Introduction: Competing Approaches to Sustainability: Dimensions of Controversy*

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Following the report by the "World Commission on Environment and Development" (the Brundtland Commission) in 1987, ideas of sustainable development, sustainable societies, and "sustainability" have gained increasing prominence in political and scholarly discourse about environmental policy.[1] The struggles of various actors in the policy arena now often appear to involve active attempts to co-opt the ideas and language of "sustainability" for particular ends (Ophuls and Boyan 1992; O'Connor 1994). Thus this volume, in extensively updating and expanding earlier work (Kamieniecki et al. 1986), is unified in its attempt to think through longstanding controversies (i.e., "flashpoints") about environmental policy that, if not resolved, will present serious obstacles to achieving sustainable societies.

To accomplish this, the book presents a blend of normative and empirical policy discussions. The underlying purpose is to explore the relationship between policymaking and the past, present, and future exercise of political power. While this discussion is carried on within each chapter, it also forms the "bookends" of the volume. On the one hand, scholars have the luxury to articulate more fully normative visions of "sustainability," and this introductory chapter explores the controversies that have arisen around these visions. On the other hand, political actors operate under empirical constraints that lead to the

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fragmentation of issues and interfere with attempts to reach any normative vision. The concluding chapter assesses major flashpoints in light of the mechanics of political constraint.

The six major flashpoints in environmental policymaking selected for review in this volume have been chosen to offer insight into the widening conflicts over achieving sustainability as we enter the twenty-first century. Debates previously contained to national arenas must now consider global implications if sustainability is to be achieved (see Deudney in this volume). Thus, the last two sections in the book deal with two key flashpoints: trade and national security. Depending on the approach one adopts for achieving sustainability, global free trade may be seen as more or less desirable, and one may advocate different types of regimes for achieving sustainability within a rubric of increasing trade among nations. Closely tied to this debate is growing concern with national sovereignty and self-determination for indigenous peoples, concerns that are encapsulated in the debate about links between environmental protection and national security (see Scully Granzeier's chapter, for example).

The middle portion of the book details two flashpoints that have emerged more recently in debates about environmental protection generally. Equity issues revolving around who pays the costs of clean up and who bears the burden of pollution became a lightning rod for debate in the late 1980s. The "environmental justice" movement has already done a particularly effective job of focusing attention on the latter concern (see Bowman's chapter in this regard).

The second section of the volume is concerned with longstanding but quickly evolving debates about the role of the state in achieving sustainability. The issue of the appropriate mix of public versus private control of common resources goes right to the heart of varying approaches to achieving sustainability. With states constrained by concerns of maintaining legitimacy in the immediate present and private interests lashed to current consumer choices, whom can we trust to ensure the sustainability of common ecological resources for the future? The varying regulatory approaches that states may adopt forms another important flashpoint in debates about achieving sustainability. How directly should states regulate private production processes to best ensure sustainability for the future?

Varying conceptions of risk within the scientific community and among the public have also already led to important debates about hazardous and toxic materials policy in the U.S. The flashpoint surrounding "comparative risk assessment" may well expand in the near

future to compare risks outside of chemical contamination (see Rosenbaum in this volume). Further, the means of measuring risk says a lot about a society's orientation toward new technologies and the future (see Linder in this volume). Thus, debates about risk are likely to become increasingly germane in evaluating and choosing among different approaches to achieving sustainability.

This introductory chapter takes a detailed and critical look at three predominant approaches to sustainability that are found in the literature and the political arena. Authors throughout the volume can be seen drawing from these approaches as they grapple with defining sustainability in the context of particular flashpoints. The chapter concludes with a brief introduction to the other chapters in the volume.

SUSTAINABILITY: EMPTY PHRASE OR PROMISING DEVELOPMENT?

It is important to remember the influence of politics even at the outset of an analysis of sustainability. The concept of "sustainability" has become a hotly contested domain within public discourse. One critic has even written that "Sustainable development is in real danger of becoming a cliche like 'appropriate technology'—a fashionable phrase that everyone pays homage to but nobody cares to define" (Lele 1991, p. 607). Indeed, the very word "sustainable" can be found in many phrases with starkly different implications: "sustainable growth", "sustainable yield", "sustainable societies", and "sustainable development". The idea of sustainability functions as what Baudrillard (1993) calls a "floating-signifier" in that it masks underlying disagreement, can function differently in varying contexts, and may finally lose relevance to concrete policy choices.[2]

But it would be a mistake to dismiss the idea of sustainability prematurely. There are at least two reasons why the idea of sustainability has proven such a powerful force in shaping discourse about the environment. First, the role of sustainability as a "floating-signifier" provides common ground for parties with deeply opposed interests to search for agreement. Any agreement forged about the content of "sustainability" would offer a powerful benchmark for evaluating difficult policy choices. Second, the notion of sustainability raises crucial issues of intergenerational justice that place environmentalists in a stronger position in relation to the American (Lockean) Liberal tradition (e.g., Gore 1992). At its best, therefore, an expanding discourse of

sustainability may lead to a more integrated (in the sense of ecological systems) and long-term view of the environmental problematic.

APPROACHES TO SUSTAINABILITY

The power potentially inherent in the discourse of sustainability is revealed by the number of scholars, politicians, and policymakers who would like to coopt the term for their own use. When leaders as divergent as Albert Gore, Margaret Thatcher, and Alan Greenspan make use of the term "sustainability", different positions are clearly being implied (Matthews 1991). Even within this volume, we can find scholars on opposing sides of an issue committed to a discourse of sustainability. Activists, politicians, and scholars have found, and continue to search for, ways to bring previously held positions under the umbrella of sustainability.

