The Challenge of Sustainable Development

Jerry Taylor

Sustainable development is the environmental catchphrase of the 1990s, a vague but ambitious idea that dominates international environmental policy and permeates our domestic policy debate. It is an idea, moreover, that has now become institutionalized. The Earth Summit in Rio de Janeiro established the UN Commission on Sustainable Development to help ensure the implementation of the ambitious "Agenda 21" adopted at that conference. The Clinton administration established the President's Council on Sustainable Development, a body charged with developing specific policy recommendations and drafting the required U.S. plan to be submitted to the United Nations. An initial report from the Council is expected in June.

Despite its institutionalization, sustainable development is still difficult to define coherently. The UN Commission on Economic Development (UNCED), in its landmark 1987 *Our Common Future*, defines sustainable development as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs." If sustainable development is to inform economic and environmental policy, however, the UNCED definition is hopelessly inadequate.

How can we reasonably be expected to know, for example, what the needs of future generations will be? Imagine the economic planner of 1890 attempting to plan for the needs of today. Whale oil for heating, copper for telegram wires, rock salt for refrigeration, and draft horses for transportation and agriculture would all be high on the list of scarce resources he would worry about sustaining 100 years hence, whereas petroleum, on the other hand, would not appear on that list at all, since oil was not an economic resource at the time.

Moreover, human needs cannot be met simply by maintaining natural or man-made resources. Peace and liberty are also essential human needs. Likewise, "sustainable development" does not necessarily mean the same thing as "sustainable growth," for societal development implies the advance of individual satisfaction and well-being. Although per capita income certainly contributes to meeting those goals, it is not sufficient in and of itself. Man is more than a material being.

Some have argued that the best means to ensure that the needs of future generations are met are to conserve and if possible expand the aggregate stock of capital. If sustainable development is about conserving capital, however, this suggests that the present generation can substitute natural for man-made capital, a problematic concept for most environmentalists, who maintain that natural capital is already dangerously overexploited. Although environ-

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mentalists often concede that using natural resources to produce human goods may secure a higher rate of return than leaving those resources unexploited, all too often, they argue, the proceeds of environmental degradation or depreciation are consumed rather than reinvested for future generations. Moreover, when the natural capital in question becomes essential, they contend, there may be little or no room for substitution with other forms of capital.

Most environmentalists, therefore, define sustainable development as economic growth that does not allow the overall natural resource base to deteriorate. If economies are suitably managed, it is argued, economic growth can occur within boundaries that maintain natural resources at a minimum critical level.

Yet if "meeting the needs of future generations" is the overriding goal of sustainable development, it can't be denied that man-made capital is far more resilient than unexploited natural resources. A flood, for example, can destroy all natural resources in its path but is unlikely to destroy the capital previously generated by those resources. How can untouched coal fields, moreover, meet the needs of society in the face of something like the AIDS epidemic? Exploiting natural resources creates wealth that can be used to answer myriad needs. As Professor Daniel Boggs put it before the Center for International Affairs at Harvard, "I would certainly rather have medicines and satellites and other technology than a few more billion tons of some rock or another. We each can set our own economic time horizons. If we really think our grandchildren will be better off with shut-in oil wells than shares of IBM, we can buy them up and shut them in. But others should be free to make their own decisions." By maximizing knowledge, technology, and wealth today, we are ensuring in the most comprehensive manner that the (material) needs of tomorrow (many of which are unforeseen today) can be met.

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Man-made capital not only enables society to respond to shocks and stresses more flexibly than natural capital, it minimizes those shocks in the first place. For example, it was capital investments made in California that allowed that heavily populated state to withstand two major earthquakes over the past five years with minimal loss of life, while earthquakes of lesser magnitude routinely kill tens of thousands in less developed countries. Although environmentalists respond that this flexibility is an illusion given that advanced technological societies rely on pollution sinks to sustain economic growth, they ignore the fact that those sinks are far less burdened in the industrialized West than they are in the natural resource-rich Third World.

Finally, many environmentalists contend that exploiting natural resources today is often an irreversible process that makes our overall resource stock less diverse and restricts the choices of future generations. It is fashionable in certain intellectual circles to go even further and argue, as does Richard Norgaard, an associate professor of energy and resources at the University of California at Berkeley, that future generations have as much right to today's environmental resources as we do, and that we have no right to decide whether or not they should inherit their share of those rights.

The concept of tangible rights to resources for those not yet even conceived is dubious to say the least. Under its logic, no generation has the right to use or draw-down the natural resource base given that another generation will always follow with their own claim on the resources in question. No resource rights will exist for *any* generation.

The notion of resource rights for future generations is also hopelessly grounded in the philosophical muck of so-called positive rights—the "right" to forcibly take from someone else that which is not yours in order to satisfy a personal need. Although that is an argument best left unexplored here, suffice it to say that this concept of "rights" has been convincingly demolished by the very classical liberal scholars who introduced human rights to the vocabulary of modern man.

Regardless, it should be acknowledged that the campaign for sustainable development is a clear break with the older, more militant environmental campaign against economic growth of any kind. The authors of *Our Common*

Future, for example, argue that economic growth is a prerequisite of sustainable development, even a "top priority." Developed nations are urged to maintain 3 percent annual growth in GNP while developing nations are urged to grow by at least 3 to 4 percent annually. Thus, environmentalists calling for sustainable development are implicitly rejecting such zero or negative growth advocates as Robert Heilbroner, Paul Ehrlich, Garrett Hardin, Barry Commoner, and Dennis and Donella Matthews.

