and transportation;" effective recycling of waste *and land*; minimization of production of greenhouse gases and other damaging and toxic materials.

The recycling of land refers to the redevelopment of urban and industrial waste lands in the old urban and industrial centers of the region. For example, the Regional Plan Association of New Jersey and the Union County Economic Development Corporation, in a joint project called the Union County Land Recycling Project, recently inventoried derelict lands in Union County for redevelopment potential (*New York Times*, December 20, 1992). They found 2,515 acres of abandoned, vacant and underutilized land at 185 sites that could be reclaimed for redevelopment or ecorestoration. All the sites were zoned for industrial or commercial use; most had either been decontaminated or had never been contaminated. It is to sites like these that the recently adopted New Jersey state land use plan would direct growth while simultaneously limiting it in areas unserved by infrastructure. New Jersey's plan, described in the previous chapter, will provide a framework for implementing (to some extent, at least) RPA's vision.

The RPA approach to sustainable development of the New York City region is through comprehensive planning. Implementation would be through coordinated federal,

state, and local government action, but first a base of political support must be established. RPA is attempting to gain public support for its vision at the grassroots level by making presentations throughout the region. Particularly effective, according to Yaro (personal communication, February 10, 1993) are the graphic simulations showing the results of "typical development" vs. "recommended development." RPA's recommended development is "deconcentrated": clustered, high-density, transit friendly communities (not unlike Calthorpe's Pedestrian Pockets) in which the necessity for auto travel is minimized or obviated. The New York City region already is better served by transit and is more densely developed than many metropolitan areas, according to Yaro, but the development occurring at the region's "outer ring," without planning, will represent a move away from this pattern. By concentrating development in designated areas and redeveloping the central cities and older manufacturing areas (as in New Jersey under the state land use plan), development of the outer ring can be prevented. Regulation, overlay zoning, reserves (as in the Pinelands reserve) would be used to direct development to transit-friendly villages, or back to existing cities, where infrastructure already exists. RPA is working to build a constituency involving coalitions of environmental and community groups, convincing them that their goals could best be advanced by supporting RPA's vision for the region.

The RPA approach is "intermediate" -- instead of a stark contrast between existing practice and utopia, it offers some practical steps that can be taken in the right direction in an existing city. Moreover, the approach is not limited to new development, but is rather a strategy aimed at making existing urbanization work so that sprawl development is not needed, thus saving the rural character of the countryside in the region.

Another component of the RPA vision is environmental restoration and reclamation of natural systems to provide the services that otherwise would need to be provided by alternate means. For example, use recreated and restored urban wetland systems for polishing waste water, creating habitat and open space and saving investments on tertiary treatment.

The RPA vision for the region does not require a new environmental consciousness or radical lifestyle changes; rather, it depends on a long-term vision to guide large-scale public capital investments which in turn affect both the spatial distribution of development as well as the ability of the region to compete successfully in global markets. Indeed, the RPA sees moves toward sustainability, particularly in trans-

portation energy efficiency, as increasing the region's competitive advantage in a global economy. It does not reject economic growth, but rather seeks to guide and manage it, as well as decouple economic growth from the spatial growth and consumption of raw land that so often accompanies it now. It may not be sustainable development, but it moves in important ways toward sustainability.

There are aspects of sustainable development that it does not (and probably cannot) address directly: for example, consumerism and the need to reduce population growth. Moreover, it takes the increasingly integrated global economy as a given: rather than take defensive measures against the incursions of global markets on local autonomy, the RPA rather advocates becoming more competitive through strategic investments in telecommunications and transportation infrastructure. This decisively sets the RPA approach apart from the ecotopian communitarian visionaries, as is probably appropriate for a densely populated world capital.

Community

Given planning's social model/good society tradition, and perhaps even more its social reform tradition (Castells 1992), it is to be expected that planners writing about sustainable development should emphasize *community*. Much of the planning/sustainable development writing that focuses on urban or city planning is couched in the language of community. Perks and Tyler (1991), for example, argue that it is at the local level that sustainable development must be implemented: "This urban focus for sustainable development, and the commensurate changes in the mandates and mechanisms of local communities as the emerging forum for sustainable development decision-making, are two necessary conditions that will define the emerging arena for planning practitioners." (p. 9). They believe that sustainable development planning ought to seek to build community, and that in order to do so it must keep in mind not only the interplay of environment and economy, but also social equity and local empowerment.

The emphasis on community is a natural one both for planning and for sustainable development outside the mainstream. In the first place, as Castells (1992) points out, the tradition of planning as an activity that is brought to bear against capitalism, in order to correct imbalances generated by the market, or to protect "political space" from the encroachment of "economic space" (Friedmann 1987, p. 365) is an important one. It includes "both public sector orientation and advocacy planning on behalf of

the 'grassroots' level of society" (Castells 1992, p. 75). While neoclassical economics is based upon the concept of economic man as one who rationally pursues his own self-interest in competition with others, who similarly pursue theirs, community is based upon a recognition of people's embeddedness in social groups and our interdependence with others, even for our identity. Community, as Friedmann (p. 363) points out, is strongly associated with such concepts as "self-governance; the identity of commune as people, government, and territory; on the commonality of interests; on the historicity of the commune; and on its popular, radical tradition."

Second, in writings on sustainable development, an emphasis on community in opposition to industrial capitalism, the global market, and the consumerist society is not surprising when it is just those things that are frequently identified as the cause or essence of nonsustainability. Communities, like ecosystems, are strongly place-identified, either locally or regionally; increasingly, industries and especially capital are transnational, global in reach, flow-oriented (rather than place-oriented), and loosely attached or unattached to particular locations. The replacement of the *citizen*, a member of a political community, by the passive and dependent *consumer* has been widely decried (e.g., by Bookchin 1987; Daly and Cobb 1989). The tension between a global industrial capitalism and local communities and places (e.g., Plotkin 1987) comprises a major theme of the Radical/Critical Paradigm, as well as a longstanding and central theme of the work of some of planning's luminaries (e.g., Lewis Mumford and John Friedmann). However, given what Castells (1992 p. 76) calls "the verdict of history" regarding central planning's claim to superior rationality, as well as what might be called the cultural inertia of longstanding ideologies (particularly those that serve the interests of social elites), the burden of proof will be upon those advancing the claims of the collective over the individual, of citizenship over economic rationality.

This is, perhaps, where the issue of *scale* becomes critical. While Marxist-style central planning has been judged an historical failure, this does not necessarily prove that all planning is inferior to market mechanisms. It does argue strongly for local power over decisions that affect local communities. Harvey Jacobs (1989), in his article on localism and land use planning, suggests that there is a crisis in planning theory, a crisis that he relates to two developments in the post-WWII period: (1) a preoccupation with the *process* of planning, to the neglect of the *substance* of planning; and (2) an abandonment of localism *in theory* as a result of the critiques of localism outlined in the section on growth management in the previous chapter, and its replacement with regionalism. The dilemma, he explains, is that the movement

to regionalize land use controls has died a-borning. The reasons for its demise are both political (local governments and communities are extremely reluctant to surrender land use controls to centralized governments, be they regional, state, or federal) and theoretical (regional control is deemed to be unsatisfactory because it is “less responsive to citizen participation, invites control by other organized interests in society, and is fundamentally un-American in concept” (Jacobs 1989, p. 7)). Jacobs argues for a new localism, one that draws upon the substantive tradition in planning theory personified by Lewis Mumford in his work with the Regional Planning Association of America. This tradition argues for a decentralization of communities, both spatially and in terms of the locus of land use control.

Jacobs, however, does not assume that the concentration of power over local land use will be sufficient for the preservation of communities and of the environment. Eckersley (1992, p. 185) is similarly cautious about local communities: “I do not assume that handing over more power to local communities will necessarily make them Green, like-minded and ‘good.’ Higher order legislative assemblies, institutional checks and balances, the protection of basic political freedoms (e.g. of speech and assembly), and the rule of law are essential to prevent excessive parochialism and the abuse of power.” In Jacobs’ localist scheme, localities would retain responsibility for land use controls and environmental resource management but would be aided by collaborative and confederative relationships with higher levels of government and with other localities. Wisner (1990) also advocates a roughly similar organizational structures of local, regional, state, federal, and even global power. Such a system of organization and governance, while seeking to maximize local self-determination, would be more hierarchical than the loose confederations of relatively small-scale, maximally self-sufficient communities advocated by bioregionalists such as Kirkpatrick Sale (1985) and such eco-anarchists as Murray Bookchin. Eckersley (1992, p. 185) describes the structural organization of an “ecocentric polity” as one in which

there is a democratic state legislature (which is part of a multilevelled decision-making structure that makes it less powerful than the existing nation State and more responsive to the political determinations of local, regional, and international democratic decision-making bodies); a greater dispersal of political and economic power both within and between local communities; a greater sharing of wealth both within and between local communities; a greater sharing of wealth both within and between local communities; a far more extensive range of macro-controls on market activity; and the flowering of an ecocentric emancipatory culture.

The question is, then, how can local governments be brought to a point of greater environmental responsibility in their land use decisionmaking so that land use and resource decisions are not made by centralized institutions at a much higher level in the hierarchical order, whether they be governmental or corporate institutions?

Clearly, the only lasting solution must lie in the cultivation of a greater awareness on the part of the local citizenry of the environmental consequences of local decisions, for the locality itself, as well as others at the regional and even global scale.

Eckersley agrees with this assessment, arguing (p. 185) that "it is only in those political communities in which an ecocentric sensibility is widely shared that there will be a general consensus in favor of the kinds of far-reaching, substantive reforms that will protect biological diversity and life-support systems."¹⁰² The awakening and encouragement of environmental and social awareness becomes, then, a critical part of a strategy for sustainable development that maximizes local self-determination and democracy.

Wisner (1990) bases a community-based planning approach for sustainable development in Canada on six principles: community, equity, environment-economy integration, self-determination, diversity, and balance. Wisner (p. 23) argues for a definition of sustainable development as:

a community-based process directed toward achieving optimum states of human and environmental well-being without compromising the possibilities for other people, at other times and places, to do the same. Community-based sustainable development is a locally initiated process directed toward sustainable development within a community context.

Based on her analysis of four case study communities, Wisner articulates a process of community-based sustainable development planning that incorporates social learning and adaptation to change but that is based upon traditional values in the communities. This last strategy -- basing sustainable development on an appeal to "pre-modern" values that emphasize the continuity of the community -- is especially appropriate to two of her study communities, which include significant native populations. Such a strategy could be useful in rural, agriculture-based communities in

¹⁰² Eckersley (1992, p. 185) defines an ecocentric sensibility as one that understands the necessity of protecting large tracts of representative ecosystems; of developing a humane population policy that respect the carrying capacity of ecosystems and the rights of nonhuman species to share the earth; of rethinking and modifying human needs, lifestyles, and technologies to minimize energy and resource use as well as pollution; and of making ecologically-targeted reforms (e.g., wetlands preservation) equitable in terms of their effects on social groups, classes, and nations.

the United States, and perhaps even more so in non-western nations, but in cosmopolitan urban centers in which the last vestiges of traditional values have disappeared another tack will have to be taken.

Wisner argues that planning to support such a process of community-based sustainable development must do the following:

1. facilitate and support community-based, community-initiated activities undertaken in the interests of all community members (p. 153);
2. be democratic, participatory, encourage the articulation of values, and promote equality of opportunity;
3. be open, accessible to non-experts, facilitate self-management at the community level and incorporate vision and a commitment to social learning;
4. be systemic, synergistic, and provide for identification and analysis of economic/environmental interdependencies;
5. be cyclical, place ecological principles at the center of development planning, respect and honor traditions, and promote change in character with the community, attachment to place, and long time horizons; and
6. be inclusive enough to accommodate persistence and change, tradition and innovation (pp. 153-154).

Wisner, like Jacobs (1989) and Coates (1981) points to a number of sources of values and ideas that can inform a planning process for sustainable development: Lewis Mumford and other members of the Regional Planning Association of America; John Friedmann's concept of planning for social transformation; bioregionalism; community economic development planning and nonformal adult education; and the women's movement (p. 161). She describes a model planning process which focuses on the community; however Wisner recognizes that "there is a need for supporting political and economic institutions not only at local, but also at regional, national, and international levels" (p. 183). Local communities cannot do it alone; however, "the necessary supporting institutional structures are not in place" (p. 186). Indeed Wisner explicitly recognizes what most discussions of sustainable development tend to ignore or gloss over: that attempts to create self-reliant, autonomous, sustainable communities are likely to be met with indifference at best and outright hostility at

worst on the part of existing public and private institutions, both government and economic.