To simplify the dimensions of these conflicts, I propose and review three positions on the issue of sustainability in this chapter (see Table I.1). Of course, such a simplification is necessarily reductive of the complex mixtures of ideas proposed by some scholars in a growing literature on the idea of sustainability (e.g., Daly and Cobb 1989; Milbrath 1989). Yet, the enterprise of simplification points out divisions that exist among many scholars and policymakers who must make key choices across a range of dimensions. It also allows us to consider how divisions that exist in the political arena, which often emerge as fragments of the three positions identified here, are linked to larger choices because of their conceptual interrelationships.

Each of the three approaches demonstrates the adaptation of some system of thought to the idea of sustainability. Each has roots that go back long before the emergence of "sustainability" as a central organizing principle of economic, political, or scientific study of the environment. Indeed, it quickly becomes evident that the different disciplinary roots involved in each concept often result in a situation where scholars "talk past one another" or simply ignore the implications of work outside their disciplinary boundary.

The first approach reviewed here is the most recent school of thought to adapt itself, at least tentatively, to the idea of sustainability. Neoclassical economists have traditionally been reluctant to theorize about the environment at all. Yet, recently an entire school of thought, sometimes called "free-market" environmentalism, has begun to emerge (Anderson and Leal 1991). In fact, neoclassical economists have a long tradition with the terms "sustainable" and "steady-state" as it relates

Table I.1. Dimensions of Controversy over Sustainability

Competing Approaches	*Free-Market Advocates/ Economists' View*	*Ecological-Science Advocates/ Biologists' View*	*Deep-Ecologists/ Philosophers' View*
Dimensions			
Human Ontology	Possessive-Materialist	Human as Evolved	Bio-centric Human Subject
Ontology of Nature	Object of Use (Resource), Benevolent Forms of Adaptation	Object of Study; Emphasis on Dynamic Equilibrium of Ecosystems	Granted Status as a "Subject," Viewed as Fragile
Limits? Rate/Scale	None/None	Yes/Yes, hard to define	Yes/Yes
Role of Technology	Technological Rationality	Cautiously Skeptical	Highly Skeptical
Equity/Distributive Questions	Choices Left to the Market	Consider Equity as it Relates to Population	Must Include Nature
Leading Causal Factor in Environmental Degradation	Externalization of Costs (Leads to Inefficiency in Growth)	Overpopulation and Overconsumption	Ethical Crisis Following the Enlightenment
Mode of Transition	Privatization/ Deregulation	"Objective" Scientific Management	Social Learning/ New Values
Intergenerational Ethic?	Current Accumlation Can "Compensate" Future Costs	Concern for Human Survival/ Wellbeing in the Near Future	Strong Concern for Futures of all Species

to the capacity of the economy for continual growth (Dore 1995). Traditional economists, therefore, look to inefficiencies caused by rising "external" environmental costs as a potential drain on the capacity of the economy to grow (any costs external to an individual producer but borne by others).

The concept of sustainability originated with the second approach. In this context, the term "sustainable" comes from biologists and ecologists who use it to describe the rates at which renewable resources (e.g., fish, trees, etc.) can be extracted (or damaged by pollution) without

threatening the underlying integrity of an ecosystem (Lele 1991; see Davis in this volume). A major and controversial concept in the ecological-science approach is called "carrying-capacity". It originated with population biologists who use it to describe the number of a particular species that can be supported in a given ecosystem without degrading the resource base and ending in a population crash (Hardin 1993; Myers 1993).

The third locus of controversy is that presented by deep-ecologists. Here the term refers to the appropriate ethical and moral framework for the relationship of humankind with nature. This ethical framework is often seen as directly linked to a social structure or normative political theory (Milbrath 1989). The issue of intergenerational justice is directly implicated in providing the opportunity for future generations to experience well-being through a spiritually satisfying relationship to the natural world.

Although each approach presents some strength as a guide for policymaking, each is also undermined by a key weakness: the lack of an ethical or normative underpinning that can provide for human freedom and liberation into the future. The deep-ecology approach offers an explicit ethical framework. But the radical rejection of the canon of enlightenment thought posited in deep-ecology leads to questions about its intelligibility as a framework for guiding moral and political choices, its capacity to provide a theory for liberty, and its far-flung departure from traditional political culture (Stark 1995).

In the free-market and ecological science dimensions, normative and ethical frameworks are only implicit. Advocates of the free-market framework masquerade as defenders of "free consumer choice" while actually positing a rough utilitarian ethical calculus rooted in the concerns of the present (Alier 1994). For ecological scientists, sustainability functions as a materially determined theory that compels concurrence with its operational conclusions regardless of "one's fundamental ethical persuasions and priorities" (Lele 1991, p.608). What is particularly troubling about this approach is the essentialist view of the human subject rooted in sociobiology, a view that free-market advocates have always been quick to criticize, in a narrow sense, as lacking an appreciation of human technological ingenuity (e.g., Simon 1981).

FREE-MARKET ADVOCATES OF SUSTAINABILITY

Free-market advocates are somewhat hostile to the idea of sustainability as it has developed among scholars less enamored with market ap-

proaches. Anderson and Leal (1991) protest that often, pervasive externalities identified as "market failures" are not really market failures when evolving regimes of property rights and liability claims are taken into account. However, they also argue that the idea of "maximizing-subject-to-constraints" provides for sustainability and is not inconsistent with neoclassical economics (p.167). If policies change to allow external costs into the market, including taxes and fees when absolutely necessary, consumer choice will signal the most efficient, and thus sustainable, growth (see Baden and O'Brien as well as Bryner in this volume; Anderson and Leal 1991).

Many of the ideas contained in the free-market approach are quite commonly held by policymakers, particularly at the international level. A major element in the discourse of sustainable development is that it is a "meta-fix" for contradictions between economic expansion and environmental protection (Lele 1991). Thus, it is meant as a catchall to describe "win-win" situations where economic expansion and environmental protection are successfully reconciled and "win-win" anecdotes are common in the literature.

