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Introduction

Robert Kates examines the "genius of the oxymoron of sustainable development that lies in its essential ambiguity," one that "seeks to finesse the real conflicts between economy and environment and between the present and the future." In looking at the successes and failures of past and contemporary globalization, Kates concludes that while globalization has allowed the world community to attack certain problems effectively, to date its harms have overwhelmed its benefits. "[G]lobalization has not helped reduce the numbers of chronically hungry in the world. . . . The shifts in investment, income, and job opportunities in some parts of the world are matched by the growth of hunger elsewhere. . . . [D]espite major gains in technologies that reduce the use of energy and materials per unit of production, the absolute growth in consumption overwhelms the steady global technological progress." Kates argues, however, that those of us who aspire to a transition toward sustainability, to meet human needs while preserving the life support of the planet, cannot be "against globalization."

He advances the idea that just as capitalism was (over a century) "civilized" through the rule of law, increased transparency, and the creation of better forms of governance, so must globalization be—the difference being that this change must be compressed into perhaps the next two decades, and that its best hope now comes from the "bottom up," through the popular movements and groups that are now well advanced in their efforts to "humanize" globalization.

Dr. Robert Kates is a geographer who served as the first director of the Feinstein World Hunger Program at Brown University until his retirement in 1992. In 1991, he was awarded the National Medal of Science for his work on hunger, environment, and natural hazards. He played a major role in the completion of the National Academy of Sciences report *Our Common Journey: A Transition toward Sustainability.* He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences and is a visiting scholar at the Belfer Center for Science and International Affairs at Harvard University's Kennedy School of Government. Currently, Kates serves as co-convenor of the initiative on science and technology for sustainability, is executive editor of *Environment* magazine, and is university professor emeritus for the Watson Institute for International Studies at Brown University. He now continues his work as an independent scholar from his home in Maine.

—J.G.S.

Chapter 6

The Nexus and the Neem Tree: Globalization and a Transition toward Sustainability

Robert W. Kates

The world of this new century is in transition—becoming more crowded and more consuming, warmer and more stressed, more interconnected, yet diverse and divided. Can this transition also be a transition for sustainability, in which the more than 9 billion people of the next half century meet their wants and needs in ways that do not further degrade the planet's life-support systems?

In this chapter, I explore this transition to sustainability, the context in which it will take place, and the ways in which the new-old phenomenon of globalization affects it. My title is a play on the title of what may be the best-known book on globalization—Tom Friedman's *The Lexus and the Olive Tree.*

Friedman describes his title as follows:

> So there I was speeding along at 180 miles an hour on the most modern train in the world, reading this story about the oldest corner of the world. And the thought occurred to me that these Japanese, whose Lexus factory I had just visited and whose train I was riding, were building the greatest luxury car in the world with robots. And over here, on the top page of page 3 of the *Herald Tribune,* the people with whom I had lived for so many years in Beirut and Jerusalem, whom I knew so well, were still fighting over who owned which olive tree. It struck me then that the Lexus and the olive tree were pretty good symbols of this post–Cold War era: half the world seemed to be emerging from the Cold War intent on building a better Lexus, dedicated to modernizing, streamlining and privatizing their economies

> in order to thrive in the system of globalization. And half the world—sometimes half the same country, sometimes half the same person—was still caught up in the fight over who owns which olive tree (p. 31).

But unlike this Lexus, which stands for all that is modern and different in globalization, and the olive tree for all that resists it, the nexus I explore is that of environment and development and the context in which it will play out over the coming two generations. And the Neem tree symbolizes the globalizing world where the elements of both the Lexus and the olive tree coexist in an uneasy tension of mutual attraction and repulsion.

I use three critical goals required for a successful sustainability transition—meeting human needs, reducing hunger and poverty, and preserving the life-support systems of the planet—to ask how globalization might help or hinder achieving these. For globalization to help more than hinder, it will need to be "civilized," and I conclude with an analog of how that might take place.