Table I
PROVEN RESERVES OF VARIOUS RESOURCES, 1950–90
(MILLION METRIC TONS)

Resource	1950	1990	Change (%)
Bauxite	1,400	21,500	1,436
Chromium	70	420	500
Copper	100	350	250
Iron ore	19,000	145,000	663
Lead	40	70	75
Manganese	500	980	96
Nickel	17	59	247
Oil and Gas[a]	30	250	733
Coal[a]	450	570	27
Tin	6.0	4.2	−30
Zinc	70	145	107

SOURCE: Jerry Taylor, *Market Liberalism*, (Cato Institute, 1992); *World Bank Development Report 1992*.
[a]Billion tons of oil equivalent.

How Unsustainable is the Present?

Implicit in calls for "sustainable development" is the contention that human society is currently unsustainable—if it were not, a new "sustainable development" policy would hardly be necessary. Yet it is far from clear that human civilization is somehow unsustainable on its present course.

Although human civilization has never had any sort of bureaucracy to plan its "sustainability," it has sustained itself over the past 5,000 years. Many generations have somehow managed to inherit more resources than were available to prior generations. The basic needs of food, shelter, and clothing are better met around the world today than ever before.

That fact is clearly demonstrated by the global increase in life expectancy. In less developed countries, life expectancy has increased from 40 years in 1950 to 63 years today. Adult mortality rates in the developing world (the probability of dying between the ages of 15 and 60) have fallen from 450 per 1,000 in 1950 to 230 per 1,000 today. Moreover, those gains in human health have accelerated over time. Child mortality rates in the developing world, for example, dropped 2 percent annually in the 1960s, 3 percent annually in the 1970s, and 5 percent annually in the 1980s. None of the above data can be squared with life-threatening environmental deterioration or resource scarcity. Only Cambodia, Ethiopia, Rwanda, Uganda, and some parts of Eastern Europe show little or no gains in life expectancy since 1970, and that is largely because of political factors.

There are three ways in which resource scarcity can be measured: proven reserves, ultimately recoverable stock, and price data. By any of these measures, resources are more, not less, abundant today than ever before.

Proven reserves measure the amount of a given resource that has been discovered and can be extracted profitably given current prices and technology. Thus, proven reserves are a function of economics and technology, not geological abundance. As such, they are not a particularly reliable way to measure scarcity, yet recourse to this data is (unfortunately) the most popular way to measure resource scarcity. Even so, Table 1 shows that proven reserves of various resources have been steadily increasing, not decreasing, over the past 40 years.

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Resource scarcity can also be measured by

Table II
RESOURCE PRICES INDEXED TO WAGES, 1950–90
(RELATIVE TO 1990 BASELINE)

Resource	Year					Change (%)
	1950	1960	1970	1980	1990	1950–90
Food[a]	386	210	145	161	100	–74
Lumber	170	114	95	126	100	–41
Paper	139	121	97	104	100	–28
Minerals[b]	194	147	179	217	100	–48
Energy[c]	184	126	74	138	100	–46

SOURCE: Taylor, *Market Liberalism.*

[a]Includes barley, broilers, carrots, cattle, corn, cotton, eggs, milk, oats, oranges, rice, sorghum, soybeans, wheat, and wool.

[b]Includes aluminum, antimony, copper, lead, magnesium, manganese, mercury, nickel, platinum, silver, tin, tungsten, and zinc.

[c]Includes coal, electricity, natural gas, and oil.

reference to ultimately recoverable stock, defined as a mere 1 percent of a given resource estimated to be in the top kilometer of the earth's crust. Although this is a slightly better method by which to judge resource scarcity than proven reserve data, it has no relation to economic considerations and is a bit speculative—it's difficult to know precisely how much of any material is ultimately available simply because much of it has yet to be discovered. Still, U.S. Geological Survey data indicates that there are enough recoverable fossil fuels to last approximately 520 years given projected rates of demand.

Pollution emissions and concentrations decline as per capita income increases. Given the dramatic growth in economic wealth over the past century, then, it is reasonable to conclude that the earth's carrying capacity for pollution is actually expanding, not contracting.

Moreover, 95 percent of the world demand for minerals is for five metals—iron, aluminum, bauxite, silicon, magnesium, and titanium—which are not considered exhaustible. Most of the remaining mineral demand is for seven metals—copper, zinc, manganese, chromium, lead, nickel, and tin—that are "probably inexhaustible" according to the late physicist Herman Kahn.

The final means to measure resource scarcity are price data, which reflect the relative supply and demand for goods and services. Because prices reflect the accumulated knowledge of millions of economic actors, the market is far more likely to accurately judge resource scarcity than non-economic indicators. By indexing prices to wages, we get a complete picture of relative scarcity because we control for both inflation and consumer access to capital. As Table 2 reveals, price data indicate that resources are indeed becoming far more abundant with time.

Other resources that don't lend themselves well to the above measuring sticks are also growing in abundance. Forestland, for example, has grown by 57 percent in the United States since 1920; 27 percent since 1952. Likewise, European forests have expanded by 25 to 30 percent since 1970, according to data compiled by the Finnish Forest Research Institute. Globally, UN data shows that forests cover about 30 percent of the earth's total land area, a figure that has not changed appreciably since 1950.

Measuring the sustainability of global pollution sinks (air and water sheds) is more difficult, given the scarcity of reliable data regarding the concentration of pollutants. Yet what we do know is that pollution emissions and concentrations decline as per capita income increases. Given the dramatic growth in economic wealth over the past century, then, it is reasonable to conclude that the earth's carrying capacity for pollution is actually expanding, not contracting.

For example, professors Grossman and Krueger of Princeton University examined data from the World Health Organization and found that particulate and sulphur dioxide emissions declined when per capita income exceeded $5,000 and declined dramatically when per capita income approached that of the developed world. Likewise, the World Bank reports that water quality, as measured by dissolved oxygen, improves as per capita income rises. It is reasonable to assume that other pollutants experience similar emission reductions as income rises.