In light of its vague definition of sustainable development, the call by the Brundtland report for substantial economic growth in developing countries as a fix for poverty and thus environmental degradation is hardly out of step with a free-market approach (see Goodman and Howarth's chapter; Goodland et al. 1992).[3] And the quick incorporation of sustainable development in "Agenda 21" at the Rio conference and by large international lending agencies leaves little doubt that a free-market approach has taken top priority.

Within Agenda 21 the concept has become part of a program to redistribute investment to the developing world in order to encourage economic growth that is "essential for sustainable development and cannot be overly restrained" (Sitarz 1993 p.234). The idea is to challenge barriers to free trade in order to increase the flow of capital to developing countries, and subsequently to build "growth" industries in pollution control technologies by accounting for externalities (see Allison in this book; Sitarz 1993).

Major international lending agencies including the World Bank, the Asian Development Bank, and the Organization for Economic Cooperation and Development (OECD) have also adopted the idea of sustainable development following Brundtland, signalling a free-market approach. Lending agencies explicitly depend on further economic expansion to recoup their loans (Rich 1994). For example, at World Bank workshops on "sustainable agriculture" participants interpret

sustainable development in agriculture as simply maintaining growth in agricultural production (Lele 1991).

The focus on economic growth as a primary objective is what distinguishes the free-market advocates most directly from the other approaches (see Table I.1). Free-market advocates believe that if environmental costs are appropriately priced in the market, there needs be no limit to the rate of expansion or the ultimate scale of the human use of environmental sources and sinks.[4] It is around this contention that other dimensions are organized in the free-market approach. Humans are conceptualized as "possessive-materialists" who desire consumption above all else and can only be trusted to defend their property interests. Nature is conceptualized as a resource that can be manipulated to achieve human interest. Technology is considered the ultimate and proper application of human reason ("technological rationality"), allowing complete domination and infinite exploitation of nature (see Linder in this volume).

These basic assumptions in turn drive the key policy recommendations. Anderson and Leal (1991) argue that environmental protection is always accomplished with more efficiency and effectiveness, at least in the case of common resources, in an unfettered free market than with state management. Rooted in the possessive-materialist view of humanity, private ownership is seen as the only effective incentive to use resources efficiently: abuse will directly harm the material interest of the owner. Also, while downplaying the existence of negative and pervasive externalities, they argue that privatizing common resources will create incentives for private actors to hold each other liable through lawsuits for degradation.

Free-market advocates argue that enforcing private property rights creates an incentive for developing knowledge about the environment and technologies to protect it. The system of property rights provides an incentive for the property owner to "know" his or her own business. Free-market advocates argue that the knowledge of individual property owners will take better account of ecological variations than central regulatory management (Anderson and Leal 1991, p.4). Private ownership will lead to thousands of "individual experiments" in managing ecosystems, and the most successful experiments may be emulated (see Baden and O'Brien in this volume).

But knowledge of the environment is not as straightforward as this analysis implies. Many functions of ecosystems fluctuate randomly across a particular range (i.e., stochastic effects) and across geographical scales (McCay and Acheson 1987). Systems theory indicates that

critical points of ecosystem degradation can cause nonlinear effects. Lele (1991) argues that frameworks guiding sustainable development must go beyond the notion of an annual increment to take into consideration "the dynamic behavior of resources, stochastic properties of and uncertainties of environmental conditions" (p.615). When an additive or linear approach is wrongly assumed for externalities, "information costs" may appear too large for particular producers to gather information on pollution accumulation until after sudden perturbations have already occurred (i.e., the information comes too late to take proper care of the resources).

Free-market advocates also hope technology may solve the often intractable difficulties of ownership in ecosystems. Anderson and Leal (1991) report that it is easier to create private property rights for land disposal than air, ground water, or surface water disposal because it is a relatively simple matter to fence off and create legal title to land. They hope that fencing technologies will soon develop to make other parts of ecosystems easy to commodify or at least to allow for tracing of liability through the ecosystem.

In the immediate term, free-market advocates have a variety of proposals for making a transition to sustainability, including rejuvenation of liability and privatization of public lands. However, it is less clear what these schemes might mean in the longer term for complete market accounting of externalities. In a competitive economy, we should expect major political struggles against establishing property rights (and thus full cost inclusion) in traditionally common (and thus subsidized) benefit streams. Also, the free market contains important incentives to implement technologies that externalize the costs of production to the maximum extent feasible. Individual companies become more profitable by lowering their own microeconomic costs even at the expense of other producers and society at large.

Economists recognize that consumers are generally unable to respond to the externalization of cost because they face much higher "information and opportunity costs" for political action relative to lower costs faced by narrow producing interests. As a result, government subsidizes environmental degradation in both direct and indirect ways, even by creating distortions in the liability market (e.g., the Price-Anderson Act that limits the liability of nuclear power producers). Full pricing of externalities is a political conundrum that free-market advocates have hardly begun to address (see Bryner in this volume). Myers (1993) estimates, for example, that if the price of

gasoline actually reflected all of its external costs, including urban smog, acid rain, global warming, and the costs of securing oil in the Persian Gulf, the "true" price would be roughly four times the present U.S. price.

Holding aside the political problems faced by a transition to the free-market approach, there are important practical problems to recognize as well. Even with optimistic advances in "fencing technologies", it is practically difficult to divide ecosystems that are inherently connected in complex ways, especially when considering time frames as short as even a few decades. Disposal on land leads to unknown external costs in ground water pollution from leachate, and the use of "in-flow" water resources may eventually deplete the processes that recharge ground water aquifers: How can the value (the true external costs) of clean ground water to future generations be calculated in the present? These problems exist in the Superfund program which must confront the practical and legal difficulties of tracing complex liability schemes through to actions from decades past (as Kamieniecki's and Steckenrider's chapter shows).