Sustainable Development: The Nexus of Environment and Development

The nexus of society's developmental goals with its environmental limits over the long term comes together in "sustainable development," which is only the most recent effort to link together the collective aspirations of the peoples of the world. Over my adult life, four aspirations emerged: first, for peace in the postwar world of 1945; then for freedom, in the struggles in the late 1940s and 1950s to end imperialism; followed by development for the poorest three-fourths of the world; and last, in the final quarter of the century, a concern for a healthy environment for humankind, the earth itself, and its complex systems that support life. As global aspirations develop, good people try to bring them together in a characteristic pattern of international high-level commissions (Brandt, Palme, Brundtland), followed by great international conferences. Such was the 1987 report of the World Commission on Environment and Development (WCED, also known as the Brundtland Commission) widely disseminated as *Our Common Future (WCED, 1987), followed by the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, and now a decade later in South Africa as the World Summit for Sustainable Development*.

"Sustainable development" is now central to the mission of countless international organizations, national institutions, "sustainable cities" and

locales, transnational corporations, and nongovernmental organizations. The genius of the oxymoron of sustainable development lies in its essential ambiguity that seeks to finesse the real conflicts between economy and environment and between the present and the future. While sharing a common concern for the fate of the earth, proponents of sustainable development differ in their emphases on what is to be sustained, what is to be developed, how to link environment and development, and for how long a time (see Figure 6.1). Thus, proponents differ on what is to be sustained: Is it nature itself, or nature in the utilitarian life support of humankind, and does it include sustaining the community of the olive tree, as Friedman (2000) describes it: "everything that roots us . . . family, a community, a tribe, a nation, a religion or, most of all, a place called home" (p. 31)? Proponents differ on what is to be developed: Is it the economy, some broader notion of society, or is it people themselves? And how shall we link the two: sustain only, develop mostly, develop only but sustain somewhat, sustain or develop?—these and many more permutations are found. Finally, over what time horizon will this occur? The Bruntland report employs the usefully ambiguous and widely accepted time horizon as "now and in the

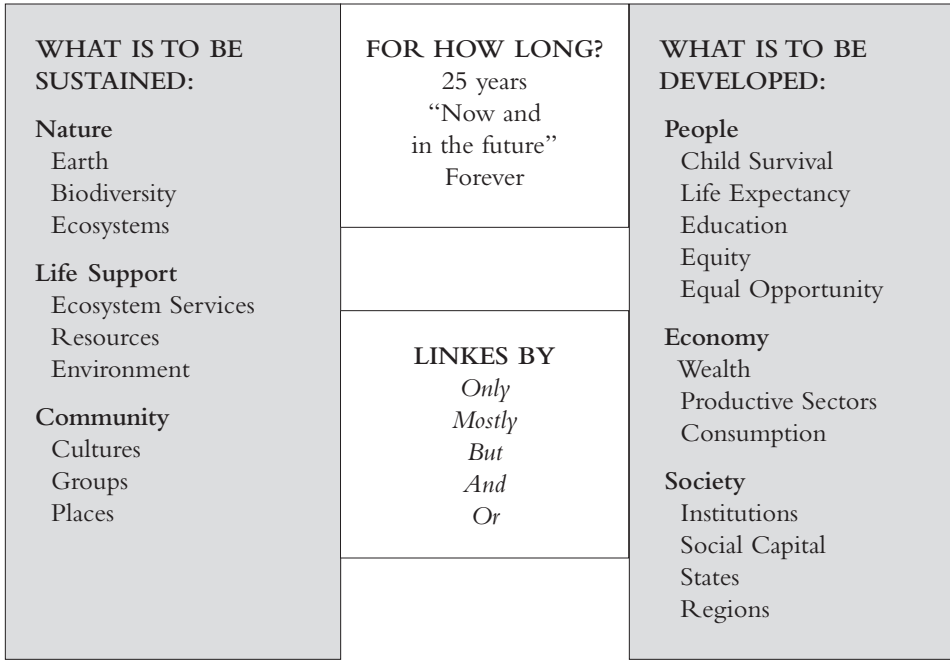

Figure 6-1. Sustainable Development: Common Concerns, Differing Emphases.

future." But in a future of a single generation, twenty-five years, almost any development appears sustainable. Over an infinite forever, none does, as even the smallest growth extended indefinitely creates situations that seem surely unsustainable. And over the century, now encompassed in many assessments such as that of climate change, the large and the long future is both remote and uncertain.

While a major political success, sustainable development has not been a significant scientific focus beyond the earliest days of its conceptualization. While originating in the scientific activities of the early 1980s, particularly the work of the International Union for the Conservation of Nature (IUCN), as sustainable development gained greater political adherence, organized science found less to address. This has now changed, and a focus on a transition toward sustainability has made sustainable development scientifically manageable, and measurable for the world academies of science, for the international organizations of science, and increasingly for an emergent sustainability science.

