American Enterprise Institute for Public Policy Research

AEI

August 2002

Sustainable Development in the Balance

By Steven F. Hayward

The United Nations is taking up the issue of sustainable development at a high-profile world summit in South Africa. The consensus-driven process of UN meetings is slow and opaque but can generate international commitments over time. The UN helped originate the idea of sustainable development, but our understanding of the issue may be moving ahead of the UN. This issue of the Environmental Policy Outlook *examines some basic aspects of sustainable development and reviews recent attempts to quantify the sustainability of the world economy.*

The UN World Summit on Sustainable Development, being held in Johannesburg August 26 through September 4, is expected to attract a throng of 60,000 people. Participants will include major and minor diplomats and legislators, political activists of sundry persuasions and agendas, corporate executives and damage-control specialists, scientists, priests, press agents, and journalists—and, the UN emphasizes, "heads of State, . . . children and youth, farmers, indigenous people, and women and workers and trade unions."

For the UN to style such a capacious gathering a *summit*—which means a secluded meeting of heads of government, usually to make sovereign commitments on carefully specified subjects—is a fine example of reworking language for political ends. Meetings such as Johannesburg are the very opposite of summits: they are base camps, where plans are laid and gear assembled for scaling the political mountains of established policies and institutions (leading in time, the organizers hope, to real summits). The intellectual gear of the Johannesburg summit is the idea of sustainable development. That phrase is another example of politically inspired terminology—but one, as we shall see, of language acquiring a life of its own, moving rather than being moved by political developments.

It is easy, and a profound mistake, to regard conferences such as the Johannesburg summit dismissively or to make fun of the inflated rhetoric that surrounds them. Described by promoters as events of world-historical importance, they invariable result in lengthy and nearly unreadable documents comprising high-minded declarations, pledges, commitments, ministerial statements, lists of principles and goals, resolutions, frameworks, and annexes—all recalling Woody Allen's gag about developing a framework to turn a concept into an idea. And the vague and undisciplined nature of the reports, resulting from a consensus process in which everybody's wish list is incorporated in bureaucratic jargon, impedes the development of concepts into coherent ideas (the various draft documents prepared for the Johannesburg summit, for example, include the eradication of money laundering and the ratification of the International Criminal Court as policies for promoting sustainable development). Yet the UN environment program is serious business. Although the process grinds slowly, it aims to change the policies of sovereign governments by gradually shifting public sentiment and the positions of private interest groups and government bureaucracies. The process has, for better or worse, produced many successes and near misses, such as the law of the sea treaty, the Montreal

Steven F. Hayward is the F. K. Weyerhaeuser Fellow at AEI and the author of the annual *Index of Leading Environmental Indicators,* released each year on Earth Day.

Environmental Policy Outlook

Protocol on ozone-depleting chemicals, and the Kyoto Protocol on climate change.

The Johannesburg summit is neither as promising as environmentalists think nor as menacing as its critics worry. To be sure, the undemocratic influence of non-government organizations (NGOs), the radical fringe's agenda of global environmental governance, and the socialist-redistributionist impulse will all be on display. On the other side of the ledger, however, are signs that the sustainable development project may be turning away from its Malthusian roots toward a broader and more productive view of the relationship between economic development and environment quality. Though still hard to apply with precision, sustainable development has matured and diversified: it may no longer reflect what environmentalists had in mind when the idea came to the fore more than fifteen years ago. If an intellectually sustainable conception of sustainable development dominates the original Malthusian conception, the Johannesburg summit could mark a turning point in the global environmental debate.

The Road to Johannesburg

Sustainable development first came to light as a successor to the limits-to-growth idea popular in the 1970s. The limits-to-growth theme held that we were in imminent danger of running out of natural resources and choking on rising pollution.[1] But the originators of the idea were confident enough to offer firm predictions and certain dates: those turned out to be spectacularly wrong (the Carter administration's *Global 2000 Report to the President* announced that the price of oil would rise 50 percent in real terms in the 1980s and reach $100 a barrel by 2000).[2] In retrospect it is apparent that the resource scarcities of the 1970s were the transient results of faulty government policies, such as price controls and currency inflation; falling pollution levels in industrialized nations have since demonstrated that environmental improvement is compatible with economic growth. Among serious environmentalists the limits-to-growth notion has been thoroughly discredited.[3]

The weakness of the limits-to-growth argument did not mean that no long-term environmental problems were associated with growth. Hence the idea of sustainable development was born. It may have been intended as a euphemism for *less development,* just as in today's debates over suburban sprawl *smart growth* is often a euphemism for *less growth*. But ideas often take on a life of their own, and that has happened with sustainable development. In 1987 the World Commission on Environment and Development, more commonly known as the Bruntland commission after its chairman, former Norwegian prime minister Gro Harlem Bruntland, propelled sustainable development to the forefront with its report *Our Common Future* (Oxford University Press). The Bruntland commission attempted a succinct definition of sustainable development: "To meet the needs of the present without compromising the ability of future generations to meet their own needs."