Given changing information, complex interactions among pollutants in ecosystems, and disputes about impacts, pervasive externalities cannot be calculated within politically acceptable levels of accuracy. At the least, a fairly sizeable and active governmental role is implied to meet the information costs involved in monitoring ecosystems and gathering data on externalities. But while some free-market advocates have suggested that the provision of information to the public can be an important incentive in shaping market forces (see Cohen in this volume), funding for development and dissemination of information is not a common prescription by strict advocates of the free-market approach.

FREE-MARKET ADVOCACY: AN APPROACH FOR THE FUTURE?

By rooting itself in consumer choices of the present, the free-market approach seems to ignore the future. But on the surface, at least, a simple intergenerational ethic is proposed (see Table I.1). Anderson and Leal (1991) argue that by devoting itself to the lot of the living ("accumulation") a society will transmit a more productive world to the future and thus compensate future generations for any problems that might emerge (p.172). Also, private property rights are viewed as encouraging good "stewardship" of resources. As Baden and O'Brien

argue in this book, firms looking to self interest may think in terms of both present and future demand.

The key to understanding the potential weakness of the stewardship argument lies in recognizing that the time frame in which the prices and values upon which economic calculations are made diverges sharply from the time frame in which resources and wastes flow within the geo-chemical processes of the planet (Altvater 1994). Thus, what may appear to be good stewardship in a five-year or ten-year range may eventually be unsustainable given rates of ground water recharge or soil replacement. Phaelke (1989) points out that future demand is always uncertain, and therefore an incentive exists to draw down too heavily on renewable resources in the present. Furthermore, there is a long history in the U.S. of shifting investment following abuse of a resource for short-term gain (Cahn 1995). Unless resource substitution is infinite, this will eventually be unsustainable (Goodland et al. 1992).

There are good ethical grounds upon which to question the claim that economic accumulation in the present will allow for the compensation of liabilities incurred by future generations through "basic transfers" of money and technology.[5] Spash (1993) distinguishes between "basic" and "compensatory" transfers between individuals (in the present or intergenerationally). Basic transfers involve money, technology, and investments in capital that provide for individual welfare. He suggests a hypothetical parable whereby an individual who has received such basic transfers is later found to have been injured by long-term impacts of a radioactive leak in the environment. Society would find it difficult to say to this individual that he had already been compensated for his injury by basic transfers. Instead, a "compensatory" transfer that attempted to remedy the injury directly would be viewed as the just outcome.

Spash's creative parable applies with particular force to future generations because they would be compelled to accept any substitute "basic" transfer with no economic choice in the matter. Even with perfect technology and substitution, for example, future generations might be forced to accept "ex situ" conservation of a species and technological imitations of wilderness if present consumer demand was inadequate to preserve species in their original habitat into the future. The free-market model of "consumer choice" breaks down here, and its ethical roots in maximizing individual utility in the present become evident in the rupture. The approach undermines its own claims to provide freedom: Future generations will accept "freely" the degradation past onto them.

FREE-MARKET APPROACH: ECONOMIC GROWTH AS ENVIRONMENTAL PROTECTION?

An important contention of the free-market approach, particularly as it has been adopted in the international discourse of sustainable development, is that environmental protection must be linked to economic growth (see Goodman and Howarth in this volume). The Brundtland Commission and Agenda 21 reflect the idea that economic growth provides the technological, financial, and political impetus to handle pollution. Further, high rates of population growth are linked to poverty, especially to poor health care for infants and the marginalization of women.

Lonergan (1993) has done an extensive conceptual analysis of the very roughly understood link between poverty and environmental degradation. Identifying a dearth of empirical work on the topic, he proposes to utilize the concept of "equity" as embodied in the unequal distribution of production between nations and resulting unequal treatment of citizens through human rights abuses, marginalization of women, and the corruption and power exercised by ruling elites in developing nations. Also, information is often distributed unequally among corporations, governments, and nongovernmental organizations. Thus, he argues that a nation may be less able to protect its environment, not precisely because it or its citizens are poor, but rather because of its unequal position in relation to the global political-economy.

Absolute measures of poverty like income reveal little about people around the world who meet their needs from common resource pools. Lonergan (1993) proposes conceptualizing equity in terms of "sustainable livelihood security". The point is that it is not poverty that leads to environmental degradation, but rather a combination of economic, spatial, and cultural dislocation that occurs when common resources are expropriated or destroyed during development (a manifestation of underlying inequities) (see Scully Granzeier's chapter, for example). When resources are undermined, migration of large groups of people to cities leads to unsanitary conditions and agricultural foraging ("slash and burn") leads to degradation of forests and species-extinction (Wilson 1992).

Comparative studies of debt have not yet shown statistical associations between levels of indebtedness and rapid resource depletion or environmental degradation (Sanderson 1993; Pearce et al. 1995). But the process of going into debt and subsequent structural adjustment policies can be linked to the loss of sustainable livelihood security

(Rich 1994). Debt is a manifestation of inequity that has historically deprived countries of control over resources and ecosystems. Long-range (time series) studies of the effect of debt are needed to understand what role debt forgiveness may play in giving nations the control needed to achieve sustainability.

A more detailed analysis of the role of poverty sheds light on a central contention of the free-market approach: if poverty is not the problem, is economic growth the answer? To answer this question it is important to view the problem in distributive terms. If the assumption is that economic growth will eliminate poverty especially in the developing world, then most empirical and theoretical evidence suggests this is at best a risky proposition. Growth is not in itself any guarantee of distribution, while some incomes rise, sustainable livelihood security may be compromised. But if economic growth is shaped such that it also means greater equity, and this results in secure land tenure, population control, and honest administration of environmental laws in developing countries, then it might contribute to sustainability (see Goodman and Howarth in this volume).