That has certainly been the experience in the

United States. Between 1970 and 1988, for example, particulate emissions fell 63 percent; sulfur dioxide emissions dropped 27 percent; nitrogen oxide emissions were down 7 percent; volatile organic compound emissions fell 26 percent; carbon monoxide emissions dropped 40 percent; and lead emissions almost disappeared, falling 96 percent.

Furthermore, regression analyses done by the World Bank shows most *concentrations* of air, water, and land pollutants decline rapidly as per capita income rises. A recent report issued by the UN, *Urban Air Pollution in Megacities of the World*, likewise found that economic development reduced the concentration of atmospheric pollutants and was vital in bringing urban areas into compliance with air quality standards.

In the United States, for instance, violations of water quality standards for fecal coliform bacteria have fallen 17 percent since 1980; violations of phosphorus standards have been cut in half; and dissolved oxygen, lead, and cadmium water quality violations have virtually disappeared. Likewise, the number of days in which unhealthy levels of smog hang over American cities has fallen dramatically since 1970. Even since 1983, ambient air concentrations of carbon monoxide have dropped 34 percent; (ground level) ozone concentrations have dropped 21 percent; sulfur dioxide concentrations have fallen 23 percent; nitrogen dioxide concentrations have dropped 8 percent; and lead concentrations have fallen by 98 percent. And although ambient particulate levels have only recently been systematically measured, those concentrations have declined by fully 17 percent since 1988. Outside of California, smog has almost disappeared as a public health problem.

Moreover, technological advances and improved production efficiencies mean that fewer resource inputs are needed to produce a good or service as economic wealth increases. Examples of this are legion. From 1973 to 1984, for example, the very years that Japan emerged as an economic superpower, energy and raw materials used per unit of production dropped 40 percent in that country.

Given the overwhelming evidence of growing resource abundance, how can environmentalists seriously maintain that civilization is somehow teetering on the precipice of resource collapse? In *World Without End: Economics, Environment, and Sustainable Development* (considered by many environmental economists to be the most comprehensive review of the literature concerning sustainable development), David Pearce, director of the Center for Social and Economic Research on the Global Environment at the University College of London, and Jeremy Warford, senior adviser to the Environment Department of the World Bank, entirely ignored the above data, citing but one piece of evidence to substantiate their charge of growing resource scarcity: a 1984 study by Darwin and Jane Hall that examined unit costs and relative prices for coal, oil, gas, electricity, and nonferrous metals. Prices for resources other than nonferrous metals, they found, declined in the 1960s and increased in the 1970s.

Price increases in the 1970s alone, however, tell us nothing, for, as Table 2 indicates, the 1970s are hardly representative of the long-term trend. Recall that nations around the globe took unprecedented action to control resource production and prices in that decade. The result was artificial scarcities and supply disruptions that were more a function of regulatory failure than resource exhaustion. When those controls were largely eliminated in the 1980s, resource production skyrocketed and prices subsequently dropped.

In developing countries, per capita grain production *increased* by 2 percent from 1984 to 1991 and total per capita food production in the developing world increased by 3.8 percent, far in excess of population growth.

Another example of incomplete and fragmentary data analysis leading to unjustified concern over resource scarcity can be found in the Worldwatch Institute's *State of the World 1994*, where Lester Brown, president of the Institute, expresses great alarm over an 11 percent decline in global per capita grain production since 1984. "Historians may well see 1984 as a watershed year," he writes, "one marking the transition from an era of rapid growth in food production to one of much slower growth."

Yet the decline in per capita grain production since 1984 was due not to declining soil fertility

or suitable cropland, as Brown contends, but to: (1) a reduction in global demand for grains and an increase in demand for meat, eggs, and crops such as cotton (a change in demand patterns precipitated by growing per capita income); (2) relative declines of U.S. and European grain production due to historically low grain prices; and (3) dramatic drops in Soviet grain harvests as economic meltdown accelerated in the 1980s. In developing countries, per capita grain production *increased* by 2 percent from 1984 to 1991 and total per capita food production in the developing world increased by 3.8 percent, far in excess of population growth. Further, global grain prices have fallen since 1984, dispelling any notion that grain is scarcer today than 10 years ago.

At current erosion rates, heavily farmed soils in the United States might lose 3 to 10 percent of their natural fertility over the next 100 years, losses that are sure to be more than offset by continued improvements in agricultural productivity even if no new conservation practices are adopted.

The Population Panic

Throughout recorded history, scholars have worried that population growth was unsustainable. Christian theologian Tertullian said in the second century A.D. that "what most frequently meets our view (and occasions our complaint) is our teeming population. Our numbers are burdensome to the world, which can hardly support us." About 200 years later, St. Jerome claimed that "the world is already full, and the population is too large for the soil." In our time, Paul Ehrlich was only one of many who thought the end was near, declaring flamboyantly in 1972 that "the battle to feed all of humanity is over," and that "in the 1970s and 1980s hundreds of millions of people would starve to death in spite of any crash programs embarked upon now." And today Paul Kennedy, author of *Preparing for the 21st Century*, contends that "it is inconceivable that the earth can sustain a population of 10 billion people devouring resources at the rate enjoyed by richer societies today—or even half that rate. Well before total world population reaches that level, irreparable damage to forests, water supplies, and animal and plant species will have occurred, and many environmental thresholds may have been breached." Indeed, State Department Counselor Timothy Wirth recently told the *Washington Post* that international population control efforts are the "top priority" in the Clinton administration's effort to refocus foreign policy and foreign aid to reflect the post-cold war realities.

Yet mankind is better fed today than ever before, as clearly evidenced by the aforementioned dramatic gains in life expectancy in the developing world. Ten times as many people died of famine during the last quarter of the nineteenth century as have died of famine in the third quarter of the twentieth century, despite our much larger present population and the massive engineered famines in Cambodia during the 1970s. Whereas only 42 percent of all countries reported that average daily caloric consumption reached recommended levels in the mid-1960s, 66 percent of all nations reported caloric intake at those levels by the mid-1980s, a 56 percent increase. Fully 81 percent of the world's countries, including China and India, now report average caloric intake of at least 90 percent of recommended levels.