Although the definition is suggestive, it is too vague and general to be helpful for making policy. President Bill Clinton's Council on Sustainable Development recognized in its 1996 report that the definition was "inexact." As a UN report observed in May 2002, "The concept of sustainable development does not yet provide decision-makers with the kind of detailed and integrated prescriptions that they need to make day to day policy decisions."[4] Nevertheless sustainable development seemed the ideal concept to subsume the growing concern over climate change. If climate change arising from man-made CO_2 emissions will bring catastrophic consequences over the next 100 years, then our current way of life, however agreeable for the time being, is unsustainable and will have to change.

Climate change was the central focus of the UN's last world summit on the environment in Rio de Janeiro ten years ago. It will not be this time around. The Johannesburg summit is hoping to build on the principal work product of the Rio summit, a document known as Agenda 21. Described as "a road map to a postindustrial, postmodern era of economic, political and environmental sanity,"[5] Agenda 21 is the size of a telephone directory and therefore defends itself against the risk of being widely read. But for all its faults and fulsomeness, Agenda 21 is no antiglobalist manifesto: it acknowledges the necessity of economic growth to environmental quality, calls for eliminating trade protectionism and expanding world markets, and warns against using environmental pretexts for imposing trade barriers. Agenda 21 also sensibly notes that "environmental standards valid for developed countries may have unwarranted social and economic costs in developing countries."

Those statements are the hinge on which the idea of sustainable development is turning from an antigrowth euphemism to a more robust concept that can illuminate our understanding of long-term environmental progress.

And they will be debated at a conference where the more immediate problems of the host region, sub-Saharan Africa, will crowd out worries over long-term climate change. Severe and widespread poverty, disease, malnutrition, lack of public sanitation and potable water, and political tyranny encourage serious attention to the relationship of economic development to environmental quality.

Making Sense of Sustainable Development

The idea of sustainable development is both commonsensical and contentious. It reflects common sense because no one is *for* a mode of life that diminishes our capital stock and thereby makes future generations poorer, or for one that degrades our living conditions and thereby makes future generations less healthy. Yet it is also contentious because of the difficulty of comprehending the myriad linkages between environmental factors in a dynamic world. Clashing conceptual frameworks lead to widely varying conclusions about what constitutes sustainability; quantifying sustainable development is nearly impossible. As environmental scientist Timothy O'Riordan warned in 1988, "It may only be a matter of time before the metaphor of sustainability becomes so confused as to be meaningless, certainly as a device to straddle the ideological conflicts that pervade contemporary environmentalism."[6]

Surely the first step toward taking sustainable development seriously is to treat it not as a metaphor or a political straddle, but as a practical tool for analyzing environmental and resource-use problems and helping to distinguish good policy ideas from bad ones. The following sections attempt to do so by applying the idea to a succession of discrete issues: those involving renewable resources, nonrenewable resources, local ecosystems, and the global ecosystem.

Renewable Resources

Renewable resources—such as forestlands, watersheds, wildlife, and other self-generating resources and ecosystems—present the clearest application of the idea of sustainable development. A renewable resource is used unsustainably when it is exploited at a faster rate than it can replenish itself. Typically, if a well-functioning market exists for a resource, price increases are a signal of unsustainable usage and an inducement to conservation and substitution. (The effect of the price system to correct the unsustainable is the basis of the late economist Herbert Stein's memorable dictum: If something can't go on forever, it won't.)