As might be expected given Wismer's planning model, especially her use of Friedmann's transformative planning concept, the role of the planner in community-based sustainable development is as a resource for local groups; a facilitator; an educator; a communicator. Far from being apolitical, this planner is passionately committed to using his or her technical skills in the service of a vision of social transformation.

One of the more visionary articulations of a sustainable relationship between human settlements and a natural environment involves the *nagisa* of Sagami Bay in Japan. Droege (1992) explains *nagisa* as "a traditional poetic expression denoting the coastal realm, literally meaning 'man and sea'" (p. 73). An area of ecological importance, severe seismic and other risks, and the object of overwhelming recreational development, Sagami Bay is suffering from too much development. Droege counsels the abandonment of obsolete concepts of development and the embracing of a strategy of envelopment. This strategy is based upon de-development of the *nagisa* and the creation of new, intelligent, environmentally benign human settlements; lifestyle changes; transformation of infrastructures; equitable redistribution of housing and recreation opportunities; and control of population growth in the service of harmony with nature. The strategy outlined by Droege is designed to be implemented over three generations.

Droege argues that living in harmony with nature will involve nothing less than the deconstruction and reconstruction of urban civilization.

If and when we achieve harmony with the sea, we will do so in part by retreating from the beach. We will transform the Sagami Bay *nagisa* into a realm of envelopment, where the predominant natural conditions are asked to serve as host only to the most valuable and least destructive manifestations of human culture. We will nurture nature. We will enjoy, as we once enjoyed, healthy shores, dunes, tidal flats, salt marshes, ponds, and maritime forests. Human uses will be restricted to fishing, limited hydroponic and other agriculture, and nondestructive forms of recreation and exploration.

Here is an articulation of sustainable development that is not community-based, but resonates with traditional values of Japanese culture and respect for place. Wismer (1990) too emphasized the importance of tradition in community-based sustainable development. It is perhaps well to recall that many qualities and attitudes associated

with at least one vision of sustainable development are those also associated with “traditional values” in this country: love of the land, a rejection of greed and materialism as the basis of human fulfillment, a concern for the community, and care for future generations.

Evaluation of Alternative Planning Approaches

The vision of environmentally benign, diverse, compact, self-reliant human communities as the sustainable society that is found in Van der Ryn and Calthorpe and Wisner, as well as (historically) the work of Mumford, Friedmann, and other planners, is broadly consistent with the radical/critical paradigm described in Chapter 2. It is an expression not only of the intellectual currents in planning thought that Castells (1992) calls the social reform and good society traditions, but also of its Utopian tradition. The immediate conceptual and “spiritual” roots of the Utopian tradition can be found in the work of E. F. Schumacher (e.g., 1973) and Lewis Mumford,¹⁰³ but they extend back much further. Reflecting a Jeffersonian democratic version of America’s potential, its justifications are both ecological and political.

The utopian tradition is alive and well in planning literature on sustainable development. As Coates (1981, p. 3) puts it in the introduction to *Resettling America: Energy, Ecology, and Community*, “the fundamental premise of the present volume is that the accelerating depletion of nonrenewable energy and natural resources, and escalating levels of environmental degradation have already set in motion changes that will force a transition to an entirely new form of human culture.” This new form, which according to Coates is now emerging, is not viewed as an inevitable future; indeed, without considerable effort, planning, and design, the future is likely to be dystopian or even catastrophic: if left to existing institutions, especially the market, the result is likely to be “a frantic effort to sustain our environmentally destructive way of life until it collapses through the sheer weight of its life-denying tendencies.” (Coates 1981, p. 3).

Many writers in this tradition, which could be called “ecotopian,” claim that a transformation of values in the direction of those that they hold is now happening or is inevitable. Carolyn Merchant, in her recent book, *Radical Ecology* (Merchant 1992),

¹⁰³ Coates (1981, p. xi) mentions Ivan Illich, Erich Fromm, Theodore Roszak, William Irwin Thompson, Gregory Bateson, Roy Rappaport, Murray Bookchin, and Wendell Berry.

seems to yield to the temptation to see in a few isolated (and somewhat shopworn) examples -- the Chipko movement, the African Greenbelt Movement -- evidence of a groundswell of support for radical ecology. Such examples must be interpreted cautiously: they are illuminating and may be inspiring, but they are also local, contingent, and essentially unconnected (except perhaps in the minds of theorists). Nonetheless, it is certainly conceivable that further perceived decrements in environmental quality or social integration could affect and indeed may now be affecting the value structure of American society in unexpected ways. There is evidence of a long-term trend toward support for environmental protection (see Dunlap 1991). Nevertheless, predicting a values transformation is a risky business: consumerism, for example, which is anathema to the kind of values represented in the literature under discussion, seems rather to be on the rise than declining, and the concentration of power and wealth in the global economy continues unabated.

The espousal of the "ecotopia" model is predicated upon a critique of modern, industrial, capitalist forms of social organization prevalent throughout the western world as ecologically unsustainable and morally, politically, and aesthetically undesirable. However, industrial socialist, state capitalist, and other centrally planned industrial forms of social organization are also rejected. They are generally seen as involving similar contradictions and failures as the industrial capitalist forms. From this point of view, Marxist-Leninist revolutionary paths to social transformation are at least as inimical to local control, democratic self-determination, and ecological sustainability as is the global capitalist system, and are incapable of producing material sufficiency.

Although local economic self-reliance is considered a virtue and even perhaps an ideal among ecotopian writers, there is a recognition of the positive and even irreplaceable qualities of extra-local markets in terms of organizing production and distribution of goods and services. There is, as well, an appreciation of the contribution to democratic ideals of the decentralized decisionmaking processes inherent to well-functioning markets. Eckersley (1992, p. 184), for example, in her construction of an ecocentric political economic order, would retain markets with a broad range of macro-controls to "break down concentrations of economic power, protect ecosystem integrity and biological diversity, and promote greater equality of social opportunity." As was seen to be necessary among citizens for responsible local control over land use and resource management decisions, an enhancement of environmental awareness among consumers would be among the preconditions for the functioning of markets in support of sustainable development. This would involve no

inconsistency with conventional economic theory: consumers are supposed to have perfect information to guide their purchasing behavior if the operation of markets is to lead to social optimality.

Chapter 7: Conclusions

This research started from the premise that the discourse on sustainable development was directly relevant and potentially of great significance to the theory and practice of environmental planning. However, there seemed to be little clarity on what it might mean, and therefore what it could imply for planning theory and practice. Worse yet, the breadth of the discourse on sustainable development makes it impossible to avoid the question of what theoretical framework is appropriate for consideration of its meaning. Thus, a major part of the dissertation (Chapters 1 and 2) are devoted to tracing the history of the concept of sustainable development and distinguishing three political/ideological frameworks with very different perspectives on sustainable development. Moreover, the theory and context of planning are also being challenged, and the nature of the challenge is outlined in Chapter 3. Chapter 4 moves the discussion of growth and sustainable development to the context of localities in the U.S. Chapter 5 describes the range of responses of mainstream land use planning to the challenge of sustainability. Finally, in Chapter 6 I review some planning thought and practice aimed at going beyond mainstream approaches by either changing the nature of development or resurrecting community at the local level. The research leads to the following conclusions:

1. *The "ecological crisis" is a sufficiently credible possibility to merit a central place in the concerns of planners.*

A review of evidence on global environmental degradation, summarized in Appendix A, led to this conclusion. Although there is no way to be certain about whether the accumulating evidence of global change and environmental degradation adds up to a likely near-term catastrophe, certainly there are grounds for concern, and there are indeed many scientists and others who are not merely concerned, but alarmed. The dangers they point to can no longer be consigned to the long term, the distant future, generations unborn. Although the exponential growth curves of models such as that used in *Limits to Growth* have been rightly criticized in terms of their implicit determinism, the critics in general base their

confidence on a flattening out of these curves, a slackening of the pace of population growth, resource consumption, deforestation, soil loss, loss of biodiversity, and land conversion. This reversal of trends has not occurred in much of the world. The editorial advisory board of the World Resources Institute's compilation, *World Resources 1992-93* (World Resource Institute 1992) broke with tradition and, in addition to reporting data, expressed "deep concern" over global trends and prospects (p. xi). The need to attend to the myriad of pressing ecological problems sufficiently quickly in the face of a demographic momentum that is likely to double the world's population within the next three to four decades is no longer particularly controversial. The time frames of potential global ecological catastrophes -- climatic shifts of unprecedented rapidity, a manyfold increase in the ultraviolet intensity in sunlight, the collapse of many ecosystems -- are well within the lifetimes of people now living. The future generations at risk are our children and grandchildren.

Sustainable development, however, does not just concern global issues, although the Brundtland Commission report (WCED 1987a), which is most responsible for publicizing the phrase, cast it in global terms. The local problems that give rise to a concern over the shape of the futures of U.S. communities and their environment, evident in the cases studied, are connected to those global issues, but the connection is necessary neither for local concern nor for local action.

2. *Despite the tremendous amount of verbiage and analysis devoted to defining sustainable development, there remains no concise, universally accepted definition, and there will be none. Rather, sustainable development is a vigorously contested intellectual terrain on which competing political/ideological perspectives are brought to bear.*

The discourse on sustainable development represents a continuation of the problem originally stated by Malthus, concerning the adequacy of the earth to provide for such numbers of people as might conceivably populate it. This concern was revived by the rise of the environmental movement and the attention drawn to the possibility of global catastrophe by *Limits to Growth* (Meadows and others 1972) and other, similar works. The roots of the present discourse on sustainable development also include a concern with the effects of growth on the periphery on tropical forests and wild animal populations, as well as the deepening problem of an uneven distribution of the benefits of modernization between the industrialized nations and the less-developed countries. Finally, in

the United States in particular, the concept of sustained yields and, more generally, the scientific management approach to conservation, have contributed to the concept of sustainable development.

Sustainable development has been aptly compared (Perks and Tyler 1991) to a Zen *koan*, a conceptual puzzle that, pondered sufficiently, can lead to enlightenment. These same authors go on to say that sustainable development “symbolically represents a system of values and a conceptual framework” (p. 6). I would argue, on the contrary, that sustainable development is not so much a concept as (like a *koan*) an open question, at least when it is considered in the abstract. The meaning of sustainability is straightforward enough, but as a modifier of development throws open the meaning of the latter term. We are, it would seem, at a turning point. What the discourse on sustainability is about is what kind of futures are possible and for whom, and what kind of future we want.

3. *The meaning of development, and therefore of sustainable development, is fundamentally political. Alternative political/ideological paradigms imply different meanings of sustainable development and therefore alternative possible futures.*

In the dominant social paradigm (DSP), development is associated with such positively valued concepts as progress, steady growth of affluence, and technological advance. At the more concrete, local level, development in the U.S. means economic growth, urbanization, and sprawl. According to the DSP, there is no real need to consciously tend to the future, because market mechanisms of resource substitution and induced technologies will solve problems before they reach crisis proportions. There is considerable historical precedent on which to base such optimism and faith in the ability of markets to mobilize human ingenuity and to push back limits indefinitely.

It is quite possible to imagine a future in which industry has become “ecologized” and in which production and consumption processes have been rendered environmentally benign. Such a future Spaargaren and Mol (1992) refer to as ecological modernization. However, it is difficult to imagine a future of ecologically benign prosperity extending to the periphery, or being able to deal successfully and humanely with the necessity of timely population stabilization, while maintaining the disparities of wealth and opportunity that characterize the current political economic system. Such a resolution of the sustainability problematic would avoid the difficult (perhaps impossible) task of more equitably dis-

tributing power and wealth. Indeed this would be its most attractive feature, in the sense that what is easiest is always attractive. But as long as current values, political arrangements, and inequalities persisted, ecological sustainability would depend on ever-more intensive environmental management, requiring ever-more centralized, pervasive, and effective means of social control, with concomitant loss of local self-determination.