Many environmentalists maintain that the dramatic increase in global food production has largely come at the expense of the environment, that land devoted to agriculture is expanding dramatically at the expense of forests and grasslands. For example, the aforementioned study by Darwin and Jane Hall examined the land-use rates of 1850 and 1980 and found a large increase in global land devoted to agriculture. North America, for instance, saw farmland expand by 309 percent over that period of time.

But why use those two data points? 1850 represents the height of low-input agricultural technology and really has nothing to say about current trends. If 1910 is used as the baseline (the beginning of the modern agricultural revolution), we find that the amount of land devoted to agriculture in the United States has actually somewhat declined; 325 million acres in 1910 compared to 322 million acres in 1990. Globally, land devoted to grain production has declined by about 7 percent since 1980 even though grain

production increased by 20 percent over that same period. Over the past 25 years, 90 percent of the doubling of food production was due to greater productivity of existing farmland; only 10 percent was due to expanding land cultivation.

The fact that increasing agricultural productivity and technological advance—not cropland expansion—are the engines behind this massive increase in global food production can be readily appreciated by considering that, had technology and agricultural productivity not advanced since 1910, the U.S. would require about 1.2 billion acres of farmland (over half the country, including Alaska) to produce the same amount of food as produced today on 322 million acres.

Reductions in cropland cultivation are also viewed with alarm by environmentalists, who maintain that less land is devoted to growing crops because we've run out of arable land and intensive modern agricultural practices are destroying soil at a rapidly accelerating rate. Yet studies by the U.S. Department of Agriculture, the University of Minnesota's Soil Science Department, and Pierre Crosson of Resources for the Future all conclude that, at current erosion rates, heavily farmed soils in the United States might lose 3 to 10 percent of their natural fertility over the next 100 years, losses that are sure to be more than offset by continued improvements in agricultural productivity even if no new conservation practices are adopted. As the World Bank noted in *World Development Report 1992*, "the few comprehensive analyses of soil erosion that have been done in temperate areas indicate that the consequences are not large for aggregate agricultural productivity." Moreover, the World Bank noted that "standard measurements of gross soil erosion from test plots typically overstate the consequences for productivity, since the eroded soil can remain for decades elsewhere in the farming landscape before it is delivered to the oceans. Thus, a portion of onsite erosion represents a transfer of assets rather than a complete loss from the standpoint of agricultural productivity."

Soil erosion in the developing world is largely a minor and temporary problem. As noted, crop yields per acre have increased in the developing world, a fact that hardly squares with serious soil erosion. Secondly, most of the world's worst soil erosion problems are the result, not of modern high-yield farming, but of attempts to use low-yield, traditional agricultural techniques on fragile soils. Rising per capita income in the developing world is gradually replacing those practices, reducing soil erosion and alleviating the need to expand cropland.

So there is little reason to believe that our current population is unsustainable. The "population explosion" in the twentieth century has been accompanied by a similar explosion in resource abundance. But what about the future? Although most of us are aware that population in the developed world has largely stabilized over the past few decades, few have noticed that less developed countries saw annual percentage increases in population peak in 1970. Population growth in the developing world has been declining ever since, and declining more steeply than the rate of decline in developed nations since their peak in 1900.

Population growth today is the result of declining mortality rates due to improved health care, sanitation, and changing lifestyles afforded by rises in per capita income. In other words, it is the result of people living longer and healthier lives in the third world. Fertility rates in the developing world, on the other hand, have dropped dramatically: from 5.7 in 1970 to 3.6 today. The World Bank accordingly projects population growth of about 1.7 percent a year, slowing to about 1 percent by 2030 and stabilizing at 12.5 billion around the middle of the twenty-second century (projections that are accepted, incidently, even by population alarmists such as the Worldwatch Institute).

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In order to sustain that population increase, the World Bank notes that "world grain output will have to grow by about 1.6 percent a year—a difficult target, but less than the 2.0 percent a year increase achieved over the past three decades." So at present population and agricultural growth rates, the world is more than capable of feeding itself in the future. But most environmentalists maintain that those trends can't

continue. They contend that we've maximized the amount of land that can be devoted to agriculture and that agricultural practices and technologies have advanced to their natural limit. Fortunately, most agronomists are confident that the agricultural resources of the world have still hardly been tapped.

The late Harvard Professor Roger Revelle (often cited by Vice President Al Gore as one of the scientific giants of the twentieth century for his work on other issues) contended that the earth was capable of providing an adequate diet for 40 billion people and would require less than one-fourth the earth's ice-free land to do so, and that's assuming crop yields only one-half those of the American Midwest. He further estimated that land in less developed countries alone was capable of feeding 18 billion people (more than five times their population) and that Africa itself could feed 10 billion people (12 times its current population).

There are two reasons why Revelle's striking projection is common wisdom today among professional agronomists. First, great expanses of agricultural land are presently both uncultivated and underutilized. Suitable agricultural land makes up 24 percent of the total ice-free landmass of the globe, well over twice the amount cultivated in recent decades and more than triple the acreage cultivated in any given year. Moreover, a great deal of the world's cropland is underused or cultivated using low-yield technologies and practices similar to those used in this country in 1910. Obviously, agricultural productivity will skyrocket as high-yield technologies continue to advance throughout the developing world. Agronomist Donald Plucknett, for example, recently estimated in *Science* that worldwide harvests could be boosted by 50 percent if improved crop varieties and modern agricultural practices were made more widely available in the developing world. The late political economist David Osterfeld further observes that simply increasing the efficiency of water use in developing nations could provide enough advances in agricultural productivity to support a global population of 35 to 40 billion people.