Most instances of unsustainable use of renewable resources can be attributed to a lack of a well-functioning market and price system, a lack of property rights to resources or of ready alternatives to those resources (especially in underdeveloped nations),[7] or perverse regulatory policies. Groundwater and stream-flow resources in the United States are often overused because of government subsidies and a lack of clearly defined, tradable property rights to water. Overfishing in the oceans illustrates unsustainable use of resources owned in common. It is easy to imagine that cattle might be scarce if they were owned in common and were taken from one vast domain (as buffalo once were) rather than being privately owned on separate ranches. Assigning ownership rights to ocean fishing should not be much more difficult than assigning rights to the radio frequency spectrum, as has been done throughout the world. Some promising experiments are using property rights to preserve fisheries in New Zealand, Iceland, and several other areas.[8]

Research advances in resource economics have cast a shadow on regulatory approaches to many large-scale resource use problems, and interest is growing in the use of markets and property rights to solve those problems, even among left-leaning environmentalists.[9] Much destruction of forest resources of present concern resulted from unsound government policies that private owners would not likely have undertaken to the same extent, if at all. Former vice president Al Gore noted 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."

Whether caused by faulty markets or faulty public policies, overuse of renewable resources is relatively easy to correct—in principle and increasingly in practice. The United States has shown the way toward correcting unsustainable forestry practices; forestland in the United States and other industrialized nations has been increasing for more than forty years. There are signs as well that the unsustainable exploitation of rain forests throughout the developing world is beginning to ebb.

Nonrenewable Resources and Technological Change

The implications of sustainable development for the use of nonrenewable resources such as fossil fuels and minerals are more complicated. It is by definition impossible to use a nonrenewable resource sustainably; each unit of a nonrenewable resource used is one less unit from a finite pool.[10] But it does not follow that such resources need to be conserved to any particular degree to sustain *development,* or even that exhausting the resources entirely will impinge on the ability of future generations to meet their needs (the Bruntland formulation). The use of whale oil in the nineteenth century as an input for energy and manufacturing was clearly unsustainable. And it was not sustained. The hunting of whales to near extinction may have been a tragedy and may have threatened the biological diversity of the planet, but the depletion of whale oil as a resource did not impede succeeding generations from growing and meeting their needs (and not, incidentally, from restoring and protecting the whale population at the same time). More plausibly the use of whale oil facilitated economic development—growing wealth, incomes, occupational specialization, and technological prowess—that put humankind in a position to adopt better, more efficient, more sustainable methods of production.

That example illustrates the problem of a static view of resource consumption when dealing with a long time horizon—as one almost always is when considering nonrenewable resources. Production technology changes profoundly and unpredictably over time; newer technologies, being more efficient than the ones they replace, yield more output per unit of resource input. That sequence does not mean that every technological improvement is more conserving of natural resources, because more efficient technology stimulates growth and therefore total output. But it does mean that it is nigh impossible for one generation to know what resources future generations will need and in what proportions—and that a little humility is in order when making long-range plans. A planner in 1900, worried about the resource needs of the year 2000, would have taken care to secure supplies of whale oil and firewood for heating and lighting, copper for telegraph wires, rock salt for refrigeration, horses for transportation, and vast expanses of land to grow feedstock for draft animals; the planner would likely have been unworried about securing supplies of oil and gas, as they were only starting to come into widespread use, and their supplies were abundant.

The resource-conservation benefits of new technologies are often vastly greater than later generations, concerned with new conservation challenges, appreciate. Consider the large, immediate, and lasting resource benefits of the development of the automobile—now often portrayed as environmental public enemy number one. In 1900, 3.4 million horses were used for transportation in urban areas of the United States (another 17 million lived in rural areas, primarily pulling plows and performing other farm chores).[11] The transport capacity of horses was three-quarters as great as that of railroads in 1900; as late as 1911 the value of horse-drawn transportation equipment produced was greater than the value of railroad equipment produced.[12] The average horse consumed about 30 pounds of feed a day, or 5 tons a year. The air and water quality and public sanitation hazards from horse dung were substantial. A single horse could produce 12,000 pounds of manure and 400 gallons of urine a year, much falling on city streets. The August 1900 issue of *Scientific American* summarized the problem vividly:

> The streets of our great cities can not be kept scrupulously clean until automobiles have entirely replaced horse-drawn vehicles. At the present time women sweep through the streets with their skirts and bring with them, wherever they go, the abominable filth which is by courtesy called "dust." The management of a long gown is a difficult matter. Fortunately, the short skirt is coming into fashion, and the medical journals especially commend the sensible walking gown.[13]

More significant than the pollution benefits was the conservation of land resources brought about by the auto. The amount of land used for growing feedstock for horses peaked in 1915 at 93 million acres—an area roughly equivalent to the area of all U.S. cities and suburbs today, representing as much as 25 percent of total agricultural land at the turn of the century. That land has largely reverted to natural woodlands and grasslands or has been put to other, higher agricultural uses.[14] (In fact that one change accounts for much of the lamented decline in farmland over the past century.) The coming of the car and truck and tractor saved 90 million acres of U.S. land, a saving of resources usually left out of the environmental accounting of the internal combustion engine.