Within the DSP, considerable intellectual effort has gone into identifying mechanisms for improving the functioning of markets in order to take the environment into account and improve the management of environmental-social systems. However, given the current (and likely near-term future) concentration of political and economic power in the hands of those who benefit most from continued growth, implementation of such measures is difficult at best. To the extent that reforms involve either the setting aside of areas for preservation or internalizing costs formerly passed on to the future, to marginal social groups, to the public at large, or to the environment, they will be resisted. The question of sustainability is not merely an intellectual puzzle, but a political struggle. As one critic has argued, "What is objectionable ...is not the neoclassical model of the market, but rather the reality of the market system itself. The task is not to come up with a more realistic model but to change the current economic system before it effectively destroys all higher life-forms on the planet" (Gowdy 1992, p. 103).

The two alternative paradigms, the Marxist paradigm and the radical/critical paradigm, are based on critiques of industrial capitalism. While the example of existing and former centrally planned economies offers little that points the way to a resolution of the dilemma posed by ecological limits to the growth of industrialized societies, Marxian thought does provide a number of useful insights into the nature and dynamics of social change and capitalist development. It takes as a central concern the question of what should be the limits of economic rationalization -- that is, what areas in private life, in public life, and (by extension) in the environment -- should be off-limits to commoditization, to market valuation and exchange. This is also a central concern of sustainable development thinking.

A further question on which Marxism can shed light is the question of how such limits might be set. The Marxist analysis of the role of the State in a capitalist society -- in essence, government is constrained in its ability to act counter to the interests of capital -- invites skepticism toward the notion that government regu-

lation or other actions can effectively deal with the social and environmental costs of capitalist development. A Marxist perspective also draws attention to equity concerns, particularly the distribution of the costs and benefits of development, both among social groups within a community or a nation, or between the industrial nations and the periphery. From the point of view of the radical/critical paradigm (as well as from non-Western perspectives), Marxism (like the DSP) is too wedded to European Enlightenment epistemologies, notions of progress, and concepts of the relationship between culture and nature to provide alone the basis for sustainability. Nonetheless it must be admitted that any lasting resolution of the environmental problematic in all its dimensions requires an accurate understanding of its causes, and the Marxist critique is indispensable for such an understanding.

The radical/critical paradigm takes the existence of a global ecological crisis as the basis for a thoroughgoing critique of modern society as absurd, unfulfilling, repressive, destructive, and ultimately suicidal. Although there are diverse political positions within this paradigm, the thrust is toward an emancipatory reconstruction of society that draws upon the perspectives of those who disproportionately bear the costs of the modern global economy: women, particularly those at the periphery; nonwestern cultural groups; the poor both within industrialized nations and in the "developing" nations; future generations. Progressives writing within this paradigm -- social ecologists, ecofeminists, green political theorists -- locate the roots of the current crisis in relations of dominance between social groups and between humans and nature. They argue for a reconstructed, mutually regenerative relationship between culture and nature, one that takes into account not only the right of, and necessity for, wild nature to exist, but also the possibility of a mutually beneficial synthesis of human culture and nature.

The radical/critical paradigm specifically rejects centralized, managerialist solutions, whether by central governments or multinational corporations, as being inherently destructive of local communities and ecosystems, fundamentally anti-democratic, and inimical to local self-determination. However, the reconstruction of societies along these lines would require fundamental social transformation. This in turn would depend upon or entail a broad-based change in perception and values, since (and here the radical/critical paradigm is distinguished from the Marxian) top-down solutions are specifically rejected, but the egalitarian, anticonsumerist values of this paradigm appear to go against the grain of our

consumption-oriented culture. The Marxian perspective, as well as common sense, also warn that the values of this paradigm appear to be directly opposed to the interests of large capital and multinational corporations, and in general those who benefit most from the present growth-oriented, consumerist society.¹⁰⁴

The three paradigms illuminate different aspects of sustainability. The discourse on sustainability within the DSP has tended to be limited to the analysis and attempted resolution of a basic contradiction between environment and economics, with continued growth of population driving the need for growth (e.g., WCED 1987a). Technological sustainability, the DSP's model of sustainable development, is concerned with finding ways to maintain some minimum sustainable level of ecological functioning necessary for survival in the face of projected growth of populations, while implicitly ruling out a transformation of values or directed social change. The DSP does not eschew social change -- indeed continual social transformation is a chief feature of industrial capitalism -- but intentional, directed social change is considered necessarily inferior to the change that happens "automatically" as a result of private decisions in free markets.¹⁰⁵

In light of the Marxist and radical/critical critiques of capitalism, there is reason to suspect that industrial capitalism is *per se* unsustainable. Although the possibility of an ecologized industrialism has recently been suggested (by, for example, Spaargaren and Mol (1992) and Tibbs (1993)), this would only resolve the environment vs. economics aspect of the sustainability problematic. That is, it would be confined to the sphere of production (although it would go far to resolve the contradictions between production and reproduction, production and ecosphere described by Merchant (1989)). Social inequities, both within the industrialized nations and between them and the less developed nations, would remain. Industrial ecology may be a necessary, but cannot be a sufficient, condition of sustainability.

¹⁰⁴ It is useful to recall at this point Atkinson's (1992) warning that "any headway in this direction will be made over the dead body of capitalism" (p. 5).

¹⁰⁵ There is a certain degree of obfuscation of the role of corporate (and State) planning in the ideologies of the DSP, which has occasioned such plays on Adam Smith's notion of "the invisible hand" as "the hiding hand" and "the invisible foot." Thus, continual social change is acceptable as long as it is in the interests of capital, which are necessarily short-term.

The sustainability of social institutions is arguably essential to the sustainability of the ecological systems in which they are embedded. Yet social systems which are manifestly unjust, which perpetuate gross inequities of opportunity, wealth, and access to power, which in short lack legitimacy, can only be maintained through repression and social control or through economic growth. Economic growth carries with it an unacceptable level of ecological risk. Therefore, if democratic values and self-determination are to be upheld, sustainability must be concerned with social justice and equity. This conclusion is fortified by the necessity to deal affirmatively with population control. In the absence of social justice, attempts to control population growth can only be seen as attempts by dominant groups to secure privilege and amenities.

The existence of distinct paradigms and divergent visions of desirable futures, each of which may be plausibly argued to be sustainable in some sense, shows that sustainability is ultimately a question of values -- what we as individuals and as citizens value -- and of power: whose values count?

4. *Mainstream environmental planning (which, both ideologically and epistemologically is part of the dominant social paradigm) has been challenged in fundamental ways by recent social movements and theoretical developments. Its legitimacy is undermined by its association (or complicity) with established authority, by its reliance on reductionist science and technocratic forms of governance, and by its inability to deal with complexity and rapid change.*

Postmodernist and ecofeminist critiques of scientific rationality and of structures of authority and dominance directly challenge mainstream environmental planning's claims to legitimacy and privileged knowledge. If planning is the application of knowledge to action in the public sphere (Friedmann 1987), then these critiques raise fundamental questions of what counts as knowledge, and whose knowledge counts. Moreover, the substantive theories of environmental planning are changing rapidly. Ecological knowledge and vastly increased attention to both the ecological effects of development and the causes of environmental degradation are changing our conception of the relationship between culture and nature. Finally, the social and environmental context in which environmental planning takes place, and in which it has taken its present form, is being transformed in the 1990s. The scale of human activity is reaching a similar order of magnitude to biospheric flows and phenomena. There is a contradictory movement of increasing concentration of wealth and power in the multinational cor-

porations and within elites in the industrialized countries, simultaneously with increasing demands for democracy and self-determination throughout the world. A number of planning theorists have pointed to these and other recent developments as evidence of a crisis in the theory and mission of planning (Friedmann 1987, Jacobs 1989, Castells 1992).

5. *Development at the local level is nearly synonymous with growth and urbanization.*

Trends in land use in the United States toward greater sprawl, segregation of social groups, devaluation of public space in favor of the automobile and private spaces, and dereliction of landscapes raise grave questions of sustainability, either in global or in local/regional terms. Growth machines in many localities promote policies that encourage economic expansion, population growth, and sprawl. There are also exogenous influences related to the global economy or the military that have shaped the development of localities. Too often, land and the communities that dwell on it are treated as commodities to be used and abandoned when it no longer is profitable.

6. *Mainstream approaches in land use planning have tended to pursue spatial resolutions of what is seen to be a contradiction between development and environment.*

Mainstream environmental planning approaches reveal a conception of sustainable development as holding the line on environmental degradation by marginally altering development practice, and as preservation of certain valued ecosystems and environments, achieved by channelling growth elsewhere. Mitigation and ecological restoration can reduce development impacts, especially offsite, although on-site development and nature tend still to be mutually exclusive. In some cases there is attention to equity concerns (for example, in requirements for affordable housing to accompany growth management programs), but these are often conceived narrowly, in terms of the equity considerations of landowners. Mainstream land use planning takes place primarily in the context of local government, so fundamental social change and fundamental challenges to development are eschewed. The mainstream planning model has planners acting as technical experts maintaining a stance of objectivity and political neutrality, although in practice planners are mediators, communicators, and advocates as well.

7. *There is an enduring tension between democratic self-determination as enshrined in local land use control and the need to consider ecological and social systems at a regional and even global scale.*

In the United States, local governments maintain significant power to regulate land use. Regional approaches to land use planning, as well as growth management, rely heavily upon a surrender of some land use control by local communities, although there may be considerable negotiation involved. While local controls over land use are preferable in terms of democratic values and self-determination, they have been rightly criticized as inadequate in scope. Local land use control, especially when local government is dominated by growth interests, leads to a kind of tragedy of the commons. A regional (and even global) perspective is also necessary if localities are not to engage in various forms of externalization of costs and displacement of problems. However, regionalization of land use control may serve the interests of large corporations and metropolitan regions at the expense of local communities.

One possible solution that respects local self-determination but also regional and global ecological and social contexts is a responsible localism. Environmentally and socially responsible land use decisions by local government would depend in turn on the active involvement of a well-informed, responsible, and empowered citizenry. Here again, as in so many areas related to fundamental social dilemmas, one confronts a tangled web of complexly interacting interdependencies. Active citizen involvement in local (or any other level) government has become all but impossible for ordinary people. Time is increasingly at a premium when both husband and wife work and people are distracted by mindless entertainments and consumerism. Staying informed takes an investment of time and effort that not everyone is capable of. Finally, apathy, impotence, and despair, the feeling that one's efforts will not make a difference, are all too frequently reinforced by sham public involvement ceremonies for decisions that have already been made by power brokers in closed meetings.

Given democratic forms of government, planners interested in promoting sustainability (and planners ought to be interested in promoting sustainability!) must work to broaden the base of participation in land use decisions and the many decisions that crucially affect land use, such as transportation and infrastructure decisions. Although planners may be personally committed to ecological sustainability, social equity, and even emancipatory social change, they

must take care to prepare the groundwork by building coalitions, networking, and working to influence public opinion.

The involvement of responsible, concerned, and active citizens is no guarantee that local decisions will reflect positions favored by environmentalists, preservationists, or radicals. Even when the social and environmental costs of urban growth are easily recognized, many will favor incurring those costs for the prospect of increased mobility, likelihood of secure employment, or improved services. This is particularly likely to be the case in slow-growth or no-growth rural areas. Where this is the case, the challenge for planners becomes to seek creative solutions that accommodate growth while preserving ecological, aesthetic, and other valued landscape attributes.

8. *Alternative approaches to land use planning for sustainable development focus on design solutions and the resurrection of community at the local level.*

Sustainable development in the sense of ecologically sensitive, community-oriented design is a traditional concern of planning. A vision of environmentally benign, diverse, compact, self-reliant communities -- in some ways utopian or ecotopian but in all likelihood technically achievable -- can be found in the work of such seminal planning thinkers as Lewis Mumford and John Friedmann. In many respects the designs that have been proposed for sustainable communities in the ecotopian tradition would fulfill what are widely considered to be technically necessary conditions for sustainability: energy- and resource-efficiency, substitution of renewable resources for nonrenewables, efficiency in the use of land. However, many design approaches are limited (though still potentially very useful as an alternative to suburban sprawl) in that they are only applicable to new development, and do not fully address social equity considerations. Their implementation would reduce the need for continued displacement of environmental costs (associated with resource extraction and waste disposal) to the periphery and to the global commons, but would not actively address the need for redressing the gross disparities of wealth between the developed nations and the periphery, or even between suburbs and inner cities within the United States. Although it might seem self-evident at first glance that design approaches could not address disparities of wealth, their use within a framework of recapitalization and redevelopment of cities, not to serve the interests of global capital, but rather to empower impoverished communities, could go far towards breaking the cycle

of poverty and despair in which many are stuck. Here, however, the crucial variable is not design but political values.