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Second, agricultural history is largely defined as the transformation of land unsuited for cultivation into productive cropland. Nobel laureate Theodore Schultz observes, for example, that "the original soils of western Europe, except for the Po Valley and some parts of England and France, were in general very poor in quality. As farmland, these soils are now highly productive. A substantial part of the productivity of farmland is man-made by investments in land improvements." David Osterfeld likewise pointed out that "much of the American Midwest was forest and swampland. No account of arable land in, say, 1800 would have included it. Now, after it has been cleared and drained, it is among the most fertile lands in the world. And the elimination of the tsetse fly would open up to cultivation about 200 million hectares of African land, an area larger than the total cropland in the United States." Productive farmland is not some sort of finite given; it is, instead, a function of agricultural skill and technology, two "resources" that have been growing over the centuries and exponentially over the past 80 years.

Still, the World Bank, like many, is concerned that even if those "teeming masses" of the twenty-first century can be fed, "the sheer density of population will pose challenges for environmental management," and that "rapid population growth can exacerbate the mutually reinforcing effects of poverty and environmental damage." Likewise, Pearce and Warford maintain that "the rapid growth of urban populations clearly results in squalor, slums, and ill health."

Yet accelerating urbanization in the developing world during the last 40 years has failed to bring on that parade of horribles. As previously noted, life expectancy rose and mortality rates dropped with unprecedented speed. Resources grew more, not less, abundant than ever before. Health threats from pollution abated and the concentration of pollutants declined. And dozens of studies, starting in 1967 by Nobel laureate economist Simon Kuznets, have failed to find a negative statistical relationship between population growth and economic growth.

Consider the fact that from 1951 to 1987, the population of Hong Kong almost tripled, a rate

of growth far in excess of India's, yet Hong Kong during that time emerged as a modern economic power. Likewise, Great Britain's population grew far faster during the nineteenth century than did India's in the twentieth, yet Britain did not find that this growth in population inhibited economic expansion. If population density were a determining factor in economic growth, why does Taiwan, with 1,460 people per square mile (or for that matter, New Jersey, with 1,034 people per square mile), produce more than 20 times as much per capita as does China, with a population density of 360 people per square mile?

Agendas for Sustainability

Although "sustainable development" appears to be a solution in search of a problem, two main strategies to promote it have been suggested by environmentalists. The first, promoted by the Worldwatch Institute, Paul Kennedy, Dennis and Donella Matthews (authors of the 1970s classic *Limits to Growth* and their recent sequel *Beyond the Limits*), and to some degree the UNCED, involves giving some central authority power over the economy in order to control technological evolution and define the limits of acceptable industrial and consumer activity in order to ensure sustainability. The second strategy, advocated by the World Bank and neoclassical economists, involves economic interventions by national governments in order to correct for the "market failures" that (in their view) undermine sustainable development.

The former agenda is dubious to say the least. Central planners have been judged incompetent when it comes to overseeing economic production, having universally failed in their quest to ensure economic growth. How can we now expect planners to not only ensure economic growth (an explicit prerequisite for sustainable development), but to ensure that that growth be "sustainable"?

Consider the automobile, a technology that generally ranks as "unsustainable enemy number one" for most environmentalists. Aside from the vast social and economic benefits that would not now exist if the automobile had never been introduced, the automobile was directly responsible for the retirement of 25 percent of the land devoted to agriculture at the turn of the century, since feed was no longer needed to raise and sustain draft animals. Not only were millions of acres of land returned to nature, but major reductions in water pollution, soil degradation, and urban sanitation were achieved because of the automobile.

Similarly, the oil and gas industry (probably "unsustainable enemy number two") helped reverse the alarming deforestation rates of the nineteenth century by replacing wood used for fuel with fossil-fuel alternatives. In 1850, 50 percent of harvested timber was used for fuel, providing 90 percent of U.S. energy supplies. Today, only 20 percent of wood is consumed for fuel in America. By contrast, over half of the timber harvested worldwide is used for fuel; about 80 percent in the developing world. One could persuasively argue that those two "environmental enemies" were actually green technologies and industries, but the odds that central sustainable development planners would ever recognize them as such is minimal to say the least. As even Vice President Al Gore conceded in *Earth in the Balance*, "the most serious examples of environmental degradation in the world today are tragedies that were created or actively encouraged by governments—usually in pursuit of some notion that a dramatic reordering of the material world would enhance the greater good. It is no accident that the very worst environmental tragedies were created by communist governments, in which the power of the state completely overwhelms the capabilities of the individual steward."

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cion? Could such a bureaucracy insulate itself from politics and allocate public resources not to the politically powerful, but to the politically impotent—the unborn generations to come?

Although private resource owners can directly benefit from decisions to defer consumption (stock and bond markets, for example, are very sensitive to operating and production policies that affect future value), public officials cannot: they have a bias for political decisions that yield visible and immediate benefits and defer costs and against policies that have immediate costs but deferred benefits.

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Clearly, few nations in the foreseeable future are about to turn over their economies to centralized green planners. The neoclassical economic strategy, then, is the main route by which environmentalists hope to make their vision of "sustainable development" an economic reality. That strategy, laid out in detail by Pearce and Warford, entails changing economic accounting systems to reflect environmental assets; correcting prices by eliminating subsidies and internalizing external environmental costs; adjusting project appraisal practices to account for environmental damage and for short time spans and excessively high discount rates; and, if possible, providing for "intergenerational compensation accounts" when non-critical natural resources are drawn down.