It is possible to conceive of technological advances in the next seventy-five years that will make today's resource concerns as obsolete as concerns for whale oil, rock salt, or filthy streets a century ago. In arguing in favor of a "promethean environmentalism," Duke University's Martin Lewis points to the prospect of "molecular nanotechnology"—programmable molecules that would be a green technology par excellence and that might even provide the means of species restoration.[15] Well beneath those high-technology frontiers, it is possible to imagine such low-tech practices as mining old landfills for their raw materials, which might be thought of as retroactive recycling.

Predictions of technological salvation are a poor ground for policy, of course. If sustainable development is just a duel of competing scenarios of future development, little will have been accomplished. But two important general principles, in tandem with what we know of the history of economic development, do help us to think clearly about the challenge of sustainable development.

The first is the economic principle of *substitution:* as a resource becomes scarcer and hence more costly, incentives increase for discovering and deploying lower-cost substitutes. Many people will doubt that the price mechanism is as reliable a guide to sustainability when dealing with nonrenewable resources and long time horizons as when dealing with renewable resources and short time horizons. But the source of that doubt is uncertainty about the distant future—the core problem in making sustainability an operational policy tool. That circumstance afflicts policy planning and political decisionmaking at least as much as the private economic calculations that drive the price system. Tremendous energy and resources are being applied today to the development of practical substitutes for fossil fuels, and would be even if governments were doing nothing to subsidize the efforts.

The second and more robust idea is derived from the economic principle of the *production possibility frontier:* a society maximizes its wealth by making maximum use of all available resources in the most efficient (output-enhancing) proportions. Other things being equal, a society that maximizes its current wealth also maximizes the capital assets available for future generations. In the face of uncertainty concerning the environmental (and other) challenges and opportunities of a distant future, can a society do better than to build its capital assets as much as it can so as to have the greatest possible resources of wealth and technology to bring to bear on whatever problems the future may bring?

Economist Thomas C. Schelling has powerfully applied that notion to the issue of climate change. Even under forecasts of global warming, truly serious consequences will not appear for many decades. Because we will be much wealthier and more technologically adept in several decades than we are today, the best climate-change policy might be to emphasize economic growth for the present rather than instituting costly short-term policies (such as those envisioned in the Kyoto Protocol) that would seriously retard economic growth. "Climatically, it would make virtually no difference what the trajectory was by which we got to [acceptable atmospheric concentrations of greenhouse gasses], . . . while economically, it matters a great deal how we get there." And that makes the relationship of economic development to sound environmental stewardship particularly acute:

> [M]ight we do more to protect the Indian population of 2050 and 2075, for example, from climate change by accelerating economic development in India now than by slowing down climatic change itself? . . . Even for the grandchildren of those now in India, China, Indonesia, and other developing countries, putting a lot of resources into slowing climate change and nothing into their own accelerated development may be the wrong thing to do.

Pollution and Habitat Decline: Is the Earth's Ecosystem Sustainable?

The Schelling argument reminds us that the most animating sustainability issues today concern not staple commodities, renewable or nonrenewable, but the more complex case of large ecosystems. "We are running out of sky, not oil," says Gary Cook, legislative director of the Greenpeace Climate Campaign.[16]

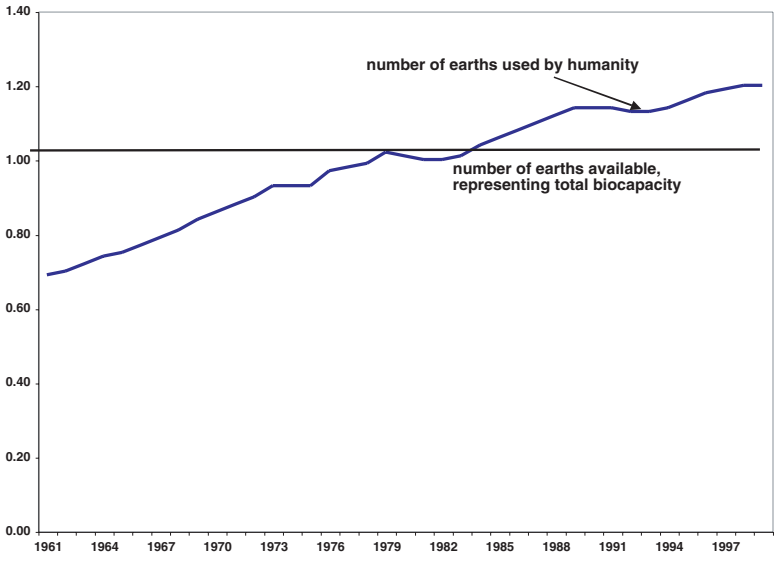
The overuse of an ecosystem is relatively easy to observe on the local level. Plausible examples of unsustainable local ecosystems include Pittsburgh in the heyday of the coal and steel industry in the first half of the twentieth century, smog levels in Los Angeles in the 1950s and 1960s, and the fouled waters of Lake Erie and the "fire hazard" Cuyahoga River before the first Earth Day in 1970. The dramatic reversal of the environmental degradation of those ecosystems shows the resiliency of nature and provides a basis for optimism—local ecosystems, at least, are renewable resources. In advanced