A few planning theorists, focusing on social transformation rather than alternative design and technical aspects of sustainability, have proposed planning processes that would intentionally try to move communities in a direction of increased self-sufficiency, self-determination, and nurturing of community as a counter to the trend toward cultural solipsism, alienation, and individual encapsulation within controlled, safe environments (e.g., air-conditioned automobiles) at the expense of common environments. Such a strategy, running counter to the interests of large-scale capital (e.g., state- or national-level real estate developers, extractive industries such as mining or lumber), would encounter resistance not only from large-scale capital but also from local development interests allied with large capital. Perhaps it is only resource-poor areas of little interest to global markets, be they rural or urban, that would provide a fertile ground for the development of largely self-sufficient communities. Even in such derelict places it is questionable whether such “free” communities could be tolerated.

The role of environmental planners in such a process would be to support and empower local groups with their technical expertise; convey technical information to citizens about the environment so that their choices will be more responsible; and provide a conceptual frame and context for issues affecting the community and the local environment. There is, moreover, a deconstructive role for environmental planners in countering the claims of those who would promote growth, sprawl, and environmentally irresponsible decision making.

Only through a process of social learning at the local level can the dilemma of responsible local control over local land and resources be resolved. As long as local citizens are poorly informed as to the connections between their political and personal choices and environmental degradation (and erosion of community); as long as they believe that progress is inevitable and that someone else will take care of any problems that arise; as long as the costs of development are hidden by displacement and obfuscation -- then there can be no environmentally sustainable development except through increasing regulation and loss of local control.

The planner's role would be far from neutral: he or she would advocate and argue for decisions that enhance the potential for decentralization, for maximum

local autonomy and self-sufficiency, for equality, and for freedom. The planner would encourage grassroots environmental movements, especially “place-defense”; educate; and point out connections between social and economic oppression and environmental degradation, which are often apparent when siting of hazardous facilities, highways, and reservoirs is in question. Finally, the planner would communicate to frame issues in such a way that the connection between moral, social, and ecological necessity is clear.

9. *Sustainable development, then, poses choices for planners. They can work toward technological sustainability, incrementally accommodating and mitigating development from within the institutional context of government. They can also work to empower citizens, build community, subvert existing relations of dominance, and deconstruct ideologies of growth as progress, thus acting as midwives for the birth of a future in which not only survival but freedom and justice are possible.*

These choices are posed starkly, but are perhaps not so mutually exclusive as they might seem. Reality is always more complex than our models of it. Choices affecting land use and other aspects of community development do not come with signposts reading “this way to sustainability,” “this way to disaster.” Much depends on the context in which the planner works as well as his or her personal and financial situation, but important too are the values and commitment of the individual planner, as well as his or her assessment of the challenges facing communities. For example, although perhaps idealists interested in social transformation are overrepresented among those who choose planning as a vocation, there are many planners who are skeptical of environmentalists’ claims, who are untroubled by what others see as social injustice and inequity, and who are quite comfortable with an instrumentalist view of nature: who subscribe, in short, to the dominant social paradigm. Such planners would be most comfortable working toward technological sustainability. By doing so they would strengthen existing institutions and authority and perhaps help to bring about an intensively managed and controlled future, sustainable or not. They should, however, recognize that political neutrality regarding development -- the apolitical stance of the technocratic mode of planning -- is impossible, a delusion at best and an instance of bad faith at worst.

Planners cannot effect social transformation. Social movements are what bring about social transformation. Planners who are interested in social transformation

toward an ecologically sustainable, just, and emancipatory future must recognize that transformation is necessarily a gradual process. If they espouse values that are too far from the mainstream they risk being marginalized and ineffectual, and perhaps even provoking a reaction. The sheer inertia of long-held beliefs cannot be underestimated, nor can the importance of perceptual lags (i.e., perceiving a situation in a way that is no longer appropriate).¹⁰⁶ To avoid repressive measures and preserve democratic values while at the same time moving society towards a lasting resolution of the three “crises” of sustainability (survival, participation, and cultural character), planners must work to broaden the base of participation in the process by which social choices are made, to counter spurious claims, disinformation, and obfuscation perpetrated by growth interests, and to raise awareness of moral, social, and ecological consequences of public and private choices.

¹⁰⁶ A good example of the latter is the longstanding tradition of refuse disposal in Appalachia. For many years, trash was dumped in rivers or over the edge of an embankment. This was perhaps a rational means of disposal when trash was not as voluminous as it is now, and when the waste stream was comprised of mainly paper, ferrous metals, wood, and glass. When the composition of the waste stream changed in both content (plastics, hazardous wastes) and volume (more trash per capita), aesthetic, public health and safety, and ecological consequences were aggravated but the practice continues.

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Appendix A. Summary of Evidence of Limits to Growth

The purpose of this section is to present an overview of evidence of the environmental degradation that is the basis for concerns over the sustainability of industrial civilization. The scientific literature is filled with ominous signs that the biosphere is unraveling in the face of this economic expansion, and there are many indications that civil society is suffering serious erosion as well. The consequences of economic (urban, agricultural, industrial) and population expansion appear to threaten the civil, ecologic, and resource bases of further growth. Yet there are also encouraging signs that in some areas at least, environmental quality is improving and that new technologies (including design and management) are rising to the challenge of sustainability.

Interpreting the data on global environmental change is not a process for which any completely satisfactory criteria or methods exist. The problems include too much data of questionable reliability on too many processes; inadequate to nonexistent knowledge of how trends on one indicator (e.g., forest cover or carbon dioxide content in the atmosphere) will affect others processes (a problem exacerbated by the existence of lags of unknown duration between cause and effect); inadequate to nonexistent knowledge of overall system properties such as thresholds and discontinuities; processes of change that outstrip indicators and our ability to interpret them, or, conversely, processes that are so slow that no one notices them. Nonetheless, some effort has to be made despite the caveats and difficulties. The stakes in this debate are almost unimaginably high.

Evidence of accelerating environmental changes resulting from human activity is increasingly difficult to ignore. Many of these changes are local or regional in effect, and taken out of context could be viewed as mere inconveniences, temporary setbacks or necessary sacrifices to be made good in more prosperous times. At times they have even been viewed positively, as indications of human social progress, or

local economic development. However, the context in which they appear is rapidly changing to one in which there is practically no place on earth capable of supporting human settlements that has not experienced deforestation, introduction of exotic species, loss of biodiversity, soil erosion, water quality degradation, acid precipitation, or some similar decrement in environmental quality. Thus the backdrop against which such local changes must be assessed is not one of a largely unaffected global ecosystem, and the cumulative impacts of such degradation can no longer be seen as negligible. Cumulative impacts to our life-support system (the "biosphere") and its individual components, such as changes in atmospheric chemistry and loss of biodiversity, are now perceived as potentially global in consequence; that is, their consequences may affect every locality on the earth. In fact, nearly all global environmental changes are the cumulative effect of many changes at the local or, at most, regional level.

In the following sections, I summarize the evidence of degradation of major components of the biosphere: the land (deforestation, soil erosion, urbanization and conversion of natural ecosystems), water, the atmosphere. These summaries are based on a more extensive review of the literature conducted in 1991-1992. They are followed by a consideration of certain properties of the biosphere as an ecosystem that underscore the risk of global ecological disruption that accompanies the present course of the world political/economic/technological system. While the separation in the following discussion of land from water, of water from the atmosphere, and the atmosphere from the earth's waters is artificial and even misleading conceptually, nonetheless it is unavoidable for the simple reason that one cannot speak of everything at once.

The Land

Deforestation

The value of forests to humankind scarcely needs to be pointed out. Forests, besides providing a sustainable stream of commodities (water, recreation, wood, game) that are economically valuable, also provide environmental "services" that are essential -- flood reduction, air purification, provision of a carbon sink to keep carbon out of the atmosphere, habitat for biodiversity, regional climate modulation. For many, the existence and availability of forests is important aesthetically and spiritually as well.

It is difficult to characterize the condition of global forests and the impact of modern industrial economies upon them, for a number of reasons. First, there are very large regional variations in rates of deforestation, reforestation, and in stresses upon forests. Second, the extent of “original” forestation in most areas can only be guessed at. Finally, there are many variations in forest types and their ecosystem functions and values: if a hectare of old growth forest is cleared and then replanted as a monoculture, what is lost and what is gained?

Deforestation has come about through the intentional activities of clearing for agriculture, logging, and urban/industrial development, and as the unintentional consequence of pollution, as in the case of some forests in Europe. According to historian Clive Ponting (1990), forest cover in western and central Europe has fallen from 95 percent to 20 percent; in ten thousand years China’s forest cover has been reduced from 70 percent to 5 percent of the land area. Williams (1990), however, points out that in the developed world in this century, deforestation has been halted and even reversed (21 million square kilometers in 1985 as compared to approximately 20 million in 1900). New England, for example, was originally largely forested but by the early 20th century had been mostly converted to agricultural uses. With the decline of agriculture in the region, forest is reclaiming open land in many areas in the region.

Postel and Ryan (1991) estimate that as of the late 1980s, the remaining area of primary (old-growth or climax) forest is about one-fourth of its original extent. They estimate that current forest cover, which includes both primary forest and reforested areas, is less than 70 percent of original forest cover.

In the post-World War II years, a combination of technological, economic, and political factors has led to an acceleration of deforestation in developing countries, where most (about 60 percent) of the remaining forests are found. Much of the remaining forest in the world is tropical. According to Myers (1988), there is a general consensus that less than 9 million square kilometers of tropical forest remains out of the original, estimated to have covered 15 million square kilometers.¹⁰⁷ Furthermore, the remainder has been subject in recent decades to rapid deforestation. Williams (1990) reviews a number of estimates of the rate of deforestation in tropical areas published between 1978 and 1986; they ranged from a high of more than 2 percent per year to

¹⁰⁷ Lugo (1986), citing Lanly (1982), argues that reforestation and regeneration offset somewhat less than half of the area deforested according to Myers (1980).

a low of one-half of one percent per year, with the four most recent studies all estimating between 0.53 percent and 0.61 percent. These figures mask large regional variations. For example, Central America during the past 40 years has seen a large proportion of its forests cleared for cattle production (Williams 1990); the clearing of forests in the Amazon region has attracted worldwide attention in recent years.

While overall rates of deforestation in the developing nations are alarming, the deforestation rates reported for some countries scarcely seem possible. In Ethiopia, for example, it has been reported that forest cover fell from 30 percent to 4 percent of the land in 28 years, and is probably less than one percent by now; Thailand's forests, which covered 53 percent of the country in 1961, had been diminished by nearly half by 1986 (Myers 1989, cited in MacNeill and others, 1991). The destruction and conversion to arable land of India's vast forests began under colonial rule (Tucker 1988) but continues practically unabated today (Myers 1988).

Williams (1990) points out that there are enormous problems of interpretation associated with estimates of deforestation. The objects of study (e.g., forests, land conversion) are not defined consistently, so that figures are not comparable and cannot be aggregated. There is as yet no uniform, systematic, and objective measure of the extent of forest, and most studies have not been conducted over long enough periods to provide dependable trend data. Finally, as Williams (1990, p. 191) points out, "[o]f one thing we can be certain, however: identical evidence can be interpreted in either a pessimistic or an optimistic light."

In the developed nations of the North, the prospects for forests seem brighter, yet there are reasons to believe that even the remaining forests there are threatened. Old-growth, primary forest has been practically extirpated from the industrialized nations (Postel and Ryan 1991). Meanwhile, although much previously cut land has been reforested, mismanagement and external assaults such as acid precipitation threaten forests throughout the developed world. In Europe, 35 percent of forests are damaged, dead, or dying as a result of air pollution, primarily acid precipitation (ECE 1989; cited in MacNeill and others 1991). Over half of West Germany's forests are dead or dying (WRI 1986). Prospects for remediation in some regions of Europe are poor because the forest death (*waldsterben*) is caused by soil chemistry changes, including leaching of nutrients as well as mobilization of aluminum, apparently from acid precipitation over long periods (Halbwachs 1983).