By and large, however, those policy recommendations ignore the phenomenon of government failure, which is far more prevalent and endemic than market failure, and blithely assume a level of ascertainable economic knowledge that recalls F.A. Hayek's indictment of the "fatal conceit" of economic planning. (See Robert Niewijk's article in this issue for a neat demolition of the pretensions of nonmarket valuation of environmental goods.) Moreover, the idea that economic planners are in a better position to judge proper time horizons than are millions of economic actors is ill-considered hubris to say the least. Finally, the belief that governments can be relied upon to provide for "intergenerational compensation" encounters the same public-choice obstacles that renders central environmental planning myopia on a grand scale.

As noted earlier, global civilization is not only sustainable today but increasingly sustainable as time goes on. That is not to say, however, that today's policies maximize resource creation and conservation. Maximizing the resources available to future generations would entail establishing legal and institutional frameworks that maximize the creation of wealth and technological evolution; eliminating economic subsidies and the bias against saving and investment; privatizing natural resource stocks; and internalizing environmental externalities by establishing property rights for environmental resources where possible and resorting to market-based regulation where not. Below, we examine the case for such reforms, save for environmental regulatory reforms which are addressed by Michael Kellogg elsewhere in this issue.

The Green Thumb of Capitalism

The very first objective of a sustainable society is to sustain human life, and increasing the level of per capita income will accomplish more toward that end than any other policy. Diseases associated with inadequate sanitation, indoor air pollution from biomass stoves and furnaces, and contaminated water occur mainly in developing countries and account for 30 percent of the total burden of disease in those nations. Diarrheal diseases, brought on by poor sanitation and contaminated water, alone kill more than three million children annually, and experts believe that two million of those deaths could easily be prevented with even minimal improvements in sanitation and water quality. Approximately seven million die each year from conditions like tuberculosis, cholera, typhoid, and hookworm that could be inexpensively prevented and cured and are virtually unknown as serious health problems in advanced countries. Another 400,000 women die annually from the direct complications of pregnancy and childbirth, mortality rates that are, on average, 30 times higher than those of developed nations. Exposure to indoor air pollution from biomass stoves is believed to be the main cause of the acute respiratory infections that cause four mil-

lion deaths annually among infants and children in the developing world.

Economic growth is also a vital component of environmental protection, for growth increases both the demand for environmental quality and the financial resources necessary to control and abate pollution. The relationship between increasing per capita income and decreasing ambient pollution is perhaps best typified by the problem of contaminated water. The most important source of water pollution in the developing world is not industrial emissions but the lack of even the most cursory wastewater treatment. Inexpensive and low-technology treatment systems are often beyond the means of the poorest communities, but economic growth historically has provided them with the resources to make needed investments in water treatment and eliminate one of the deadliest threats to human health in the developing world today.

Consider also that the main sources of particulate air emissions in Eastern Europe are not the manufacturing industries or public utilities but households and the small service sector, which generally use coal for heating and simple fuel needs. Pearce and Warford point out that relatively simple and inexpensive adoption of gas appliances, furnaces, and small boilers would largely solve the severe problem of air pollution throughout Eastern Europe, a process that occurred in heavily industrialized regions of Western Europe and North America 20 years ago as a consequence of economic growth.

Clearing land for agriculture is the single most important cause of deforestation, accounting for 80 to 90 percent of deforestation in the tropics. Economic growth would provide the capital to adopt high-yield agricultural practices that would alleviate the need to put more land under plow. Similarly, 80 percent of timber consumption in the developing world is used for fuel. Economic growth would afford the developing world with the resources to procure fossil fuels that are far more efficient and versatile.

Moreover, as people become wealthier, they increase their expenditures on recreational activities, bidding land and resources away from other uses. Finally, economic growth is a byproduct of free, competitive markets, and those markets provide competition that reduces the excessive waste of materials and energy associated with the technologies of Eastern Europe and the socialized economies of the developing world. Mikhail Bernstam of the Hoover Institution points out, for example, that competitive economies use three times less energy to produce a unit of goods or service than do planned economies. Not only does that conserve resources, but it minimizes the amount of pollution generated by energy consumption.

The free, competitive marketplace creates not only human capital but natural capital as well. That is because capitalism is the most productive engine of intellectual and technological advance, and it is that stock of human knowledge and technology that turns the earth's material into useful commodities. "Humans are the active agent, having ideas that they use to transform the environment for human purposes," observes economist Thomas De Gregori. "Resources are not fixed and finite because they are not natural. They are a product of human ingenuity resulting from the creation of technology and science." David Osterfeld adds that "since resources are a function of human knowledge, and since our stock of knowledge has increased over time, it should come as no surprise that the stock of physical resources has also been expanding." Closed societies and economies under the heavy hand of state planning are doomed to live within the confines of dwindling resource bases and eventually experience the very collapse feared by the proponents of sustainable development.

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Third World nations that allowed markets to operate relatively unhindered after World War II, for example, have far more "sustainable" societies than those nations that intervened heavily in their economies to correct for "market failure." Typical is the case of South Korea and Ghana which, about 35 years ago, had about the same per capita income. Ghana was much more richly endowed with natural resources and was less densely populated. Ghana intervened in its economy to a far greater extent than South Korea and today, South Korea has eight times the per capita income of Ghana and is a healthier and more stable society.

The Environmental Poison of Economic Intervention

The pernicious effect of state intervention in the economy is most striking when one considers the unintended impact those interventions have on the environment. In fact, the staggering array of industrial and consumer subsidies is perhaps the greatest enemy of sustainable development today.

Subsidies for energy consumption, for example, total $230 billion annually in developing countries alone, four times the total world volume of developmental assistance. The World Bank estimates that half of the air pollution in Eastern Europe is directly attributable to those subsidies. Electricity prices in the developing world cover barely one-third the cost of supplying that electricity, resulting in the consumption of about 20 percent more electricity than if consumers paid the true marginal cost of supply. Not only do electricity subsidies encourage overconsumption and generate unnecessary energy-related pollutants, they also discourage investment in new, cleaner industrial technologies.