In 1995, the Board on Sustainable Development of the U.S. National Academy of Sciences–National Research Council (NAS-NRC) sought to resolve some of the ambiguity I have described by focusing on a transition to sustainability over the next fifty years. By focusing on a transition, we took as our starting point the best understood of future trends—the demographic transition from a world with a population that grew by many births and many deaths to one that stabilized with few births and few deaths. With such a transition well under way, we can with some confidence project a declining or steady state population by the end of this century, with the bulk of that population born by 2050 (perhaps 9 billion of an eventual 10 billion). Thus, the human development needs of that population will surely increase, compared to the more than 6 billion alive today, but probably not more than by half again as much as that of today. The board defined a sustainability transition as one that would meet the human needs for food, nurture, housing, education, and employment of that larger but finite population, significantly reducing hunger and poverty, while still maintaining the essential life-support systems of the planet (NRC-BSD, 1999). These human needs are unmet today; for example, in 1995, 16 percent of the world population was hungry, 24 percent had unsafe water to drink, and 24 percent were illiterate.

For these three normative goals, we found ample consensual support and measurable targets in the deliberations and subsequent treaties of international conferences and summits of leaders. For example, for the amount of reduction in hunger and poverty we used international consensus state-

ments that call for reducing hunger and poverty by half within one to two decades and suggested a target of reducing hunger by half in each of the next two generations.

Compared to meeting human needs, quantitative targets for preserving life-support systems are fewer, more modest, and more contested. Global targets now exist for reducing ozone-depleting substances, greenhouse gases, and, regionally, for some air pollutants. Absolute prohibitions (zero targets) exist for ocean dumping of radioactive wastes and some toxics (persistent organic pesticides), for the taking and/or sale of a few large mammals (whales, elephants, seals), migratory birds when breeding or endangered, and certain regional fishing stocks. International standards exist for many toxic materials, organic pollutants, and heavy metals that threaten human health, but not for ecosystem health. Water, land, and vegetative resources, such as arid lands or forests, have at best qualitative aspirations for sustainable management or restoration.

The Neem Tree: The New and Old Globalization

The 1992 NAS-NRC report *Neem: A Tree for Solving Global Problems* begins:

> Neem is a fascinating tree. On the one hand, it seems to be one of the most promising of all plants, and may eventually benefit every person on the planet. Probably no other yields as many strange and varied products or has as many exploitable by-products. Indeed, as foreseen by some scientists, this plant may usher in new era in pest control, provide millions with inexpensive medicines, cut down the rate of human population growth, and perhaps even reduce erosion, deforestation, and the excessive temperature of an overheated globe (p. v).

The Neem tree, *Azadirachta indica,* is an attractive broad-leafed evergreen that grows tall and broad and can live for a century or more. Native to South Asia, it has been carried over the last century to the rest of tropical and semitropical Asia, Africa, and increasingly to the Caribbean and Central America and is now well established in thirty countries and has been introduced to many more. Everywhere it grows, it is prized for its ability to grow in marginal soils, to provide shade, firewood, oil for lamps, cosmetics, soaps, and lubrication, medicinals that date back several millennia, twig toothbrushes that prevent gum disease, and as a natural insecticide. Even where it does not grow, word of its wonders are carried on numerous Web sites, many dedicated to the Neem itself.

Figure 6-2. Neem Tree.

But it is for its pesticidal qualities—as a safer alternative to dangerous neurotoxins, effective across a large range of insects, fungi, nematodes, and the like, and seemingly safe for humans, birds, and animals—that Neem has attracted considerable scientific and commercial interest. More than seventy patents for uses or processes related to Neem products exist, and in May 2000 in an important decision, the European Patent Office revoked the patent given to W. R. Grace company for a fungicidal product, a decision hailed by Vandana Shiva (see Chapter 9), who had challenged the original patent, as "a great day for all who have been fighting to take back control of their resources and knowledge-systems from the patent regimes of the North."