Although Europe seems to be the most severely affected, damage from air pollution has been documented in forests in the United States and other industrialized nations, and it is feared that the marginal damage now observed in some areas, such as the Great Smokies, will be followed by forest decline similar to that in northern Europe (Eager and Adams, 1992).

Global climate change resulting from changes in atmospheric chemistry of human origin could have a major impact upon forests throughout the world (Shands and Hoffman, 1992 in press; Clark 1991). These impacts are predicted to be more severe at the mid-latitudes and the great northern forests, if, as expected, warming occurs to a greater degree in those regions. The impact of global warming, together with destabilization of established weather patterns, may be nothing short of disastrous. Although climate fluctuations have been numerous over the millenia, they have occurred slowly, and species have had time to respond by shifting their ranges. The predicted warming will happen hundreds of times faster than any known previous event (Schneider 1989a), and because of their lack of mobility, forests will likely suffer massive diebacks, or at best require human intervention and management on a massive scale (Peters 1988). However, predictions based on hypothesized global warming must be interpreted cautiously, as they involve predictions based upon predictions, with compounding uncertainties.¹⁰⁸

Soil Erosion and Land Degradation

The extent and significance of soil erosion, desertification, and other forms of land degradation (e.g., salinization) have long been the subject of sometimes heated debate. The terms of the debate in some respects are analogous if not identical to those of the sustainable development discourse in general. Those who see salvation in innovation, human ingenuity, and technological advance through induced innovation (e.g., Simon 1981, Boserup 1981) tend to see soil erosion and desertification as non-problems, solvable in principle if not solved in fact. On the other side of the debate are those who cite instance after instance of enormous losses of soil per unit land area as proof that a crisis exists (e.g., Eckholm 1976). These analysts, who do not fall neatly into a single category such as "neo-Malthusians," see desertification as spreading inexorably throughout many parts of the world, and believe that therefore world food production, both present and future, is threatened. Postel, for exam-

¹⁰⁸ The uncertainties involved in predictions of global warming are discussed later in this chapter.

ple (1989), cites U.N.E.P. figures as showing that every year, "practically" irreversible desertification occurs on 6 million ha. worldwide, with another 20 million ha. losing their economic value for food production through desertification.

Blaikie (1985), examining the debate, concludes that the empirical evidence is too unreliable to be conclusive one way or the other. He persuasively argues that the question is deeply ideological, not technical, having to do with "the assumptions about *future* agricultural technology which are made when assessing tolerable soil losses" (p. 17) as well as whose soil losses count. It is not a question of whether technology exists to maintain agricultural productivity in the face of soil erosion and land degradation (it does), or to halt or reverse them, but rather of whether this technology will ever be available to those marginal producers in areas where land degradation is perhaps most serious and most immediately threatens livelihoods. As Blaikie puts it, "the belief that agricultural technologies will be developed for marginal, ecologically fragile areas, *and* for the marginal poor farmers and pastoralists that live there is ...a trifle heroic." (p. 18).

Blaikie's concern here is mainly with the on-site impacts of land degradation; however, there is considerable evidence the off-farm impacts may be at least as significant (Clark 1985; Duda 1985). Moreover, some of the induced innovations that keep productivity high in the face of soil erosion and loss of fertility are problematic in themselves. In general, such innovations have relied upon inputs of fossil fuels, both for mechanization and for fertilizers, various pesticides and fertilizers, and irrigation. These technologies are in many settings either not sustainable in themselves (due to, for example, limited supplies of fossil fuels, either absolutely or relative to farmer's ability to pay for them), or have secondary effects that make their long-term viability suspect.

Irrigation, for example, is often associated with salinization, alkalinization, and waterlogging of cropland. This association is especially true for large-scale developments. Simmons (1989) asserts that 30-80 percent of all irrigated lands are affected by "major environmental difficulties" (p. 258). Irrigation, besides its on-field effects, can have far-reaching hydrologic, biological, social, and public health effects associated with water withdrawals and impoundments (see, for example, Worthington, 1977; Reisner and Bates, 1990). Among the numerous instances of the latter that one could cite here are the destruction of the sardine fishery caused by the construction of the Aswan High Dam on the Nile; the spread of schistosomiasis in some areas; the water quality and habitat degradation from return flows with high concentrations of dissolved

solids, nutrients, and agricultural chemicals (Conservation Foundation 1987, p. 93); the displacement of native communities and wildlife for impoundments on the upper Missouri and in the Amazon Basin; and the decimation of numerous anadromous fisheries in the United States through interference with spawning runs.¹⁰⁹

Many of the other technological innovations associated with modern, industrial agriculture appear to have consequences that may limit their long-term utility. Use of pesticides and herbicides has damaged aquatic and other ecosystems in many areas. These chemicals may be carried off fields by atmospheric drift or volatilization, or they may be carried away in runoff, either by dissolving in water or by attaching to soil particles that are then entrained. Drifting herbicides are suspected of contributing to forest decline in some areas, and pesticide drift has resulted in bioaccumulation in aquatic ecosystems. Contamination of groundwater in some areas by biocides or nutrients from fertilizers, particular nitrogen compounds, has raised public health concerns.

Urbanization and Land Conversion

This century, and especially the past fifty years, has witnessed a tremendous surge of population into cities, and a simultaneous, almost explosive growth in the size (both in human numbers and in areal extent) of cities. This expansion has been especially true in the developing nations in recent decades. The population of Third World cities is now doubling every ten to fifteen years (Lowe 1992), both through high birth rates and immigration from the countryside. Mexico City's population is expected to pass 25 million before the end of the century, and that of Sao Paulo to exceed 20 million by that time (United Nations 1985). The growth to date of these and other cities in the Third World is placing nearly unimaginable strains on water systems, sewage and waste disposal systems, health and public safety organizations, housing -- in short, nearly all the systems that make urban life possible. Air pollution is another consequence of rapid urbanization and modernization of Third World cities. Mexico City has experienced air pollution episodes regularly in recent years so severe that use of private automobiles has had to be curtailed drastically to prevent widespread morbidity and even mortality. The consequences of additional growth

¹⁰⁹ The subject of this section is evidence of environmental degradation, so the discussion necessarily centers upon the adverse impacts of various technologies. It scarcely needs to be pointed out that irrigation agriculture has carried with it many benefits, including productive use of otherwise unproductive lands as well as the food and fiber produced.

projected for the next several decades in these cities are difficult to imagine, particularly in view of the fact that 30-60 percent of the populations in these Third World cities lives in illegal squatter settlements (Lowe 1992).

In the United States, while both overall population growth and growth of metropolitan areas is considerably slower, there is still consistently higher growth in metropolitan areas than in rural areas (Starsinic and Forstall 1989). Furthermore, within U.S. metropolitan areas, most of the growth since 1950 has been outside the central cities. By 1986, almost sixty percent of those living in metropolitan areas lived in the suburbs. Suburban growth, frequently manifested as sprawl, increases capital costs for infrastructure provision, increases the energy costs of both space heating and transportation, and encourages rapid conversion of nonurban land surrounding central cities. The per capita conversion of land to urban use around many U.S. cities increased greatly from 1960 to 1980, especially in the latter decade. For example, the density of population on urbanized land was about 19 persons per ha. in Detroit in 1960, but the density of population on land urbanized around that city over the next 20 years was less than one fifth of that at 3.3 persons per ha. In Denver, density in 1960 was 18.6 persons per ha.; density of land urbanized over the next 20 years was less than half that (calculated from data in Newman and Kenworthy 1989).

These patterns of growth have contributed to a growth in the percent of U.S. land designated as "metropolitan" from 5.9 in 1950 to 16 percent in 1980 (U.S. Department of Commerce, Bureau of the Census 1986). Estimates of the area under urban use in 1980 range from 19 million to 25 million hectares (Conservation Foundation 1987 p. 203). Rural land in the mid-1980s was being converted to urban and transportation uses at an estimated rate of 364,225 hectares per year (Gustaffson and Biles 1984).

Because of the historical tendency for settlements to locate on flat land and near water bodies, much of the land being converted to urban uses is good agricultural land. Concern over loss of farmland is high in many places, and in a number of states programs have been implemented to help preserve it from urban development (Daniels 1990). However, there is considerable debate over whether this constitutes a serious national problem or merely a local one (see, for example, Brown and others 1982, and Simon and Sudman 1982).

Given that the United States currently enjoys food surpluses, it can scarcely be argued that the removal of agricultural land from food production through urbanization constitutes an urgent national problem. However, there are other values associated

with open space, be it agricultural or forested, that are lost in the process of urbanization: aesthetic, recreational, and habitat values. Land converted to either urban uses or agriculture (or, for that matter, land degraded by industrial emissions or by some of the less enlightened practices of forestry) represents land largely lost to existing ecosystems. Richards (1984) estimates that between 1860 and 1978, 851 million hectares (over two billion acres) of land were converted to cropland worldwide. This represents, as environmental historian Donald Worster puts it, "one billion hectares of forests and grasslands that had been teeming with biological complexity, much of which was lost in the simplifications of commercial agriculture." (Worster 1988, p. 15). In most places, the land with the greatest biological productivity is also the most productive agricultural land, and so one can expect the best land (gentle slopes, deep rich soils) to have been cleared first and most thoroughly appropriated.

Human appropriation of the biological production of the earth, whether through land conversion, "mining" of renewable resources, harvest of natural populations or grazing livestock on unconverted land, or through degradation of land so that biological production is reduced or eliminated (as in desertification) is reaching unprecedented levels. Vitousek and others (1986) estimated the human impact on net primary production of terrestrial ecosystems. Net primary production represents the net conversion of mostly solar energy by "primary producers" or autotrophs -- mainly plants. Primary producers represent the energy basis for all heterotrophs (consumer and decomposer species) and are thus fundamental to all ecosystems. Human "co-option, diversion, and destruction" of organic material represents about 40 percent of net primary production in terrestrial (exclusive of marine) ecosystems. This is primary production that is no longer available to support natural ecosystems and, according to the authors, "clearly contributes to human-caused extinctions of species and genetically distinct populations." (Vitousek and others 1986, p. 372).

Wright (1990) followed up on this assertion by calculating the human impacts of the flow of energy through natural ecosystems and then estimating the percentage of species thought to be endangered as a result. Using a different method than Vitousek *et al.*, Wright calculates the percentage of global energy fixed by natural terrestrial ecosystems prior to significant human impacts to have been about 2800×10^{18} joules. Contemporary human activity either diverts (through appropriation) or prevents (through habitat degradation) 20-30 percent of that energy from flowing through natural ecosystems. Wright then calculates that two to seven percent of all species are endangered by this level, and that expected growth in human activity will result in endangerment or extinction of three to nine percent of species in the next decade.

The observed number of endangered and extinct species is roughly consistent with his predicted results.

These two studies raise several questions. If, as the Brundtland Commission (1987) and some other commentators have concluded, a five-fold expansion of the global economy (at a minimum) will be necessary to achieve some minimum acceptable standard of living for the 10 billion or so people expected to be living on the earth in 30 years, and human activities already account for 20 to 40 percent of net primary production, does this mean all of NPP will be appropriated by humans? What parts of ecosystems are being deprived of their "share" through human appropriation (e.g., top predators only? all trophic layers above the first?)? Does this mean that ecosystems will collapse, or that there will be a substitution of human-useful animals and plants in niches used by animals and plants currently of no economic value? That is, is it simply a matter of substituting, say, cows for buffalo, or are there more complex interactions involved? What are the possibilities for intelligent and sensitive substitutions that keep natural ecosystems relatively intact? What are the possibilities for recycling of human wastes back into ecosystems in a way that returns productivity? Vitousek and others (1986) seem to view human appropriation as strictly unidirectional, and to the extent we bury our wastes (and our bodies) in nonbiodegradable landfills/graves this may be correct; nonetheless it could be otherwise. Finally, neither Vitousek and his co-authors nor Wright discuss the issue of whether the displacement of natural ecosystems by human-managed ecosystems (such as gardens) represent a loss to nature. That is to say, Vitousek and Wright seem to posit a sharp divide between human-appropriated systems and natural systems, one which would seem to exclude any sort of co-evolutionary view, such as that of Dubos (1980).