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Environmentalists have long expressed alarm over the excessive use of water and the ruinous overirrigation of fragile agricultural lands. Yet this is not a function of "too many people, too little water" but a function of the extravagant subsidies of water consumption throughout the global economy. Households in developing countries, for instance, pay only 35 percent of the cost of supplying water. Likewise, irrigation charges are typically only 20 percent of the cost of supply in developing economies. The heavy subsidization of irrigation contributes to significant tracts of land lost through waterlogging and salinization; downstream pollution and upstream siltation and deforestation as a consequence of damming; and declining household water quality due to the vast amounts of water misdirected toward the agricultural sector. Ninety-one percent of all water withdrawals in low-income nations is directed to the agricultural economy—4 percent for domestic consumption—whereas only 39 percent of water withdrawals in high-income economies are devoted to agricultural use.

Extravagant subsidies for fertilizer and pesticide consumption are also rife throughout Third World economies, with predictable ramifications for water quality. Although global data is incomplete, subsidies are known to cover 89 percent of pesticide costs in Senegal; 83 percent in Egypt; 67 percent in Ghana; 44 percent in Colombia; 41 percent in Ecuador; and 19 percent in China. Nitrogen fertilizer costs are likewise only 60 to 80 percent of market costs in Mexico, Sri Lanka, India, Indonesia, and Turkey.

Other interventions in the economy contribute to environmental degradation and the overexploitation of resources, although the effect is not so apparent as in the above cases. Protectionism in general reduces competition and the pressure to more efficiently use natural resources. Prohibitions against foreign business operations in less developed countries prevent the introduction of environmentally benign technologies and practices common in the developed world. Price supports for agricultural commodities encourage overproduction and excessive pesticide use with negative results for water quality, energy use, and soil conservation. Price controls for agricultural commodities, on the other hand, depress the value of land, lowering the rate of return for conservation measures such as soil conservation and tree planting. Government policies that discriminate against export crops (widely adopted in the developing world to encourage "agricultural independence") tend to harm soil fertility because most export crops today such as palms, coffee, and cocoa typically have low erosion factors while subsistence crops such as maize, sorghum, and millet have high erosion factors. Policies that restrict or ban log exports and steer domestic timber production toward domestic finishing industries tend to depress the price of logs, causing the value of the wood itself to decline. Consequently, forest land becomes more attractive for agricultural or industrial development and investments in forest sustainability become less attractive for private owners.

The practical environmental impact of those

perverse subsidies is hard to ignore. Pearce and Warford observe, for example, that fertilizer plants in Egypt don't recover ammonia or ammonium nitrate because the domestic price is only 45 to 48 percent of the global price, making recovery uneconomic. Yeast cake is not recovered because the controlled price of yeast is low. Consequently, yeast waste is a major source of organic wastewater pollution in Lake Maryut. In Algeria, artificially low natural gas prices encourage excessive production and use of agricultural chemicals. In Turkey, huge subsidies and protectionist barriers designed to help exporting industries such as chemical, iron and steel, paper, and nonferrous metal are responsible for massive overconsumption of energy and, consequently, pollution emissions, despite the fact that Turkey has no comparative advantage in those industries.

Macroeconomic mismanagement also plays an indirect but very real role in environmental degradation. Overvalued exchange rates, for example, make exporting difficult and reduce the availability of foreign capital (inhibiting the adoption of modern pollution control equipment and the adoption of high-yield agricultural practices), depress agricultural prices (thus lowering the value of farmland and discouraging land improvements), discourage the planting of more environmentally benign export crops, and protect domestic industry from foreign competition (thus relieving the pressure for efficient resource use).

The Tragedy of the Commons Revisited

It is gradually dawning on even the most ardent green statists that public ownership of environmental resources is a recipe for ecological disaster. Alan Durning of the Worldwatch Institute, for example, acknowledges after years of study that "tenure is a key determinant of the sustainability of forest economies," a fact "supported by reams of scholarly studies and economic analysis." He concludes that "nationalizing the forests sabotaged traditional management, creating the free-for-all it purported to avert. . . . Across the Third World, forest departments are hopelessly inadequate to the problem at hand. Their guards number in the hundreds or thousands in most tropical countries, while tropical forest inhabitants number in the millions. In Zaire, for instance, the forest department's staff of about

800 is charged with protecting 100 million hectares of jungle inhabited by perhaps 15 million people."

Private stewards are more likely to protect environmental resources given their direct economic stake in the matter than are public agencies, which are subject to political pressures, limited budgets, and imperfect information. That conclusion is underscored by a recent study by Peter Morrisette for Resources for the Future. "Political structure is an important factor affecting global patterns of land and

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resource use," Morrisette concludes. "Countries with open political systems and capitalist economies have low rates of deforestation, while countries with either closed political systems or capitalist-statist economies are more likely than not to have higher rather than lower rates of deforestation." The World Bank also points out that one of the few detailed studies of the connection between secure land tenure and land management found a "clear, positive link between more secure tenure, access to formal credit, and investment in land."

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Perhaps no better example of government failure to protect public resources can be found than the tragedy that has occurred in the Amazon rainforests. The Amazon Basin, generally inaccessible and thus relatively undeveloped until about 30 years ago, began its decline when Brazil offered to subsidize as much as 75 percent of the startup costs of cattle ranching in the rainforest back in the mid-1960s. The government further offered to recognize homesteads and grant land titles to anyone who could demonstrate that they had cleared the land of trees. By 1970, Brazil adopted its "National Integration Policy" which allocated funds to construct roads through the Amazon, including superhighways running east-west and north-south in order to introduce human settlements in areas completely inaccessible before. The Brazilian income tax code exempted agricultural revenue from taxation altogether through the use of massive tax credits for virtually every agricultural undertaking, making land acquisition more attractive still in comparison with other investments. Consequently, revenues from Amazonian beef cattle ranching cover only about one-third the cost of setting up the ranches in the first place.