ECOLOGICAL-SCIENCE ADVOCATES OF SUSTAINABILITY

The major controversy between free-market advocates and the advocates of an ecological-science approach turns on the issue of limits to economic growth (i.e., expansion of environmental sources and sinks).[6] A range of authors hold that the first and second laws of thermodynamics define an ultimate limit to the rate at which energy can be appropriated for useful work on earth (Ophuls and Boyan 1992; Meadows et al. 1992; Hardin 1993; Ehrlich and Ehrlich 1993).[7] Since no energy can be created or destroyed and all closed systems tend toward greater entropy, there is a limit to stocks of energy. Fortunately, the earth is not precisely a closed system. It receives constant inputs of solar energy, but this implies that energy use is in the long run restricted to the rate at which solar energy reaches the earth.[8] There is a "speed limit" for energy use defined by solar renewable resources (Meadows et al. 1992). Therefore, even with full internalization of costs, economic growth will eventually be unsustainable since increasing energy inputs are required to expand sources and sinks (i.e., to repair environmental degradation) (Daly and Cobb 1989; Goodland et al. 1992).

This position is fundamentally at odds, on technical grounds, with the free-market approach. It means that for the free-market approach to succeed we must not only: (1) define and enforce exclusive property

rights in ecosystems and their functions, and (2) correctly estimate and incorporate the cost of externalities. We must also never run into limits blocking expansion in the magnitudes of sources and sinks. To avoid limits, technology (i.e., human capital) must provide infinite "substitutability" of resources. As ecological-scientists argue, however, the laws of thermodynamics specify that the magnitude of energy available at any point in time is limited. Energy can be "neither created nor destroyed". Substitution is not possible (i.e., no amount of human ingenuity can create energy).[9]

The often cited formula in the ecological-science approach, "Environmental Impact = Affluence * Technology * Population" (I=A*T*P) perhaps implies an exactitude that is unwarranted. Meadows et al. (1992) take a systems approach, using computer models to trace complex interactions between sources and sinks, and point out that the formula must be expressed as a multiplication because of interactive potentials between each component. Hardin (1993) writes that although the supply is strictly limited, we are unable to state the limits with precision. This is because there are simply too many unknowns about the future (including a range of choices yet to be made by human societies). Yet this need not undermine the claim by ecological-science advocates of the need to search for structured limits to growth. The consequences of even approaching limits will likely mean a lower material standard of living and less economic freedom as more capital resources must be diverted to repair and maintain the environment (Ophuls and Boyan 1992; Meadows et al. 1992).

Limits as theorized by the application of the first and second laws of thermodynamics are the core of the ecological-science approach, driving the views of these scholars on the issues of technology and population (see Table I.1). Myers (1993) writes that, " . . . human population—both present numbers and rates of growth—is a prominent factor, often a predominant factor, in problems of environmental decline and unsustainable development" (p. 205). Ehrlich and Ehrlich (1993) have long raised concerns about the results of exponential population growth. Population growth functions as a sort of first among equals in the "I=A*T*P" formula. Several scholars argue that the planet is already overpopulated, and thus changes in technology and lifestyle will be compelled in the future (Ehrlich and Ehrlich 1993; Hardin 1993).

The position of ecological-scientists on the role of technology is a cautiously skeptical critique of technological rationality. Hardin (1993) argues that on balance predictions of technological optimists (e.g., nuclear power "too cheap to meter") have been at least as bad as those of pessimists, criticizing the notion that social problems can be solved

by expanding resources from technological development. Ophuls and Boyan (1992) question the generous assumption that human society will be able to organize itself to implement technological fixes even if they are invented in a timely matter. E.O. Wilson (1992) makes a similar point, arguing that solely technological solutions will be unable to store or conserve species "ex situ" because the rate and magnitude of species extinction is so much larger than either resources for conservation or knowledge about the species.

This approach argues that while technological development is essential, it cannot produce sustainability by itself. A narrow technological rationality eventually falls back upon itself because technology requires human will, capital, and organization to be implemented. Also, it is dangerous to imagine that the only new technical knowledge will show means to expand sources and sinks instead of revealing that certain limits really are binding (Daly and Cobb 1989). The critique of technological rationality reveals that we need not give neoclassical economists a monopoly on the quality of human ingenuity. Human ingenuity as confined to technological rationality is a highly truncated version of the real potential for human rationality. A broader understanding would encompass social organization, cultural goods, and creative adaptation of lifestyles.

GROWTH VERSUS DEVELOPMENT: A PATH TO SUSTAINABILITY?

An increasingly conventional distinction shared in the literature on sustainability is that between "growth" and "development" (e.g., Milbrath 1989; Daly and Cobb 1989; Hardin 1993; see Goodman and Howarth in this volume). This distinction seeks to reconcile the conflict between human freedom expressed as a desire for continual change or improvement and the realization of limits to economic growth. Scholars argue that in ceasing to expand sources and sinks of the economy (i.e., "to grow") we need not cease to improve the quality of life in terms of aesthetic production, better relationships among human beings, and human comfort through specialized services (i.e., "to develop"). Thus, while there are limits to quantitative growth, there are no limits to qualitative development.

As Milbrath recognizes (1989), such a change would require a major transformation in the desires, goals, and ambitions of many human beings. Humans would have to move beyond "possessive-materialism," a key component within Milbrath's (1989) "Dominant

Social Paradigm". Yet neither Milbrath (1989) nor Daly and Cobb (1989) seem to recognize the implications of this position in terms of the capitalist economy. An ongoing process of accumulation of capital resources is at the foundation of a free-market economy. Accumulation directly undergirds the money-commodity-money exchange. As such, accumulation forms a sharp contradiction with the limits to growth recognized in the ecological-science approach (O'Connor 1994).