The loss of biological diversity resulting directly or indirectly from human activity is accounted as one of the most serious "environmental problems" facing humanity today. Wilson (1988) estimates the total number of species to be between 5 and 30 million. Because neither the number of species present at the beginning of the industrial era (i.e., around 1800) nor the current number are known, it is difficult even to guess at the number of species lost since then. Nonetheless, there are many reasons to believe that recent rates of extinction have been far greater than those prior to 1880 (Wilson 1988). Forests, especially tropical forests, are both species-rich and have a high level of endemism -- that is, a high proportion of species that exist nowhere else (Erwin 1983); as described earlier, forests throughout the world, again especially tropical forests, are under great pressure. Estimates of deforestation that

can be expected in future vary, but there is no indication that current trends will be reversed in the near future. Obviously, when a forest is cleared, burned, or replaced with monocrops, the original ecosystem is either destroyed or replaced with a managed or simplified one.

Other unique ecosystems and ecosystem types in every corner of the world are under sustained assault. For example, according to Richards (1984), the draining of wetlands worldwide dramatically increased after 1870 and continues at a "brisk rate" today. In the United States, drainage of wetlands for conversion to agriculture was encouraged by congressional acts of 1849, 1850, and 1860 that conveyed nearly 26 million hectares of wetlands to the states for privatization and reclamation, as well as by numerous federal and state policies. As a result, the lower 48 states have lost over half of their original wetlands, and in some areas the proportion is much higher (Dahl 1990).

Grassland and similar ecosystems (savannas, prairies) throughout the world, estimated to cover about one-fourth of the total land surface (Shantz 1954), have been subject to widespread conversion to cropland or appropriated for grazing of livestock. Discussing man's impacts on natural grasslands, Looman (1983) concludes that "little, if any, of the grasslands have escaped man's influence." Risser (1988) characterizes the loss of grasslands in the United States resulting from cropping and overgrazing as "massive" (p. 179), resulting in significant reduction in biodiversity.

As both human populations and populations of livestock increase throughout the world, grasslands and other ecosystems are coming under increasing pressure, leaving them susceptible to erosion, desertification, and biological simplification. Population projections for the coming decades provide no reason to suppose that these trends will not continue or intensify, and there is reason to believe that the decline of both species and populations has accelerated in the past decade. As Ryan (1992, p. 9) put it. "Difficult as it is to accept, mass extinction has already begun, and the world is irrevocably committed to many further losses." Conservation biologist Michael Soule's summation of the situation is deeply disturbing: "For the first time in hundreds of millions of years significant evolutionary change in most higher organisms is coming to a screeching halt. ...Vertebrate evolution may be at an end." (Soule 1980, p. 166, quoted in Manes 1990).

The alteration of terrestrial ecosystems by human agency has undoubtedly resulted in the loss of many natural ecosystems and species. Whether this represents a threat

to continued human existence or to the progress of human welfare is extremely problematic and subject to divergent interpretation depending primarily on the value system of the interpreter. These value systems will be further explored in the next chapter.

The Waters

Every component of the hydrologic cycle has felt the impact of human activity. Even the chemical composition of rainwater has been affected by a variety of human activities, most notably combustion of fossil fuels, resulting in acid rain. Falling to earth, acid precipitation can cause a range of consequences from subtle alterations of soil chemistry and root zone ecology to the nearly complete elimination of higher forms of life from lakes.

Surface waters bear the brunt of the human assault on terrestrial ecosystems, plus such direct insults as the introduction of toxic materials and other pollutants; direct and indirect channel modifications; changes in the flow regime; alterations of habitat structure in freshwater ecosystems; introduction of nutrients; modifications in energy inputs into streams; introduction of non-native species; and over-harvesting of fish and other species.

Practically every land-disturbing activity results in sediment reaching the nearest stream, frequently in quantities sufficient to seriously disrupt local freshwater ecosystems and estuaries and coastal waters. For example, temporary sedimentation accompanies nearly every major construction project. Although it is often dismissed as a temporary environmental impact, in some watersheds there is nearly continuous disturbance over long periods as urbanization proceeds.

Sedimentation from urbanization and agriculture has been identified as one cause, perhaps the primary cause, of the decline of submerged aquatic vegetation in the Chesapeake Bay, a decline that has resulted in serious impairment of commercially important fisheries. Sedimentation often results in spite of the application of “best management practices” in agriculture and construction. Sediments abrade macroinvertebrates and attached algae in streams; block the penetration of light, thus decreasing energy available for photosynthesis; carry phosphorous and other nutrients in excess; adversely affect visibility, altering predator-prey relations; and change habitat quality and availability for both macroinvertebrates and fish (Duda 1985; Berkman and Rabeni 1987; DeLong and Brusven 1991).

The use of surface waters and groundwater for crop irrigation increased substantially from 1950 to a peak in 1978; from 1978 to 1987, per capita irrigated area dropped slightly (Postel 1990, citing U.N. Food and Agriculture Organization estimates). Worldwide, in 1986, approximately 250 million hectares were irrigated, or 17 percent of all cropland. The total amount of water that is withdrawn from aquifers and surface waters to water crops has been estimated to be over 3,000 cubic kilometers (Postel 1990). The total runoff for all land areas in the world is estimated at 40-47,000 cubic kilometers (Cox 1989), so the water withdrawn for irrigation as a fraction of total runoff is not insignificant. Leaving aside for the moment the depletion of groundwater (Beaumont 1985) and surface waters in some areas, the environmental consequences of irrigation are in some cases severe (see Reisner and Bates 1990; Simmons 1988 pp. 258-260). Return flows from irrigation frequently contain concentrations of salts and agricultural chemicals sufficiently high to adversely affect both aquatic and related ecosystems. This possibility was tragically played out at the Kesterson wildlife preserve in California. Reisner and Bates (1990, p. 44) report that the U.S. Department of the Interior recently warned of the imminence of similar consequences at a score of western wildlife refuges if irrigation return flows are not diluted with additional fresh water.

In the United States, real progress has been made on many rivers and lakes in improving water quality in the two decades since the passage of comprehensive federal water pollution control legislation in 1972. Federal funding made possible the construction of sewage treatment plants, discharges of certain toxics were reduced or halted, and a beginning was made at controlling nonpoint source pollution. As a result, many water bodies improved to the point that they could once again support fishing and recreation. The dramatic increase in whitewater recreation, for example, was made possible in part by improvements in water quality.

At the same time, water quality in many streams has either not improved or has deteriorated. Despite the comprehensive scope of the regulatory system designed to implement the federal Clean Water Act, many communities still have inadequate sewage treatment capabilities and discharges of toxic materials to surface waters continue. In 1987, 554.7 million pounds of toxic pollutants were discharged to surface waters in the U.S. (U.S. GAO, 1991). Toxics include organic chemicals, metals, and biocides. They are introduced into surface waters by both point source discharges and through both urban and agricultural nonpoint source pollution. Besides posing human health risks that are in some cases substantial, toxics can be lethal to aquatic organisms. In subacute concentrations, they can cause tumors and reproductive

disorders in fish, as well as genetic defects in shellfish and other wildlife (U.S. GAO, 1991).

Nonpoint source pollution is just beginning to be seriously addressed in the United States. Runoff from urban streets is generally shunted directly into the nearest stream or river; it typically contains both toxics and concentrations of conventional pollutants on the same order of magnitude as untreated sewage (Novotny and Chesters, 1981). Agricultural runoff may contain concentrations of various biocides either in solution or bound to sediment, and streams in agricultural areas are likely to be degraded both in terms of water quality parameters and ecosystems (Lenat, 1984).

Another nonpoint source of surface water pollution that is proving extremely difficult to control is that from atmospheric deposition, either as "acid rain" or by dry deposition. Atmospheric deposition has been found to be a major source of nitrogen in the Chesapeake Bay, while in the Great Lakes, drift from aerial application of pesticides has been found in fish tissues.

Not only are surface waters in the U.S. subject to continuing pollution despite federal laws to the contrary, but little is being done to restore those waters identified as being impaired by toxic pollution. According to the U.S. General Accounting Office, despite a clear congressional mandate, the Environmental Protection Agency and the states have failed to identify many waters in need of restoration. Only a relatively small number of the 18,770 impaired waters that were identified are targeted for more stringent regulatory controls. The failure to confront the issue of restoration may be related to the cost of restoration, which in some cases can be enormous, and to the fact that in some cases restoration is not technically or financially feasible (e.g., removal of kepone from the James River in Virginia) (U.S. GAO, 1991). Monitoring and enforcement of the federal National Pollutant Discharge Elimination System have been inadequate (U.S. GAO, 1991). The National Research Council's Committee on Restoration of Aquatic Ecosystems recently called for a large-scale program to restore degraded surface waters in the United States, which they said was needed promptly to prevent permanent damage to aquatic and related ecosystems (National Research Council 1991).

Despite continuing problems, efforts to improve water quality are probably further advanced in the U.S. than in practically any other country. This generalization is not meant to encourage complacency here but rather to suggest that in many countries,

indeed wherever urbanization, industrialization, or modern agriculture dominate the landscape, surface waters may be expected to be in as poor or worse condition.

Water quality is just one aspect of the health of surface waters, especially streams and rivers. *Biological integrity*, one of the goals of the Clean Water Act, depends only in part on maintenance of water quality. It is affected as well by construction of dams and impoundments, modifications to the flow regime, alterations of habitat structure such as channelization, and modification of energy inputs in the form of both organic material and sunlight. It should be recognized, but is often not, that headwater streams, including intermittent ones; wetlands; floodplains; and channels all make up an integrated hydrologic/ecologic system. Too often, changes are made to serve limited objectives that result in degradation of the resource. The extent of channelization, dredging, snagging, damming, and deforestation of riparian corridors worldwide is not known. Even in the United States, comprehensive data are difficult to find. However, there is limited information that is suggestive of the magnitude of alteration of streams and rivers. The United States had 5,338 large dams (greater than 15 meters high) by 1982; the number has probably not increased much since then. In 1950, there were 5,196 large dams in the world; in 1982, there were 34,798. Much of the increase was in China, which, faced with a burgeoning population and a shortage of cropland, built 18,587 large dams during the period (van der Leeden and others, 1990). Large dams and their associated impoundments can have major, and frequently adverse, impacts upon aquatic, riparian, and related ecosystem, as well as upon local communities (Cox 1987; Canter 1985). The decline of fisheries is likely to be the most visible ecological consequence of large dam construction; the anadromous fisheries of the Pacific Northwest in the United States, which have been decimated by construction of multiple dams in the Columbia and other river systems, are a good example. Other, more subtle impacts result from changes in water temperature, removal of sediment and organic material, and channel scouring and bank erosion below the dam.

Channelization includes widening, deepening, and straightening of channels; levee construction and bank stabilization; and clearing, snagging, and dredging. It is undertaken for drainage, irrigation, navigation, and flood control. River channelization is extensive in many countries but the history and geography of channelization are poorly documented (Brookes, 1988). In the United States, 320,000 km of rivers have been modified over a period of 150 years, according to Little (1973). Leopold (1977) estimated that approximately 26,550 km of river in the United States underwent modification after passage of the Flood Control Act of 1936. England and

Denmark, two countries for which detailed data are available, have considerably greater proportions of channelized streams than the United States (Brookes, 1988). The environmental impacts of channelization depend on the type and location of project as well as a number of other factors, but both individually and cumulatively they can and frequently do result in significant degradation of biological integrity as well as of chemical and physical parameters of the water body (Canter, 1985).

Modifications to the flow regimes of rivers and streams result from channelization, water withdrawals, impoundment and operation of hydroelectric facilities, and land use changes in watersheds. Channelization and conversion of land from forested to agricultural or urban/impervious is likely to result in faster runoff, higher flood peaks, low flows that are more frequent and last longer, and higher water temperatures. The effects of water withdrawals and operation of dams and hydroelectric facilities depend upon many factors and range from insignificant to beneficial to some organisms to catastrophic in their impacts upon other organisms and aquatic communities.