Thus, the Neem shares three major characteristics of globalization. It is not new, but quite ancient, as is globalization. In ancient Sanskrit it is known as *aristha,* or reliever of sickness. As with previous globalizations, it spread with religion and with empire. Part of traditional ayurvedic medi-

cine, the Neem is found wherever Hinduism is found and often where the British Empire ruled. But as with globalization, there is much that is new in its dispersal and product development, as Neem seeds are now an international commodity. Modern science is close to synthesizing its major insecticidal properties, international nongovernmental organizations encourage its usage for impoverished rural peoples, and Web sites huckster its cosmetic and medicinal values. Finally, as with globalization, it is full of unrealized promise and currently realized discord. For except as a source of shade, firewood, toothbrushes, oil, or home remedies, it is not widely used beyond its South Asian home; and its most promising commercial products—refined or synthesized and standardized pesticides, medicinals, or contraceptives—are either underdeveloped or contested as to their efficacy and safety, as well as ethically in relation to the commercialization of an ancient legacy of nature and humankind.

Contemporary Globalization

As to globalization in general, I prefer the simplified definition by Held, McGrew, Goldblatt, and Perraton (1999) in *Global Transformations: Politics, Economics, and Culture,* a study that some think is currently the best academic book on the subject. Held et al. say that "in its simplest sense globalization refers to the widening, deepening and speeding up of global interconnectedness . . . " (p. 14). But, of course, as good academics they are not content with such simplicity and go on to describe a set of technical terms and criteria to mirror these items as extensiveness, intensiveness, velocity, and the impacts of interconnections.

Globalization, as noted, is not new, and Held et al. recognize four major periods of globalization: the premodern period of early empires and world religions, the early modern period of Western expansion, the modern industrial era, and the contemporary period from 1945 to the present. I would add two others: the earliest prehistoric period in which humans spread out of Africa around the world, and the future, especially that of the first half of the twenty-first century.

Reviewing the contemporary period and projecting to the future, our Academy study (NRC-BSD, 1999) identified some major dimensions of contemporary globalization. The first is global interconnectedness with the much larger population of the future more closely connected by ties of economic production and consumption, migration, communication, and interlinked technologies. Since 1950, trade between nations has grown at more than twice the rate of the economy, and now some 20 percent of the

world's goods and services pass over a border. Trade in money and capital—a hundred times the volume of world trade—now moves at a dizzying pace with electronic movement of funds, worldwide currency markets, and twenty-four-hour financial markets.

Words, images, and ideas also outpace the flow of products. New information technologies and mass communication techniques will continue to penetrate many different linguistic, cultural, and political barriers. Flows of people—temporary, permanent, and forced—have also increased, although most movements are poorly measured. The rate of increase in refugees is more rapid than that of world trade.

The rapid movement of peoples and products also makes possible the rapid transmission of infectious diseases of people, crops, and livestock and the biological invasions so destructive of native biota. Environmental harms are exported to countries with weak environmental standards. Most feared of all may be the rapid increases in consumption fueled by aggressive marketing and rapid cultural change. But as communication carries a culture of consumption, it also carries a culture of universal concern with the fate of the earth and links to common international efforts, shared information, and growing numbers of environmental groups.

But the academy study also considered the persistence of diversity, how connectedness, while increasing the similarity of places, can also increase diversity, particularly in urban areas that attract migrants. Places of wealth or opportunity toward which people and products are drawn actually become more diverse. There are also strong countercurrents to global culture that emphasize ethnic, national, and religious distinctiveness.

Finally, connectedness and diversity are also reflected in institutional innovation and power shifts. At a global level, new institutions of governance have emerged, transnational corporate and financial institutions grow and consolidate, and networks of nongovernmental institutions collaborate and expand. At the subnational level, government has devolved, privatization is common, and civic society in many places has been strengthened. Power has shifted from the national state—upward to the global level and downward to the local level—and at all levels from the public to the private.

How does globalization affect a transition toward sustainability in meeting human needs, reducing hunger and poverty, and preserving life-support systems? It helps in some ways, hinders in others, and for many important characteristics, it does both. In this exploration of a highly complex subject, I present two illustrative examples using qualitative, but ordered, judgments. For one, I combine the first two human needs, feed-

ing and nurturing, with the related goal of reducing hunger. In the second, I explore the determinants of threats to the life-support systems.

Feeding, Nurturing, and Reducing Hunger

There are three major types of hunger: chronic household hunger, episodic hunger, and special-needs hunger. Each responds somewhat differently to globalization.