industrialized nations, most forms of pollution have been falling for decades.[17] Although pollution is increasing in many developing nations, research and experience suggest that nations with growing economies can look forward to falling pollution rates over time.

Yet the question remains whether the progress to date is sufficient in the aggregate or whether the degradation of ecosystems in the developing world will overwhelm the progress being made in the developed world. Is the earth's ecosystem as a whole being sustained?

Recent studies by Redefining Progress and the World Wildlife Fund attempt to sum up the total impacts of the human economy on the planet's ecosystems, and both are pessimistic.[18] The studies employ the same methodology, converting human activities into a measurement of the land area required to support them; they conclude that "human activities have exceeded the biosphere's capacity since the 1980s" and that the earth can no longer regenerate itself fast enough to keep up with human demands. Both studies feature an ominous line graph of "Number of Earths Used by Humanity" showing the line crossing the 1.0 mark in 1978. By 1999, the chart suggests, humans were using the equivalent of 1.2 earths (see figure 1). The World Wildlife Fund version of the study predicts that ecological collapse will arrive by the year 2050 unless major changes are made.

Figure 1: World Ecological Footprint, 1961–1999



Source: World Wildlife Fund, *WWF Living Planet Report 2002* (Washington, D.C.: WWF, 2002), and Mathis Wackernagel et al., "Tracking the Ecological Overshoot of the Human Economy," PNAS Early Edition, May 2002 (available at www.pnas.org/cgi/doi/10.1073.pnas.1420334699).

Both studies received wide publicity when they were released recently and will be widely circulated and discussed at the Johannesburg summit.

The conclusions of the studies depend, however, on the assumptions used to convert human impact into land area equivalents, a procedure the authors candidly admit allows for a large variance in outcomes if different assumptions are made.[19] The largest variable in the studies is the land area required to sequester all of mankind's carbon dioxide emissions such that there would be no increase in CO_2 levels in the atmosphere. If one changes the model's assumptions about sustainable levels of CO_2, or what other potential sequestration techniques might be substituted, the results of the model are dramatically less alarming.

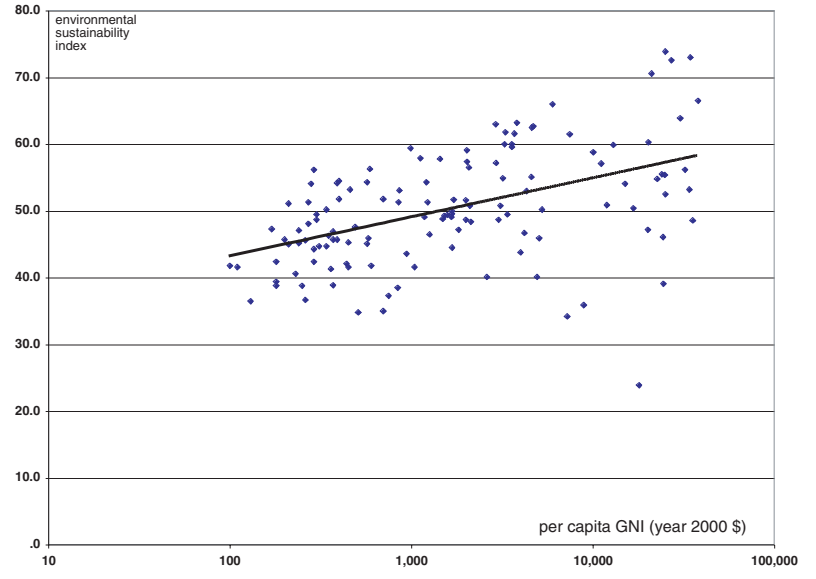
Converting human impact on the planet into a simple metric of land area is an interesting contribution to our understanding of sustainability, but it is static and incomplete. It does not allow for dynamic trade-offs and technological change over time—such as the example of the automobile reducing the impact of transportation by nearly 100 million acres of land. The model is therefore of limited value to policymakers, except as a reminder of the inherent difficulties that uncertainty about the future create for any form of long-range planning.[20]