Daly and Cobb (1989) hint at this when they offer that it is important to understand "savings" as a "lien against future production" (p. 38). Without careful modifications to a growth-oriented economy, savings could be employed to expand the use of sources and sinks in the future, and the capacity to honor the lien will at some point become an issue. Also, expanding service sectors may well require larger transportation and information sectors. "Development" as understood by these scholars is possible only if it involves the elaboration of human potentials *outside* of traditional market activity. To provide for this will eventually require deeper modifications in the market economy than have thus far been recognized.

DEEP-ECOLOGY AS AN APPROACH TO SUSTAINABILITY

The extensive critique of economic theory and practice proffered by ecological-scientists has often led to the conflation of their view with deep-ecology. However, there are several key elements of deep-ecology that distinguish it from the approach identified above (see Table I.1). In general, deep-ecologists focus on the spiritual or cultural aspect of the environmental problematic, and see the solution in terms of a shift in both human and natural ontologies (Eckersley 1992). Deep-ecologists see technological rationality as irretrievably embedded in a relationship of human domination of the natural world, and are thus highly skeptical of claims that technology can offer a solution to the environmental problematic. Instead, they argue that a better solution is for humans to relearn their ethics and values in a more eco-centric fashion (Milbrath 1989).

As used here, the term "deep-ecology" describes a radical critique of the canon of enlightenment political thought that finds the roots of the environmental crisis in the dominating position of the human subject over nature (conceived as an object) (e.g., Stone 1974 and 1987; Devall and Sessions 1985; Milbrath 1989; Naess 1989). As a solution, deep-ecologists would like to locate subjectivity in the natural world. In the standard enlightenment ontological arrangement, the subject/

object dichotomy grants free will and consciousness to humans but not to nonhuman nature (an "I" to "it" relationship). Deep-ecologists argue that it is important to conceive both humans and other forms of life as subjects (an "I" to "thou" relationship) (Michael and Grove-White 1993). Thus, sustainability for deep-ecologists is as much about considering the role of the natural world in future human well-being as it is about " . . . protecting, maintaining, and developing nature for its own sake (sustainability of nature)" (Achterberg 1993, p. 82).

Some deep-ecologists view history as an expanding circle of "rights" predicated on subjectivity and hope that the next expansion of rights will encompass the nonhuman world (Nash 1989). In this vein, nature is seen to be oppressed by the same hierarchical values and exploitative institutions that have in various times and places denied rights to particular human groups (e.g., women, racial minorities, etc.) (Merchant 1980). In *Should Trees Have Standing?*, Christopher Stone urges that the common law tradition should include rights of property "in-self" for nonhuman nature (Stone 1974). Why, he suggestively asks, if corporations have fictional individual legal identities should a river not share in such standing to sue? Guardians could be appointed for natural entities after which they could sue in national courts. The advantage or right assigned to natural entities would be one of "intactness" or making the entity whole. The subjectivity of the natural entity is derived from its identity—for example the "riverhood" of a river.

Deep-ecologists have advocated subjectivity for nature in other ways. Milbrath (1989) theorizes sustainability from the premise that all natural entities are equal, and refuses to engage thinkers who will not accept his formulation. In this volume, Scully Granzeier advocates a concept of security that includes, in part, nonhuman forms of life. Devall (1988) argues that the defense of nature, even in violent protest actions, amounts to "self-defense". The justification for such action then rests upon a Lockean formulation of the right to revolution. Finally, for Arne Naess, "self"-realization is the realization of the potentialities of life for each organism. Maximum realization is the ultimate good and means realization for the entire biotic community. Nature is here considered as a subject in even a self-conscious fashion—it knows and strives towards its ultimate teleological unfolding.

In relearning ontology, the human subject is viewed as malleable, and in need of change in order to embrace a bio-centric approach (see Table I.1). Devall (1988) describes an "ecological self" that values relations with plants and animals in a home bio-region equally with social relations, and therefore implies a kind of intersubjectivity with

the natural world. Devall and Sessions (1985) assert that "there are no boundaries and everything is related" (p. 52). Indeed, the person "dissolves" into the natural world. The identity of the self is no longer a transcendental subject, but rather finds itself with reference to its location in nature or a home bio-region.

WEAKNESSES IN THE DEEP-ECOLOGY APPROACH

While I am sympathetic to the claim that the Enlightenment was principally about the domination of nature, several important questions remain. First, is the domination of nature within our ethical system the leading cause of environmental degradation? Second, do deep-ecologists propose a replacement ethic that is intelligible for guiding difficult choices and preserving freedom? Third, does positing a radical rejection of our political tradition by granting subjectivity to nature work to advance pragmatically the interests of sustainability?

For deep-ecologists, the ultimate cause of environmental degradation is located in the historically-specific European ideological transformation of nature into an object to be dominated by humans. In contrast, the deep-ecologists assert that most often indigenous cultures are "rooted" in the land, and possess ontologies that lack the subject/object dichotomy. Therefore, these cultures often live in harmony with nature (Devall and Sessions 1985; see, in part, Scully Granzeier in this volume). If such assertions were true, it would provide the beginnings of an analysis that might conclude the subject/object dichotomy needs to be transformed. However, the archaeological record and contemporary research indicate that a wide variety of indigenous cultures have wrought great changes upon the land without the aid of Enlightenment thinking. There are a substantial number of examples where environmental degradation has taken place, even to the point of cultural extinction, despite a cultural framework that granted divinity or some type of subjectivity to nature (Stone 1993).

Stark (1995) has questioned the intelligibility of deep-ecology as an approach for guiding choices about the relationship between humans and nature. He points out the paradox between the reliance in deep-ecology on intuition and the reliance among advocates of environmental protection on scientific evidence to understand and respond to crises in ecosystems. Stark (1995) also notes the inherent difficulty in founding an ethical system upon subjects who are unable to reflect upon and take control of their own agency. How can trees or birds be expected to evaluate and participate in an ethical or political discourse?