Globalization and Reducing Chronic Hunger

Current estimates find some 800–900 million people who are chronically hungry—living in households with insufficient income or its equivalent to provide for health, children's growth, and ability to work. The numbers of hungry people differ greatly between regions of the world, with the largest numbers in Asia and the greatest proportion in Africa (Table 6.1).

The number of chronically hungry people can be approximately estimated by using four variables: the size of the population, the average income per person, the distribution of income across the population, and the definition of a hunger line of income, or its equivalent, below which the population is thought to be hungry (see Figure 6.3).

It is useful to examine some differences in these major determinants over the period of contemporary globalization beginning in 1950. World *population* grew over a half century from 2.5 billion to 6 billion, but the peak growth rate was in the 1960s and has been slowing ever since. Nonetheless, about 80 million people are added each year, increasing the numbers of chronically hungry even as the proportion of hungry people diminishes. Examining trends in *income* (Table 6.2) in this period, per capita

Table 6-1. Numbers and Proportion of Chronically Hungry Population, 1996–1998.

Regions	*Population (percent)*	*Population (millions)*
Sub-Saharan Africa	34	186
Near East/North Africa	10	36
Latin America and the Caribbean	11	55
China and India	16	348
Other Asia	19	166
Developing countries: Total	18	791

Source: Agriculture: Towards 2015/30, Technical Interim Report, FAO, April 2000.

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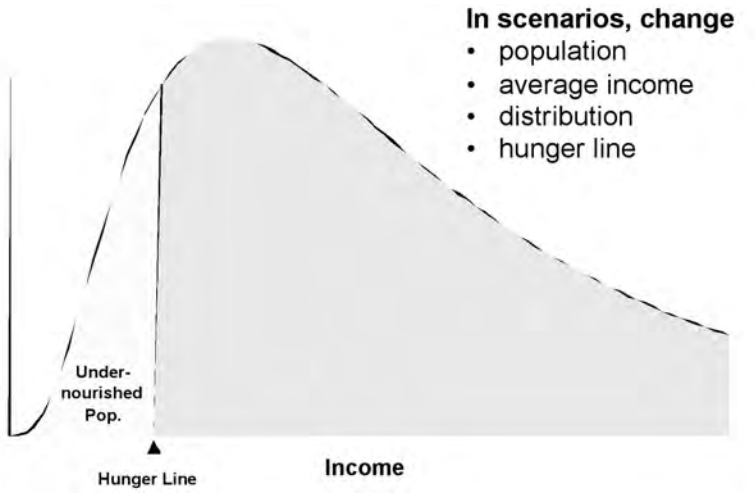

Figure 6-3. Hunger and Income.

gross domestic product (GDP) grew in all world regions between 1950 and 1973, but between 1973 and 1992, GDP in Eastern Europe declined, and it stagnated in Africa and Latin America.

Inequality in the *distribution of income* occurs both between countries and regions and within countries and regions. Between regions, Africa, Eastern Europe, and Latin America (Table 6.2) show growing inequality with the United States (ratio of U.S. GDP per capita to regional GDP per capita), even as the rest of Europe converged with the United States and the ratio of U.S per capita GDP to Asia declines from sevenfold in 1973 to fourfold in the course of two decades. Using a different data set, within-region inequality of income (as measured by the Gini coefficient, a standard measure of inequality) differs almost twofold with the greatest inequality found in Latin America and the least found among the former socialist countries of Eastern Europe. Over time, for most regions, within-region inequality has been generally diminishing except in Africa and in Eastern Europe with the end of socialism. Finally, the *hunger line* grows over time as income increases, access to informal sources of food declines, food purchases increase, and diets change.

The NAS-NRC Board on Sustainable Development commissioned a study on the feasibility of reducing hunger by half in each of the two generations before 2050 using these variables and contrasting two different scenarios. The reference scenario projected major current trends, institutional continuity, economic globalization, and the slow convergence of

Table 6-2. Trends in Regional GDP Per Capita, 1950, 1973, and 1992.