A more promising effort comes from the joint effort of the World Economic Forum, the Yale University Center for Environmental Law and Policy, and the Columbia University Center for International Earth Science Information Network. By focusing narrowly on *environmental* sustainability, the group's report does point to a general strategy for the broader but more complex issue of sustainable development. Their environmental sustainability index (ESI) offers a sustainability score ranging from 0 to 100 (with 100 being optimal sustainability) for 142 nations based on twenty indicators and sixty-eight related variables. The methodology enables cross-national comparison of environmental progress.[21] The ESI does not attempt to make aggregate judgments about the sustainability of the entire planet and notes that

> while we accept the premise that politics, economics, and social values are important factors worthy of being sustained, we do not think that there is a sufficient scientific, empirical or political basis for constructing metrics that combine all of them along with the environment . . . . Scientific knowledge does not permit us to specify precisely what levels of performance are high enough to be truly sustainable, especially at a worldwide scale.

On the ESI scale for the year 2002, Finland came in first, with a score of 73.9, and Kuwait came in last, with a score of 23.9. (The United States was ranked forty-sixth, with a score of 53.2, down from eleventh place and a score 66.1 in the 2001 ESI.) The most significant finding derived from the ESI study (by the author of this essay) is displayed in figure 2, which compares each nation's ESI score with its per capita gross national income—and shows dramatically the relationship between wealth and environmental quality.[22] The figure is a graphic depiction of what economists call the environmental Kuznets curve (named for Simon Kuznets), according to which environmental quality degrades during the early stages of economic growth but begins to improve after a certain level of income is reached.[23] Figure 2 suggests that the relationship holds in developed economies not only for current environmental quality (a well-established proposition) but for long-run sustainability as well.

Figure 2: Relationship between Wealth and Environmental Quality



Source: World Economic Forum, *Environmental Sustainability Index, 2002* (available at http:/www.ciesin.Columbia.edu/indicators/ELI), and World Bank, *2000 World Development Indicators*, available online at http://sima-ext.worldbank.org/data-query.)

The Agenda of Johannesburg

For all the disagreement about how to define and measure sustainable development, there is near unanimity among environmentalists that economic growth is important to environmental improvement. Fortunately the UN documents prepared for the Johannesburg summit reflect that consensus throughout. Although climate change is still the most prominent issue on the mind of environmentalists whenever the subject of sustainable development comes up, climate change is not high on the agenda for the Johannesburg summit.[24] The issues at the top of the agenda are poverty, water supply, and water quality.[25]

That practical, near-term issues of economic and social development are at the top of the agenda of a conference on sustainable development indicates that a more mature understanding of the issue is making headway. If the declaration that emerges from Johannesburg retains a serious emphasis on fighting poverty and solving immediate problems such as water quality and availability, it will signify that anti-growth environmentalists have lost control of sustainable development.

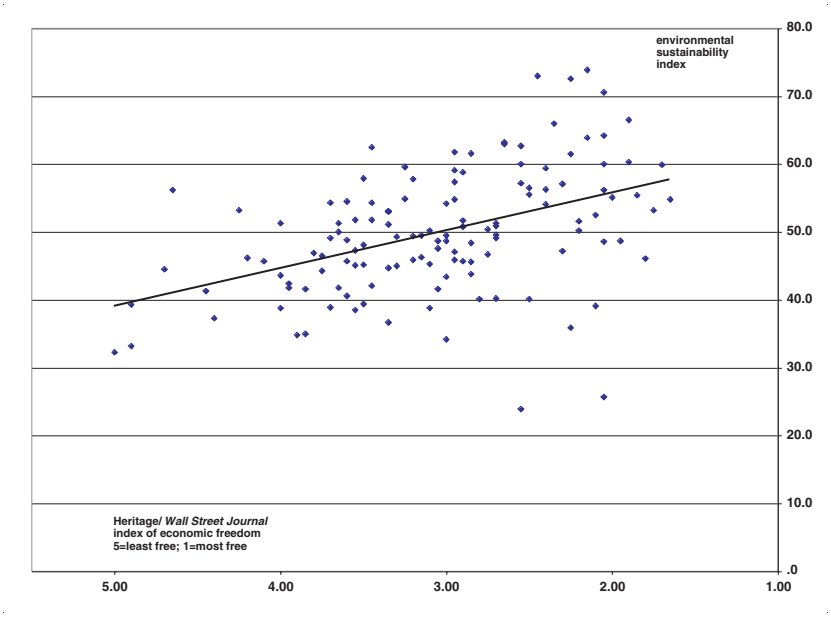
Much of the membership of the UN remains confused, however, about the sources of economic growth: on that point the Johannesburg summit hangs in the balance. The UN's recent *Global Environmental Outlook* (GEO 3) places the blame for environmental degradation on "the current 'markets first' approach" to economic and human development, and an NGO dialogue paper prepared for Johannesburg decries global economic liberalization and complains that "private corporations are a major part of the problem" of unsustainability.