Although Brazilian laws have since been passed to discourage livestock development in the Amazon, they have either failed to significantly alter the incentives for deforestation or have been ignored altogether.

The growing recognition of aboriginal land rights to the rainforest, however, remains one of the few encouraging developments. Brazil recently granted the Amazonian Kayapo tribe control of 10 million hectares of rainforest—an area the size of Ontario—and 22 million acres to the 10,000 member Yanomami tribe. But the accumulated impact of government subsidies designed to open up the Amazon to development is likely to distort even tribal land-use decisions. The Kayapo tribe, for example, immediately opted to sell mahogany and mining rights to developers, prompting Greenpeace to appeal to the Brazilian government to prohibit such sales even though property rights to the land are now held by the tribe. On the other hand, the Yanomami tribe is unwilling to sell development rights but is nonetheless facing violence as miners and loggers—once given at least implicit rights to harvest the economic bounty of the Amazon—attempt to use force to secure those resources.

Brazil's subsidization of rainforest development is typical of Ecuador and other nations that claim Amazonian land. And given that 70 percent of all global forests are owned by governments, the Amazonian experience, though perhaps more spectacular, is not substantially different from the experience of other forested regions. Although it is not necessarily "unsustainable" to make economic use of forest resources, it is certainly not wise to make artificially attractive through subsidies economic enterprises that otherwise would never be profitable. Not only are economic resources wasted, but unnecessary environmental degradation results. Had private stewards owned the resources of the Amazon, it undoubtedly would have experienced far less development than it has today.

Private ownership of fauna has also proven superior to public stewardship. Although examples abound, the case of the african elephant is perhaps most instructive. Nations that outlawed elephant hunting and assumed all ownership rights over herds couldn't stabilize animal populations. Kenya's experience was typical. In 1970, when that nation banned elephant hunting, its elephant population dropped from 140,000 to approximately 16,000 today. Elephants lost all

value to villagers simply because the herds no longer brought them any economic return. Indeed, the elephants became a decided economic liability given their voracious appetite for domestic crops. Yet in Zimbabwe, elephant herds nearly doubled since 1984 when that government granted limited ownership rights to villagers who now had an economic stake in preserving the great herds.

Those lessons in the efficacy of private stewardship are certainly applicable toward the recent concern over dwindling stocks of ocean fisheries. As environmental analyst Kent Jeffreys pointed out in "Who Should Own the Ocean?" a paper published by the Competitive Enterprise Institute, international law currently treats ocean resources as a vast open commons, a classic example of what Garrett Hardin warned of in his classic 1968 essay "The Tragedy of the Commons." Given the dynamics of virtually unregulated harvesting of unowned resources, it is no wonder that ocean resources are beginning to face depletion. Yet Jeffreys examines numerous means by which fish schools could be privatized, ownership of fishing rights could be defined, and property rights over oceanic resources could be protected. Since fish are an eminently renewable resource, there is no more reason that man should run out of harvestable fish than there is reason to fear that man might run out of cattle.

Although space does not permit more than a cursory review of the crucial role that private property plays in wise resource stewardship, suffice it to say that on at least this particular issue, environmentalists and classic economists are by and large in agreement: privatizing the environmental commons is a crucial ingredient for sustainable development.

Sustainable Development, Thy Name is Laissez-Faire

The world today is not only sustainable, but is more sustainable than ever before in the sense that future generations will inherit more natural and man-made capital to meet their needs than any preceding generation. That will be the case, however, only as long as the global economy is left relatively unrestrained by well-meaning but woefully misguided environmental planners. Government control over resource production or consumption only serves to dismantle the very engines of resource creation necessary for a sustainable society, and inevitably delivers control into the hands of those who are politically strongest at any given time. Excessive and heavy-handed regulation of pollution slows technological and economic growth, achieving few gains at the margin in developed nations while actually harming human health in less developed countries by reducing the economic resources that are so necessary to alleviate the unnecessary suffering of millions every year.

President Clinton's challenge is to break out of the old environmentalist paradigm that reached its apogee at Rio and instead embrace policies that free the economy to produce the wealth necessary for environmental improvement and the natural resources necessary for a growing economy. Such an agenda would eliminate unnecessary energy and farm subsidies, defund the World Bank and international lending institutions that subsidize projects that are unprofitable in the marketplace, deregulate energy production by electric utilities and the petroleum and natural gas industries, begin the process of divesting federal land, eliminate western water subsidies and public control of that resource, end the ban on oil exports from Alaska's North Slope, remove all subsidized energy research and development from the federal budget, and begin to seriously reexamine the heavy reliance on command-and-control environmental regulation.

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International agencies such as the UN Commission on Sustainable Development should likewise be urged to work toward the adoption of market economies in the developing world, the elimination of all forms of economic subsidy and protection, and the divestment of public ownership of economic and environmen-

tal resources in order to maximize the economic growth necessary to deliver millions from poverty and related environmental diseases.

Admittedly, the analysis presented above does not deal with what many consider the most serious threats to "sustainability:" global climate change, ozone depletion, and species extinction. All of those issues require far greater attention than can be given within the confines of this article. Suffice it to say, however, that a growing consensus of scientists believe that public fears regarding those threats are far out of proportion to the actual risks they pose to society, that the scientific evidence scarcely justifies the apocalyptic warnings of the environmental lobby, and that unwarranted fixation on those dubious threats only serves to divert scarce resources that could be used to remedy real, proven environmental and health threats that, as noted above, are responsible for millions of deaths around the globe every year.

In sum, society today is eminently sustainable, but can indeed be made more so by restricting the reach of government intervention in the economy. Not only would future generations benefit from such a policy course, but today's generation would profit as well.

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