World Regions	*1950 GDP/ capita (in 1990 $)*	*GDP/capita/ 1950 GDP/capita*		*U.S. GDP/capita/ REGIONAL GDP/capita*		
		1973	*1992*	*1950*	*1973*	*1992*
United States	9573	1.7	2.3	1.0	1.0	1.0
Western Europe	5513	2.1	3.2	1.7	1.4	1.2
East Europe	2235	2.4	2.0	4.3	3.1	4.7
Latin America	3478	1.4	1.7	2.8	3.3	3.6
Asia	863	2.8	6.1	11.1	6.8	4.1
Africa	893	1.5	1.5	10.7	12.5	16.2

Source: Madison, 1995.

developing countries toward the socioeconomic norms of developed countries. In this scenario, the number of hungry actually increased by 2050, although the proportion of hungry people declined. The "policy reform" scenario assumed that a proactive set of initiatives is instituted to achieve sustainability goals. In this scenario, hunger is cut in half with a small change in the speed of the demographic transition leading to less population, with growth in income at the higher end of plausible income growth rates, and most important, a convergence of equity to the current

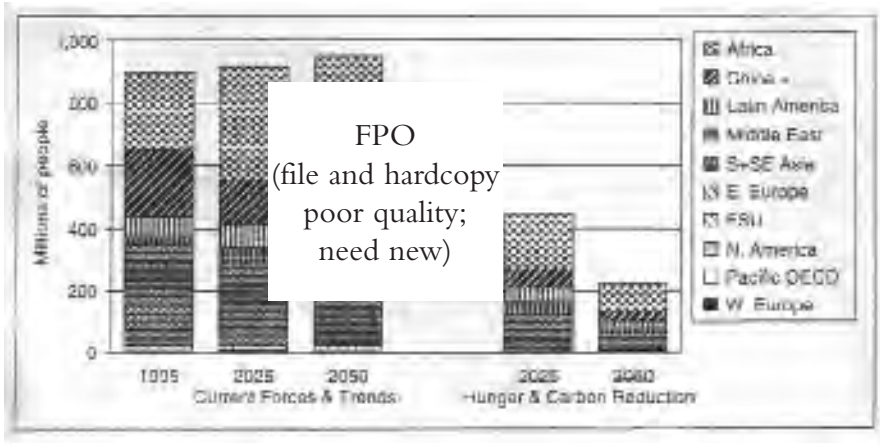

Figure 6-4. Reducing Chronic Hunger by Halves.

Table 6-3. Globalization's Impacts on Reducing Chronic Hunger.

Causal Elements	*HELPS*	*HINDERS*
Population Growth Decrease	++	
Increase in Income per capita	++	++ In Africa
Decrease in Inequity	+ Between Nations	+++ Within Nations
Decrease in Hunger Line		+

levels of Europe. The contrasting scenarios are shown in Figure 6.4 for the world as a whole and by region.

For these contrasting scenarios and the four major causal elements that underlie them, what are the impacts of globalization? In Table 6.3, I set out my qualitative judgments (using a scale of one plus sign [+] for small impact and four plus signs [++++] for large impact) as to how globalization helps or hinders the causal elements linked to chronic hunger. For *population,* globalization probably helps through a population growth rate decline by influencing all three important determinants for reducing fertility: making contraception more accessible; providing opportunities for education and work for women; and encouraging postponement of marriage through such opportunities for education and work, as well as through diffused Western lifestyle concepts.

For *income,* globalization helps increase per capita income in some parts of the world, but practices not-so-benign neglect in others. The development of an export-oriented industry in Southeast Asia, accompanied by significant public sector actions, led to major reductions in hunger in that region until the recent financial crisis slowed and even reversed some of those gains. But in Africa, where hunger will increase most, globalization has exacerbated some of the region's problems, its export trade in such products of affluence as oil or diamonds fueling corruption and conflict, while development aid has diminished without an equivalent growth in private investment. But most of all, it has suffered not-so-benign neglect and has been marginalized from the globalized world system.

While globalization will probably decrease inequity overall between countries, globalization will, for some time at least, increase inequity within countries, particularly affecting the poorest of the poor. This is so because rapid export-oriented growth in developing countries reduces somewhat the differences in income with developed countries, but within countries

opportunities vary greatly. Thus, for example, China, which had made enormous gains in reducing hunger, might well suffer an increase in hunger as the income gap between regions increases, as employment opportunities expand in export manufacturing and services but decline in local manufacturing and agriculture, and overall, the safety net system diminishes. Finally, the hunger line shifts relatively as diets expand (by preferences for both animal products and imported products or brands), more and more basic food enters the market, and the income requirement to meet these new needs increases.