The authors of those papers and other Johannesburg participants sympathetic to their views would do well to ponder a further refinement of the

World Economic Forum's ESI study (again by the current author), comparing environmental sustainability scores with a measure of economic freedom. When the ESI scores are plotted against the scores from the *Heritage Foundation/Wall Street Journal Index of Economic Freedom 2002*,[26] we see that nations with freer economies also have better records at environmental sustainability (see figure 3). The data suggest that the best strategy for sustainable development is the same as that for development per se: free markets and liberal democracy.

It is difficult, then, to derive from the idea of sustainable development justification for environmental measures different from those already familiar when the idea was first introduced. In the developed nations the familiar measures, aimed at controlling immediate problems of pollution and wasteful resource use as they arise, already go well beyond what is necessary for sustainable development (as far as we know) and also a long way toward achieving environmental sustainability (as measured by the ESI study). The political forces that will carry those measures further will have much less to do with concerns over future sustainability than with the preferences and resources of wealthy populations to make their own lives safer, healthier, cleaner, and more agreeable.

Figure 3: Relationship between Economic Freedom and Environmental Quality



Source: Gerald P. O'Driscoll, Kim R. Holmes, and Mary Anastasia O'Grady, *Index of Economic Freedom 2002* (Washington, D.C.: Heritage Foundation/*Wall Street Journal,* 2002), and World Economic Forum, *Environmental Sustainability Index 2002* (New York: CIESIN/Columbia University, 2002).

The sustainable development debate has not, however, been a waste of time for serious environmentalists. It has provided a graceful retreat from the dead-end of limits to growth, has inspired a deeper appreciation of the dependence of environmental progress on economic progress, and has pointed the way to an alliance of two important forms of political idealism (poverty fighting and environmentalism) that had long been at odds. If the result is a more practical, here-and-now environmentalism, and more serious and productive efforts to bring poor nations into the world of freedom and prosperity, the idea will have proven a fruitful one indeed.

Notes

1. The classic statement of this view is Donella Meadows, Dennis L. Meadows, and Jorgen Randers, *The Limits to Growth* (New York: Potomac Associates, 1972).

2. Gerald O. Barney, ed., *The Global 2000 Report to the President of the U.S.: Entering the Twenty-first Century* (New York: Pergamon Press, 1980).

3. Environmental scientist Michael Grubb of Cambridge University wrote recently in *Science* magazine that "to any professional, it is no news at all that the 1972 *Limits to Growth* study was mostly wrong or that Paul Ehrlich and Lester Brown have perennially exaggerated the problems of food supply." "Relying on Manna from Heaven?" *Science,* November 9, 2001, p. 1285.

4. "From Globalization to Sustainable Development: UNEP's Work on Trade, Economics, and Sustainable Development," UN Department of Economic and Social Affairs, Background Paper 1 (New York, May 2002), p. 2.

5. Philip Shabecoff, *Earth Rising: American Environmentalism in the Twenty-first Century* (Washington, D.C.: Island Press, 2000), p. 156.

6. Timothy O'Riordan, "The Politics of Sustainability," in *Sustainable Environmental Management: Principles and Practice,* edited by R. K. Turner (London: Belhaven Press, 1988), p. 29.

7. World Bank environmental consultant John Pezzey comments, "Environmental policy is all about internalizing externalities; and internalizing externalities usually amounts to

establishing some kind of property rights over the environment." Pezzey, "Sustainable Development Concepts: An Economic Analysis," World Bank, World Bank Environmental Paper 2 (Washington, D.C., 1992), p. 30.