By far the greatest quantity of freshwater in the United States occurs as groundwater. The amount retrievable through current technologies is estimated to be at least six times the total amount stored in surface lakes and reservoirs (Canter and others, 1987, p. 3). Groundwater in much of the United States comprises the water source for most rural households as well as a great deal of irrigation, especially west of the Mississippi. Groundwater also feeds surface waters (except in the case of "losing streams", where the opposite is true), making up that part of stream and river flow that is not supplied by direct runoff. As a percentage of total water used, groundwater varied among the states in 1975 from one percent in West Virginia to 86 percent in Kansas (Lehr 1981).

Groundwater in many places is being depleted through withdrawals that exceed the rate of discharge, a situation that amounts to mining groundwater. In the United States, the proportion of irrigated land that is watered by pumping groundwater at rates greater than recharge has been estimated at approximately one-fifth -- more than 4 million hectares (Dickason 1988, cited by Postel 1989). In China and India, too, there are indications that irrigation farming is using groundwater at rates in excess of recharge (Postel 1989, p. 20).

Such a strategy may be justifiable in order to make use of aquifers with little or no recharge, but is obviously not sustainable indefinitely. Overpumping in unconsol-

dated aquifers near coastlines has resulted in saltwater intrusion, making expensive treatment necessary to obtain drinking water.

In the United States (and, no doubt, in much of the industrialized world), contamination of groundwater has rendered supplies unfit for human use without treatment in many locations. Some groundwater is naturally brackish or otherwise unpalatable. Nonetheless, there are numerous existing and potential sources of groundwater contamination. "Point sources" of contaminants include mining and mineral extraction, industrial operations, injection wells, underground storage tanks, and solid and hazardous waste landfills. Because they are more easily identified and controlled, such sources tend to be subject to regulation under state and federal statutes. The control of diffuse, widespread sources of contamination that are intimately linked with land development and urbanization has been left largely to local governments, and is often inadequate.

Septic systems are responsible for widespread groundwater contamination in areas not served by central sewerage and water supply. In terms of the amount of contaminant discharged and proximity to wells used for domestic water supply, onsite septic systems must be reckoned a very serious threat to groundwater quality. Agricultural practices are a source of contaminants as well, both through diffuse application of pesticides, herbicides, and fertilizers over large areas, and through concentration of untreated animal wastes and improper disposal of agricultural chemicals.

While existing and potential sources of groundwater contamination are numerous and widespread, data on the actual extent of contamination are not readily available. The U.S. Geological Survey analyzed data from 124,000 wells tested over 25 years and found that 20 percent had nitrate-nitrogen levels above 3 ppm, suggesting contamination from human activities (Madison and Brunett 1984). Sources of this type of contamination include septic systems and agricultural fertilizers. Another USGS study (Moody and others 1986, cited in Moody 1990) found that, while large amounts of potable groundwater are available in the U.S., there are many localized areas in which groundwater contains high concentrations of toxic metals, organic chemicals, and petroleum products. This study also found that there are "large regions" (Moody 1990, p. 178) in which contaminants from nonpoint sources such as septic systems, agriculture, or urbanization "are present in many shallow wells throughout an area" (Moody 1990, p. 178).

As the ultimate recipient of nearly everything that is put upon or washed off the land, as well as of much of what is put into the air, the oceans might be expected to exhibit signs of pollution. Although signs of degradation can be found even on the high seas, serious pollution is seen primarily in coastal areas and in estuaries. Coral reefs, coastal zones, and estuaries constitute the most biologically diverse and productive of marine estuaries; they are also under intense pressure from pollution, direct habitat conversion, and harvesting. Ray (1988, p. 36) asserts that the coastal zone "is being altered just as fast as the tropical forests." The moribund condition of the Chesapeake Bay, the result of decades of pollution of rivers feeding the Bay, land development, and air pollution, is unfortunately not unique among estuaries.

Even some seas appear to be in decline. For example, the Mediterranean receives about one-fourth of the total amount of oil discharged into the world's oceans, exclusive of major spills. One hundred twenty coastal cities discharge sewage and industrial wastes into the Mediterranean, and about one-fourth of the coastline has been found to suffer either from ecological damage or human health hazards (Abel 1989). The North Sea is heavily polluted and subject to intensive fishing as well, but the ecological significance of these impacts remains unclear (Simmons 1989).

The global significance of marine pollution is difficult to assess, since relatively little is known about marine ecosystems as compared with, for example, freshwater ecosystems. The incidence and severity of pollution are highly variable (Abel 1989). Sewage causes severe damage in some coastal areas but its impact seems to be largely local. Despite their high visibility, oil spills appear to have only local and ephemeral impacts, and anthropogenic oil seems to be only a small fraction of hydrocarbons entering the oceans from natural sources (Abel 1989). Toxics, especially persistent ones, seem to have the potential for ocean-wide detrimental impacts; Patin (1982; cited by Simmons 1989) estimated that large scale contamination of the marine environment had reduced the annual production of nekton (animals able to navigate at will, rather than merely drifting) by about twenty million tons.

The Atmosphere

Changes in the atmosphere have lately excited a level and a breadth of concern seldom if ever approached by any other environmental issue. The atmosphere is that macro-component of the biosphere that is most literally a "global commons." Although there are local and regional air quality problems, which will be discussed

below, the deterioration of the stratospheric ozone layer and the accumulation of carbon dioxide and other greenhouse gases are macro-level changes with truly global potential consequences.

Deterioration of Stratospheric Ozone

Anxiety over the “ozone hole” seems to approach that generated by the nuclear arms race, mainly by virtue of its immediacy. The deterioration of the stratospheric ozone layer, an entirely anthropogenic phenomenon, is real and measurable. We have seen images, computer-generated but nonetheless convincing, of the “hole” over the Antarctic. In 1988, a National Aeronautics and Space Administration (NASA) team reported that atmospheric ozone had declined by 1.7-3.0 percent between 1969 and 1986 (NASA 1988, cited in Shea 1989). More recent measurements by NASA suggest that an ozone hole will form over populated regions of the northern hemisphere within the next decade (*Science News* February 8, 1992). Thus, the thinning of the ozone layer as a result of releases of synthetic chlorofluorocarbons and other compounds (Rowland 1980) is not a questionable prediction based on complex computer models; it is not a hypothesized event happening in the distant future. It is upon us.

With the depletion of stratospheric ozone, the penetration through the atmosphere of middle range wavelength ultraviolet radiation, known as UV-B, is enhanced. Some of the consequences of increased UV-B at ground level are predictable, others are not. In terms of human health, numbers of excess deaths from skin cancer attributable to increased exposure to UV-B are relatively easily predicted, as is incidence of cataracts and other eye diseases (EPA 1987). Effects upon human immune systems are feared but there is insufficient knowledge at present to predict what the full consequences will be (Shea 1989). Nonetheless, both local and systemic immunosuppression have been shown to result from UV irradiation in humans and animals at much lower doses than those required for carcinogenesis (Longstreth, 1991).

Both plants and animals will also be affected by enhanced UV-B penetration of the stratosphere. Enhanced UV-B in doses consistent with some projections of ozone layer deterioration has been found to increase susceptibility of wheat to certain diseases (Biggs and Webb 1983), increase susceptibility of certain plants to other environmental stresses (Teramura 1983), and interfere with the motility and photoorientation of some microorganisms (Hader 1983). UV-B adversely affects a number of microorganisms in the marine environment, either through cell damage

or by interference with photosynthesis (see, in general, Calkins 1982). Although not enough is known about marine ecosystem to be able to predict even qualitatively, much less quantitatively, what the likely impacts of increased UV-B are, it is reasonable to suppose that biological productivity of marine microorganisms might be adversely affected (Calkins 1980). Since these organisms make up the base of the food chain in marine ecosystems, it is also reasonable to suppose that there might be adverse effects throughout these ecosystems. Such a prospect is indeed alarming.

Accumulation of Greenhouse Gases and Climate Change

It is the spectre of climate change as a result of the accumulation of greenhouse gases that is perhaps the most dramatic reminder of man's power to change the planet. It may eventually demonstrate either our ability or inability to act to change our own social and economic systems, even to avoid catastrophe. The accumulation of carbon dioxide and some other trace gases in the atmosphere, if it proves to be a problem, will be a difficult and possibly even an intractable one since our modern industrial civilization is largely built upon the combustion of fossil fuels.

The theory that the combustion of coal or, more generally, fossil hydrocarbons, and the concomitant buildup of carbon dioxide in the atmosphere would lead to a global warming is far from new. The Swedish physicist Svante Arrhenius (1896) predicted such a result nearly a century ago. The basic theory is relatively simple: carbon dioxide is relatively transparent to short wave radiation from the sun, but absorbs longwave radiation going out from the earth and radiates some of it back, resulting in a net warming of the earth-atmosphere system. It was considerably more recently, however, with the publication of articles by Revelle and Suess (1957) and Bolin and Eriksson (1959) that the problem began to receive serious attention. It had been assumed that any possible increases in carbon dioxide emissions would not accumulate in the atmosphere but rather would be absorbed by the oceans. Revelle and Suess, together with Bolin and Eriksson, convincingly showed that this might not be the case.

The ultimate fate of excessive atmospheric carbon dioxide is still the object of intense study. The global carbon cycle is enormously complex and apparently some important components are very sensitive to temperature changes. Recently published studies, for example, indicate that in the short term, plants and soils may release carbon dioxide in response to global warming, thus exacerbating global warming rather than damping it as had been previously thought (Smith and Shugart 1993;

Oechel and others 1993). These studies are not definitive, however, and many questions remain. The situation is similar with respect to the role of the oceans as carbon sinks.

The attention focused on the problem by their analysis led to serious attempts to measure atmospheric carbon dioxide, and it was indeed found to have increased significantly. Based on analyses of air samples trapped in glacial ice, the level of carbon dioxide in the atmosphere just prior to the beginnings of the modern age (ca. 750) was about 275 ppmv (Bolin 1986).

It is now indisputable that the concentration of carbon dioxide in the atmosphere has risen significantly as a result of human activities. But carbon dioxide is not the only gas capable of passing short-wave but absorbing long-wave radiation. Water vapor, methane, nitrous oxide, oxone, and chloroflouorocarbons (CFCs) are also known to have this property.

The sources and sinks of atmospheric methane are not completely known but include many biogenic and anthropogenic activities and processes. The relative abundance of methane in air samples from polar ice cores taken in Greenland correlates well with the approximately exponential increase in human population over the past three centuries (Bolle and others 1986, p. 160). Human activities that contribute to methane accumulation include rice cultivation, ruminant husbandry, mining and extraction of fossil fuels, and biomass burning (Bolle and others 1986). Nitrous oxide and tropospheric ozone are also formed by both "natural" and human activities, and atmospheric concentrations of both are increasingly rapidly (Bolle and others 1986).

Chloroflouorocarbons (CFCs) are a class of compounds of exclusively human origin. Produced as solvents, spray can propellants, and for use in refrigeration and the production of plastic foams, CFCs have gained notoriety since their accumulation in the atmosphere was seen to be a source of free chlorine that could destroy stratospheric ozone (Molina and Rowland 1974). More recently the role of CFCs (Ramanathan 1975) and other chlorinated and fluorinated hydrocarbons as greenhouse gases has been assessed (Ramanathan and others 1985). The CFCs F11 and F12 are thought to be the worst offenders. They are photochemically decomposed in the stratosphere, but slowly: it is estimated that F11 and F12 will last 80 and 170 years, respectively, in the atmosphere, all the while acting to catalyze ozone destruction. Although recently international accords have been enacted to curtail

emissions of CFCs¹¹⁰ because of their impact on stratospheric ozone, they will continue to accumulate for years and will remain in the atmosphere for decades.