Globalization and Reducing Episodic Hunger

The reduction of famine-determined hunger from natural hazards is a great recent success story of a globalized emergency food aid system that relies on both public and private efforts. Today, famine-inspired hunger exists only where war and violent conflict persist. Globalization, however, increases famine vulnerability in the sense of entitlement shifts, as Sen (1981) has shown, especially in cases where the availability of food and purchasing power of rural landless workers can be diminished by far-off events. Globalization has increased the incidence of war and civil conflict both by making weapons easily available (the ubiquitous Kalashnikov) and by diminishing the impacts of war by providing emergency food aid. Recent financial crises often triggered by globalized movements of capital have created sudden episodic hunger in countries where such episodes were rare—as in Southeast Asia, which had made marked progress in reducing hunger prior to the crises. Finally, structural adjustment efforts initiated either internally or at the behest of the IMF almost always lead to an increase in hunger from a decrease in social services and programs, despite some countereffforts.

Table 6-4. Globalization's Impacts on Reducing Episodic Hunger.

Causal Element	*HELP*	*HINDER*
Famine	+++	+
War	+	+
Financial Crisis		+++
Structural Adjustment		++

Table 6-5. Globalization's Impacts on Reducing Special Needs Hunger.

Hunger Type	*HELP*	*HINDER*
Mothers and Children	+++	+
Iron, Iodine, Vitamin A	+++	+

Globalization and Reducing Special-Needs Hunger

Concerning special needs hunger (Table 6.5), global efforts to address some major causes of child undernutrition, especially from sickness and disease, by addressing immunization, treatment of diarrhea, and breast-feeding have helped to reduce the rate of wasting and stunting of children (although the actual numbers have increased as a result of population growth centered in the youngest ages). Similarly, the major micronutrient deficiencies of iodine, vitamin A, and iron have been reduced by international programs to encourage iodizing salt, to increase intakes of vitamin A through vitamin A–rich foods and through vitamin A supplementation, and to a much lesser extent, to reduce anemia by iron supplements. In some cases the diversification of diets has helped as well—for example, by providing greater access to iodized salt. The major countercurrent related to globalization is similar to the previous case: Structural adjustment and diminished development aid have severely constrained many programs directed at addressing these special needs.

Preserving Life-Support Systems

The life-support systems of the planet—atmosphere, freshwater, oceans, and the biota—are often factored into major media as biomes, ecosystems, and species. The major threats to freshwater, atmosphere, oceans, and the biota are threefold: (1) the large-scale introduction of pollutants, such as acid rain and chloroflurocarbons in the atmosphere, heavy metals in the soil, or chemicals in groundwater; (2) the massive assault on biota, such as deforestation in the tropics and the mountains, desertification in dry lands, overfishing of marine resources, and species extinction everywhere; and (3) human-induced climate change.

These threats are incredibly recent. In nine of twelve indicators of global environmental change, half of all the change that took place over the last ten thousand years occurred in our lifetime (Table 6.6).

Table 6-6. 10,000 Years of Environmental Change: Selected Indicators.

	Selected Indicators	
10,000 Years of Environmental Change	*Rate of Change Still Accelerating*	*Rate of Change Now Decelerating*
Half Occurred before Our Lifetimes	Deforested area Soil area loss	Terrestrial vertebrate diversity
Half Occurred during Our Lifetimes	Carbon releases Nitrogen releases Floral diversity Sediment flows Water withdrawals	Carbon tetrachloride releases Lead releases Marine mammal diversity Sulphur releases

Source: Turner et al., 1990.

Driving Forces of Environmental Change

These changes coincide but are not necessarily caused by the most recent wave of globalization. A general consensus among scientists posits that growth in population, in affluence, and in technology are jointly major driving forces for such change and related environmental problems. This has become enshrined in a useful, albeit overly simplified, identity known as IPAT, first published in 1972 by Ehrlich and Holdren in *Environment* magazine in response to a more limited version by Commoner. In this identity, various forms of environmental or resource impacts (I) equals population (P) times affluence (A), usually income per capita, times the impacts per unit of income as determined by technology (T) and the institutions that use it. Academic debate has now shifted from the greater or lesser importance of each of these driving forces of environmental degradation or resource depletion, to debate about their interaction and the ultimate forces that drive them.