Arne Naess's (1989) self-realization standard allows for consideration of this difficulty. In Naess, nature would pursue its own path of realization as an equal with humanity. Any conflict that would arise between humans and nature would be relegated to an anthropocentric category. Human unwillingness to share realization with all beings is normatively bad while equal realization for all beings is good. What this would mean in practice is unclear: Whose standard would determine what constituted equal self-realization? How can theorists conceive of self-realization for entities that lack consciousness? The assumption that we can know the appropriate teleological endpoint for the unfolding of the natural world is an element of hubris in a philosophy which claims to be humble.

As an important ecological principle, nature is constantly evolving. It is not within the present capacity of humans to know the final destination of nature. Indeed, there may not be a final destination to know. Naess's conceptualization of subjectivity in nature undermines this ecological principle by implying an endpoint: How else to judge self-realization? In a similar manner, Stone's (1974 and 1987) standard of "intactness" undermines the evolutionary principle as well. Intactness seems by its very definition to imply a static situation.

An important problem for deep-ecology is that the thinkers want to talk about freedom and liberation while also undermining the very basis that has guided the discussion of these ideas since the Enlightenment. Deep-ecology privileges the categories of "intuition" and "instinct" over "rationality" and "science" (Stark 1995). In very general terms, however, the Enlightenment canon posits that freedom is possible precisely because humans have the capacity to put aside instinct and desire in order to choose: The act of choosing is what makes humans free. We should hold deep-ecology to the traditional standard of moral agency because it relies on so many important Enlightenment ideas, including notions of "rights", "freedom", and "equality". Also, we should hold deep-ecologists to the traditional standard because it undergirds theories of egalitarian and democratic politics, which many deep-ecologists also support.

PRAGMATIC PROBLEMS IN THE DEEP-ECOLOGY APPROACH

Both Naess (1989) and Stone (1974) see an immediate advantage to granting subjectivity to nature in that it helps to discredit rationale for policies built strictly on present consumer choices (i.e., the free-market approach) (also see Allison's chapter in this book). Entities invested

with "person-hood" are placed beyond the reach of the free market in advanced capitalist societies. The notion of using cost-benefit analysis, for example, in a case involving human life is viewed as repugnant. As appealing as these results may be in the abstract, ontological status has not always served securely in practice—even human life has at times been put to the test of economic analysis. Furthermore, often a rigorous economic analysis will suggest additional measures to protect ecosystems. At the least, an economic analysis can serve as a starting point for policy discussions.

What about the cases, however, where economic analyses undervalue nature because of human ignorance, greed, or discounting practices? In such cases, humans may still choose either to add specific values to nature—or, reasoning that a particular value is infinite or unknowable, remove a given decision from the realm of economics. The normative need not necessarily follow the ontological as many deep-ecologists imply. There is no reason that a particular metaphysical conception of nature must be deterministically linked to a normative one: humans can value nature intrinsically without logically or scientifically reconstructing metaphysics (Fieser 1993; see Scully Granzeier in this volume).

Other practical problems with the deep-ecological approach deserve exploration as well. The early attempts to formulate rights for nature may undermine the ecological principle of interconnection. The problem is that formulations such as Stone's *Should Trees Have Standing?* read a Liberal individualism into natural processes. Consider a food chain: For example, could a tree sue a deer for chewing off its leaves or bark? In practice, the theory of individuated rights could potentially set the entire ecological web against itself. Furthermore, in Stone's conceptualization, nature could find itself in a position of legal disadvantage. People seeking retribution against the whims of nature could conceivably sue natural entities, and therefore appropriate particular natural values whatever the cost to the ecosystem as whole.

Lewis (1992) sees the normative idea of "getting into nature" that emerges from deep-ecology as impracticable and potentially destructive of the environment. After all, what would be the effect on ecosystems of millions of humans suddenly trying to get back into nature? On similar grounds, he criticizes proposals for decentralization that are common in portions of the deep-ecology literature. The consequences of human settlement, even in a "light" fashion, across uninhabited terrains could be severe. In contrast, urban settlement that is well designed and implemented may offer greater efficiency and thus less overall environmental degradation. The magnitude of human

population growth means that it is no longer pragmatic to make the complete turn away from technology that deep-ecologists would prefer; such a move would undermine their own chief desideratum, the preservation of wilderness.

SUSTAINABILITY AS A UNIFYING THEME: SKETCH OF THE BOOK

The three approaches to sustainability presented in this chapter are useful as a basic guide to the dimensions of the controversy presented in various sections of the book. Each conceptual and policy approach may be linked to the definitions and positions that various authors assume.

The consideration of risk as a scientific and cultural phenomenon by Rosenbaum and Linder relates broadly to making choices among the three approaches. In the face of uncertainty about the impacts of present choices on the future, the public and policymakers must debate ways to measure and conceptualize the risks involved in adopting one approach over another. How much consumer choice ought to be given up in the present to ensure a sustainable future? As Linder points out, the way we conceptualize risk, particularly the risks inherent in new technologies, in many respects shapes our answers to this question.

Kamieniecki and Steckenrider take a two-sided view of equity questions in the Superfund program. On the one hand, they explore the problems inherent in intergenerational equity in toxic waste disposal. They point out that liabilities are often unknown until decades after pollution is disposed in the environment, thus raising important questions about the practicality of a strictly free-market approach to sustainable societies. On the other hand, they explore the still evolving literature on equity as it relates to the distribution of pollution within one generation and society.

Bowman picks up the second equity concern in her review of the contribution of the environmental-justice movement to debates about sustainability. As is evident in the disputes noted in this chapter, distributive questions at both the national and global levels are becoming increasingly crucial to garnering the consensus necessary to support sustainable environmental policies. The environmental justice movement brings a new perspective to longstanding environmental controversies, raising important questions about equity and fairness in decision-making.