8. See Donald R. Leal, *Fencing the Fishery: A Primer on Ending the Race for Fish* (Bozeman, Mont.: PERC, 2002) (available at www.perc.org).

9. See, for example, David Roodman, *The Natural Wealth of Nations: Harnessing the Market for the Environment* (Washington, D.C.: Worldwatch Institute, 1998). Roodman writes that government regulation of environmental goods often fails "for precisely the reason that central planning has run aground almost everywhere it has been tried."

10. "It makes no sense to talk about the sustainable use of a nonrenewable resource (even with substantial recycling effort and reuse rates). Any positive rate of exploitation will eventually lead to exhaustion of the finite stock," writes economist R. K. Turner. "Sustainability, Resource Conservation and Pollution Control: An Overview," in *Sustainable Environmental Management: Principles and Practice,* edited by R. K. Turner (London: Belhaven Press, 1988), p. 13.

11. Joel Tarr, "Urban Pollution—Many Long Years Ago," *American Heritage,* October 1971, p. 65.

12. U.S. Census Bureau, *Historical Statistics of the United States, Colonial Times to 1970* (Washington, D.C.: Government Printing Office, 1975), series S-4, p. 818; series P-362, p. 702.

13. Reprinted in *Scientific American,* August 2000, p. 14.

14. The U.S. government discontinued the data series for feedstock land in 1961 because the acreage had shrunk almost to zero. See Census Bureau, *Historical Statistics of the United States,* series K-498, p. 510.

15. Martin W. Lewis, *Green Delusions: An Environmentalist Critique of Radical Environmentalism* (Duke University Press, 1992), pp. 143–44.

16. "Environmental Groups Troubled by Recent Merger," *Global Warming Today,* December 4, 1998, p. 1.

17. Particulate pollution in Pittsburgh actually began to decline in 1925.

18. The studies are Mathis Wackernagel et al., "Tracking the Ecological Overshoot of the Human Economy," PNAS Early Edition, May 2002 (available at www.pnas.org/cgi/doi/10.1073/pnas.14203334699) World Wildlife Fund, July 2002, *Living Planet Report 2002* (available at www.panda.org/livingplanet/lpr02/downloads.cfm).

19. "Sensitivity analysis reveals the range of possible outcomes by changes in our assumptions," says Wackernagel et al., "Tracking the Ecological Overshoot," p. 3.

20. The studies implicitly acknowledge that point. The WWF version of the study includes a projection allowing for unspecified "accelerated technological change" that shows a *reversal* of the upward sloping trend of the human ecological footprint, which is consistent with the dynamic understanding of sustainability outlined here.

21. The WEF environmental sustainability index is available at http://www.ciesin.columbia.edu/indicators/ESI.

22. Figure 2 correlates per capita gross national income as reported by the World Bank for 128 nations for the year 2000 with the World Economic Forum's *Environmental Sustainability Index 2002*.

23. There is a growing literature about the environmental Kuznets curve, ably summarized by Bruce Yandle, Maya Vijayaraghavan, and Madhusudan Bhattara, *The Environmental Kuznets Curve: A Primer* (Bozeman, Mont.: PERC, 2002).

24. A discussion of energy will serve as a proxy for climate change issues. The document that the conference is expected to adopt calls for the ratification of the Kyoto Protocol. Among the specific goals sought—but not yet agreed to—are a 15 percent share of the world's energy supply from renewable (that is, non–fossil fuel) sources by the year 2010 and a commitment by developed nations to dedicate at least 0.7 percent of GDP to foreign aid.

25. The focus on water represents a vindication of critics of Kyoto such as Bjorn Lomborg, who points out the entire world can be provided with clean water for a fraction of the cost of Kyoto and thereby as many as 2 million deaths a year can be prevented.

26. Gerald P. O'Driscoll Jr., Kim R. Holmes, and Mary Anastasia O'Grady, *Index of Economic Freedom 2002* (Washington, D.C.: Heritage Foundation/Wall Street Journal 2002) (available at www.heritage.org/index/2002). The Heritage Foundation/*Wall Street Journal* index measures economic freedom according to eight variables: political corruption (the WEF ESI also includes corruption as a variable of environmental sustainability), trade barriers, the fiscal burden of government, the rule of law, regulatory burdens, banking restrictions, labor market regulations, and black market activities. Each variable is assigned a score of 1 to 5 (with 1 being best), and the scores are averaged to generate a composite score for each country.