There is a growing consensus among scientists that some degree of global warming is likely as a result of the buildup of carbon dioxide and other greenhouse gases in the atmosphere. How much of a warming will occur, how soon, and what the effects on regional climates and other climate variables such as precipitation are unknown. According to Schneider (1989b), there are multiple sources of uncertainty in predictions of the climate response to greenhouse gas accumulation:

1. Uncertainty in projecting emissions of carbon dioxide and other greenhouse gases. Future carbon emissions are a function of demographic, economic, technological, and social/political variables, each of which is subject to a range of possible futures.
2. Uncertainty in projecting the resulting atmospheric concentrations of those gases. The sources of this uncertainty include the rate of water exchange between deep, intermediate, and surface ocean waters; the sensitivity of biological primary production to changes in atmospheric composition; rates of decay of organic matter in soils; biomass burning; forest exploitation/reforestation; change in the chemical composition of seawater and its ability to dissolve inorganic carbon; and the rate of burial of organic matter in sediments (Bolin 1986, p. 149).
3. Uncertainty in predicting the global climatic response to the projected atmospheric concentrations. The global climatic system is so complex that it cannot be understood in a way that would allow prediction. There are numerous interactions among the major components of the system, the nature of which is simply not known. For example, a warming of the atmosphere would increase evaporation from the oceans, which might increase the amount, brightness, or height of cloud cover. The change in cloud cover in turn would result in a net increase in the earth's albedo, so that more solar energy would be reflected than is currently the case, with a dampening effect on average global temperatures. This series of events is an example of a potential negative feedback effect; there are many potential positive feedback effects that would amplify an initial warming

¹¹⁰ The Montreal Protocol on Substances that Deplete the Ozone Layer was enacted in 1987 and implemented in 1989. It was significantly strengthened in June 1990 after evidence appeared that stratospheric ozone was disappearing more rapidly than had been supposed.

(e.g., a large-scale melting of polar and glacial ice would diminish the amount of solar radiation reflected and contribute to further warming).

4. Uncertainties in projecting regional climatic responses to a global average temperature change. There is some evidence that atmospheric warming would be uneven latitudinally, with greater increase at higher latitudes (Dickenson 1986), but in general there is little confidence in less-than-global predictions of any of the current climate models.
5. Uncertainties in estimating the environmental, economic, social, and political consequences of global and regional climatic changes.

It is not difficult to see that the uncertainties at each step add to the uncertainty at the next step: the uncertainty is cumulative. The atmospheric concentrations of greenhouse gases are partly a function of their emissions. The global climatic response is a function of the atmospheric concentrations. Ecological and social responses both depend upon and influence emissions, greenhouse gas atmospheric concentrations, global responses, and regional responses.

For what it is worth, it is estimated that the increases in atmospheric carbon dioxide and other trace gases from the beginning of the industrial era have resulted in a global warming of between 0.3 and 1.1 degrees C. If, as seems a real possibility, carbon dioxide and other trace gases continue to increase to a level equivalent to a doubling of the concentration of carbon dioxide, the resultant global warming would be between 1.5 and 5.5 degrees C (Dickinson 1986). More recent estimates put the likely range at 3.5 to 5.2 degrees C (Wetherald 1989). Wetherald, in the same review, points to substantial agreement among the state-of-the-art general circulation models (GCMs) that over the central United States, winter temperatures would rise from 4 to 6 degrees C and summer temperatures from 3 to 6 degrees C.

Since global warming as a result of carbon dioxide and trace gas accumulation has become accepted as a real possibility, even a probable future condition, studies elaborating the consequences of global warming have proliferated. Such studies are not predictive; the reliability of regional-scale estimates of climate change is not sufficient to allow prediction. There are many studies that examine the sensitivity of ecosystems to changes in climatic variables such as temperature and precipitation by making use of scenarios. Warrick and others (1986) identify three approaches to scenario development in these studies: the use of GCM simulations (despite their regional-scale inadequacies); use of past climate data; and the selection of arbitrary

changes in climate variables. Reviewing the potential impacts of climate change on both managed and unmanaged ecosystems, Warrick and others (1986) conclude that the uncertainties are large enough to accommodate either a pessimistic or an optimistic outlook. Much depends upon the *rate* of change. Increased carbon dioxide, *ceteris paribus*, enhances growth in many plant species and could increase the efficiency of trees' use of water in the short run, enhancing overall forest productivity. Long-term responses to climate change have historically included forest migration. Shugart and others (1986) examined possible forest responses to climate changes and increases in the atmospheric concentration of carbon dioxide. They concluded that climatic changes consistent with a doubling of atmospheric carbon dioxide would be sufficient to produce "substantial intermediate and long-term changes in the composition, size and location of the forests of the world," (p. 511) especially the natural forests of the high latitudes. Changes in regional precipitation patterns could have a large impact on forest ecosystems. Peters (1988), assessing the likely impacts of a global warming of even moderate proportions, speaks of "potentially disastrous consequences for biological diversity." He points out that many natural populations of wild organisms will be unable to exist in their present ranges, but will be unable to migrate because of the fragmentation and isolation of populations due to human activities. The rate of change will be unprecedented as well, and relatively immobile populations (of trees, for example) may be unable to migrate quickly enough to survive. Lovejoy (1989, p. 56) believes that "there is little question but that climate change, ironically fueled by the destruction of biological diversity, will cause a major biotic disaster" involving the loss of "the major part of our biological heritage."

Pollution of the Atmosphere

Practically every human activity in an industrial economy entails, either directly or indirectly, some emission of pollutants into the air. Although air pollution has been called an "eminently solvable" problem (French 1990), and substantial progress has been made on some fronts, in other cases (e.g., ozone in some U.S. cities) solutions have been elusive. Past solutions have sometimes simply displaced the problem, for example by constructing tall stacks to disperse pollutants. New sources have proliferated as fast as control systems can keep up with them. In the U.S., for example, commendable progress has been made to reduce emissions from individual automobiles, but both the number of cars and the number of miles driven per year have

increased in many places to such a degree that the reduction of total emissions has been only modest.

In the United States, air pollutants have been grouped for regulatory purposes into “conventional” air pollutants and toxics. Conventional air pollutants, for which in the U.S. ambient air quality standards have been established, include nitrogen dioxide, sulfur dioxide, carbon monoxide, hydrocarbons, particulates, lead, and ozone. Nitrogen oxides are formed when air is heated sufficiently. Considering that air is heated during any of the combustion processes that power the lives of citizens of industrialized nations, it is not surprising that nitrogen oxides are ubiquitous pollutants. The U.S. EPA estimated that in 1984 over 20 million metric tons of nitrogen oxides were put into the atmosphere in the United States. Combustion of fossil fuels, especially coal in electric generating plants, results in the formation of sulfur dioxide in very large quantities (over 20 million metric tons in 1984 in the U.S.) (EPA 1986). Carbon monoxide results from incomplete combustion of fuels, and the primary source is motor vehicles. Although carbon monoxide emissions in the U.S. fell from 1970 to 1984, due mainly to improved vehicle technology, they still added up to over 70 million metric tons by 1984 (EPA 1986, cited in Conservation Foundation 1987 p. 64). Hydrocarbons comprise mainly unburned (and therefore wasted), volatile fractions of gasoline and other fuels. About 20 million metric tons of volatile organic compounds were emitted in the U.S. in 1984 (EPA 1986). Particulates are small-diameter particles, either solid or liquid, formed by a variety of industrial activities. Lead, a highly toxic metal, was a particulate of special concern until its use in gasoline was prohibited. Other metals (e.g. aluminum, zinc, copper) still comprise a significant and troublesome fraction of airborne particulates (for a review of studies, now somewhat dated, see Canter 1986, pp. 137-161). Total suspended particulates in the U.S. declined between 1970 and 1984 to less than 10 million metric tons due to both reduced industrial activity and installation of emissions controls (EPA 1986).

Toxics are regulated in the U.S. under emissions standards rather than ambient standards because they are thought to represent a special threat to health or the environment. Substances regulated as toxics include such toxic metals as mercury, cadmium, and arsenic; certain toxic gases such as chlorine; and many organic chemicals. The regulatory distinction between conventional pollutants and toxics is somewhat artificial (as, indeed, are the regulatory distinctions between environmental media).

Another way to distinguish air pollutants is into primary and secondary pollutants. Primary pollutants are those substances that are put into the air as a result of human activities. Secondary pollutants result from chemical transformations in the atmosphere of combinations of primary pollutants. Smog is a mixture of such secondary pollutants as ozone, nitrogen dioxide, peroxyacyl nitrates, aldehydes, and acrolein that form when hydrocarbons (such as uncombusted fuels) combine with nitrogen oxides to form photochemical oxidants.

Acid rain, or more properly acid deposition, is one of the better-known air pollution phenomena. Sulphur dioxide and nitrogen oxides, which are byproducts of coal or oil/oil derivative combustion, are transformed in the atmosphere and fall to earth as nitric or sulfuric acid, or fall as dry acidifying compounds. Many other compounds and elemental pollutants are found in precipitation as well, however. Acid rain is an example of a local problem being transformed into a regional or international one by displacement. Before the advent of widespread environmental concern, large polluting operations such as smelters and some industrial operations emitted large quantities of pollutants directly into the air. These would fall to the ground close to the plant and in many cases wreak environmental havoc and damage human health. When this began to be seen as a problem, the response was to develop the means for dispersing the pollutants over a broad area: tall smokestacks. For example, the very large metal ore smelting operation at Sudbury, Ontario, emitted an estimated 270,000 metric tons of sulfur dioxide plus a large quantity of metal particulates at ground level prior to 1928. Local forest ecosystems were devastated. The construction in 1972 of a 381-meter "superstack" effectively protected the operation's immediate environs: although annual emissions of sulfur dioxide through that stack alone were 886,000 metric tons per year, only 1.3 percent of the total sulfur emission was deposited within 40 kilometers of the smokestack (Freedman 1989, pp. 30-36). The rest contributes to a regional acidification of precipitation.

The various compounds discussed above are considered waste byproducts, primarily of combustion processes. There are also numerous pesticides (fungicides, insecticides, nematocides, and herbicides) put into ambient air intentionally that can have deleterious unintended effects when they drift from their target areas (Glotfelty 1978) and fall out as either wet or dry deposition.

The local, regional, and international consequences of air pollution are serious. Human health is impaired by a broad range of pollutants and photochemical oxidants including carbon monoxide, sulfates, lead, nitrogen oxides, nitrates, ozone, and tox-

ics. For example, recent research has uncovered permanent lung damage in children in the Los Angeles area as a result of exposure to a mix of pollutants and ozone. Impacts of acid rain on forests and aquatic ecosystems have been described elsewhere in this chapter. Air pollution also causes billions of dollars worth of corrosion damage to the built environment, and causes the deterioration of archaeological, historical, and cultural items of great significance (e.g., the Parthenon, the Taj Mahal). Finally, visibility is impaired by various pollutants, primarily sulfate aerosol particles, graphitic soot, and nitrogen dioxide. The decline in visibility in the popular Shenandoah National Park demonstrates that this phenomenon is not confined to urban-industrial areas.

Air pollution is an almost unimaginably complex problem. The complexity comes from several sources: the sheer number of compounds involved; their interactions with each other and with soils, water, and biota; the number and scope of activities and sources of air pollution; the geographical dispersion of sources and ambient pollutants; and the centrality of some of the polluting activities (above all, the burning of fossil fuels) to “civilization as we know it;” i.e., industrial development.

A Global Crisis?

The evidence of environmental degradation presented above is an overview. The literature on every individual aspect of environmental degradation is voluminous and rapidly expanding. The interconnectedness of global environmental degradation, population increase, and industrialization has been noted by many. The Club of Rome refers to it as a *problematique* (King and Schneider 1991); the World Commission on Environment and Development, or Bruntland Commission, in its 1987 report (WCED 1987a) refers to the “global crisis” of environment and development. However, there are various interpretations possible. In Chapter 2, I describe three “paradigms” for interpreting the various pieces of evidence that, taken together, are seen by some as a global crisis.

Vita

Richard Allan Roth was born in Allentown, Pennsylvania in 1950. He graduated from the University of Virginia with a B.A. in Economics in 1972. After a ten-year career in information management consulting and technical writing in the Washington, D.C. area, he attended Virginia Polytechnic Institute and State University in Blacksburg, Virginia, earning a Master of Urban and Regional Planning degree in 1989. Mr. Roth was awarded a Presidential Fellowship to support his doctoral work at Virginia Tech.

A handwritten signature in black ink that reads "Richard Roth". The signature is written in a cursive style with a large, sweeping initial 'R'.