Cohen presents a deliberate consideration of the strengths and weaknesses of a range of regulatory approaches as public policy. He argues that the environmental policies needed to achieve sustainability will require flexibility to allow for a mixture of various economic incentives, direct regulatory structures, and public education. Bryner presents a similar consideration of the strengths and weaknesses of free-market regulatory approaches, paying particular attention to the political context. Bryner notes the interaction between policy and politics, wondering what mixture of policies will be required to sustain the political impetus behind environmental protection.

Baden and O'Brien are the most direct advocates for the free-market approach to sustainability in the volume. They argue that privatizing public lands is the most efficient way to provide for economic growth since it allows for effective communication of consumer choice to those who make decisions about land uses. Charles Davis takes issue with this position by arguing that a range of values (including sustainability for future generations) may be inadequately expressed through the mechanism of consumer choice.

A section on trade and development policy focuses attention on the increasing importance of controversies at the international level to debates about environmental protection. Allison takes a free-market approach, arguing that the benefits of free-trade outweigh the risks. She argues that public pressure and regional trade organizations may force nations to account for externalities increased by trade. One result might be an "upward harmonization" of environmental standards, and more competition and technology transfer among nations in creating and implementing technologies to meet those standards. However, Goodman and Howarth worry that political forces involved in expanding global trade may leave the developing world out of the free-trade equation. In addition, they question one central rationale of the free-market approach: that economic growth for the developing world—through increases in trade—is the primary means for achieving sustainability.

The expansion of the environmental problematic to encompass ever broader policy concerns has been an important outcome of the debate over sustainability. Daniel Deudney criticizes the expansion of environmental concerns into the arena of national security, arguing that conflation of the environment with national security will inflame nationalist passions and thus threaten hopes for achieving a global coalition for sustainability. In contrast, Margaret Scully Granzeier argues from a developing world perspective. Taking into account the direct reliance of many people around the world on various common

resources, Scully Granzeier argues that many would find it important to embrace a linkage of the environment and security in order to protect access to the resources necessary for sustaining their cultures.

In relating the wide range of controversies selected for inclusion in this book to varying ideas of sustainability, the viability of the concept for shaping environmental policymaking becomes readily apparent. Each of the flashpoints detailed here represents a critical obstacle in the attempt to achieve sustainable societies. Resolving these controversies will require the public to develop a broad and deep understanding of the intricacies and interconnections of opposing positions across the different debates. It is hoped that this book will be a step in that direction.

NOTES

1. The earliest references to the idea of sustainability as a "social" or policy-making concept generally date from the mid-1970s, particularly in work done under Lester R. Brown at the Worldwatch Institute (e.g., Hayes 1978). From limited use in this context, the concept has gained increasing prominence. In 1992, 172 nations including the U.S. adopted Agenda 21 at the United Nations Conference on the Environment (the "Earth Summit"), agreeing to develop and implement a strategy for "sustainable development" (Sitarz 1993).

2. Problems with relying on sustainability are becoming increasingly apparent. Already at the Rio summit, the Bush administration was a reluctant participant, refusing to join other developed nations in support of fundamental changes to induce a transition toward sustainability (e.g., a lack of American funds, a refusal to embrace the Bio-diversity convention). The large partisan transition in the American Congress in 1994 also leaves open the question of whether the discourse of sustainability will simply be drowned out for the time being by a chorus calling for deregulation. Even free-market advocates are somewhat uneasy, wondering if the political strength can be garnered for real reform or whether we should simply anticipate the wholesale dismantlement of U.S. environmental laws (e.g., see Baden and O'Brien in this volume).

3. Brundtland's well-worn definition, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" is inherently vague in its definition of "need" (WCED 1987, p. 41).

4. Environmental "sinks" are those elements of ecosystems that have the incredibly important and often invisible role of filtering pollution. A good example of this is the role of the aquatic life in the oceans and forests in acting as a "sink" or filter for carbon dioxide, processing it chiefly into oxygen. In

practice, "sources" and "sinks" often interact and the destruction of one results in the destruction of the other. For example, clear-cutting not only degrades a "source" (i.e., timber) but also affects several "sinks" (i.e., the control of erosion, the filtering of carbon dioxide, etc.).

5. Although the selection of a "discount" (or interest) rate is claimed to rest on "free" consumer choice to use money in the present, it actually implies an ethical position regarding future generations: that consumption (expansion in the use of sources and sinks) is more valuable in the present than in the future (Spash 1993).

6. Some may object to my application of the often highly privileged term "science" to this approach. Of course, there are some natural scientists who disagree with aspects of this approach. However, 104 Nobel Laureates signed the 1992 report of the Union of Concerned Scientists acknowledging that the "Earth's ability to provide for growing numbers of people is finite" and that, "we are fast approaching many of the Earth's limits" (quoted in Myers 1993, p. 205).

7. Eckersley (1992) has adopted a similar grouping of many of these authors, setting them apart from deep-ecologists who see sustainability in terms of a "crisis of culture" (p. 17). She argues convincingly that the group of authors I call "ecological scientists" see the environmental problematic in terms of a "crisis of human survival" (p. 11).

8. Wilson (1992) points out that humans are already an ecologically anomalous species because we are estimated to use between twenty and forty percent of "net primary production", the energy captured by plants in photosynthesis. This reveals a major reason why other species are being pushed out of ecological niches and rendered extinct. Humans are literally taking away the energy of the other species.

9. Although large gains have already been made in energy efficiency, and even larger gains will hopefully be made in the near future, this is not substitution in the strict sense of "material balance". Human and natural capitals are not substitutes but rather complements, they need each other for production.

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