Let me introduce a variant of the IPAT identity (Figure 6.5)—which might be called the PC version—and restating that identity in terms of population and consumption, it would be $I = P \star C/P \star I/C$. I equals environmental degradation and/or resource depletion; P equals the number of people or households; and C equals the consumption per person of energy, materials, and information.

With such an identity as a template and with the goal of reducing environmentally degrading and resource-depleting influences, there are at least seven major directions for research and policy. To reduce the level of

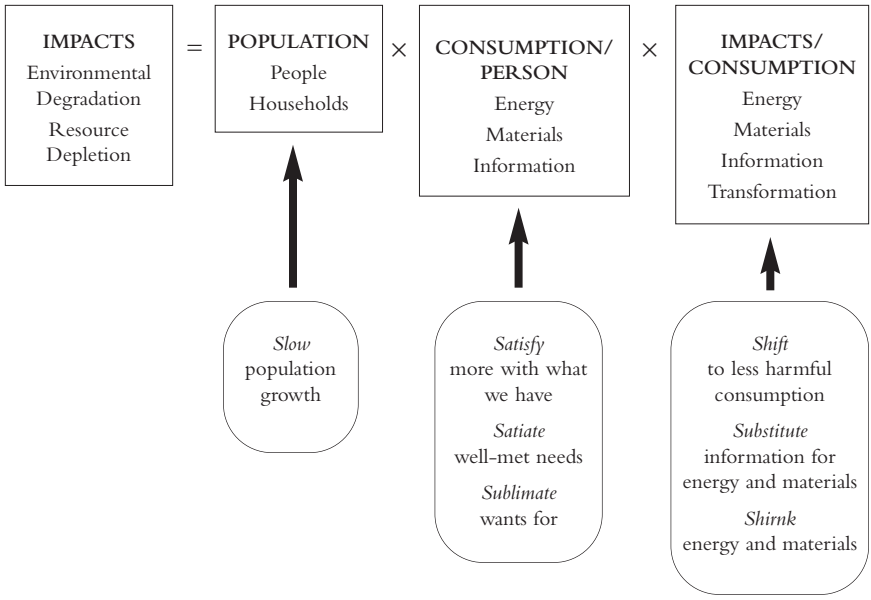

Figure 6-5. Variant of IPAT Identity.

impacts per unit of consumption, separate more damaging consumption from less harmful forms and *shift* to these, *shrink* the amounts of environmentally damaging energy and materials per unit of consumption, and *substitute* information for energy and materials. To reduce consumption per person or household, *satisfy* more with what is already had, *satiate* well-met consumption needs, and *sublimate* wants for a greater good. Finally, *slow* population growth and then stabilize population numbers as indicated earlier.

Before using these proximate determinants of the identity, a bit of caution is in order. IPAT is very useful, but is more complex than a simple identity. The PAT terms are only proximate, each in turn is driven by diverse underlying processes. Nor are the PAT terms independent of each other; for example, income (or affluence) influences the rate of population growth and consumption, as well as the technologies used to produce it. Indeed, the supposed technology term is really a catch-all of all the diverse items that determine a different set of impacts per unit of consumption—including technology, but also all kinds of ideas and institutions. Nor do I think the PAT terms are sufficient to examine the impact of globalization on Earth's life-support systems.

To add to the classic determinants, let me borrow from an analysis by Clark (2000) of environmental globalization, one that includes not only the globalization of environmental "stuff"—the energy, materials, biota transformed by production and consumption—but also the globalization of environmental ideas and governance. Specifically, Clark notes three major ideas: planetary management, risk assessment, and sustainable development; along with three forms of governance: by governments; by nongovernmental organizations, both profit and nonprofit; and by coalitions and networks that bring them together.

Globalization and Preserving Life-Support Systems

Thus, there are five causal elements related to globalization's impact on preserving the life-support systems of the planet: population, consumption, technology, ideas, and governance. Examining these five causal elements (Table 6.7), beginning with *population,* globalization, as noted, will encourage a decline in the population growth rate thus lessening future human impacts on the environment. But globalization also accelerates *consumption* in three ways. Insofar as globalization increases income and to a degree inequity, it encourages greater production and consumption. Insofar as it extends the reach of trade and transport, it makes possible consumption of distant resources that would not be consumed locally and the import of goods not available locally. With the spread of ideas and images of "Western material standards of living," it further encourages consumption. Much of this enhanced consumption is desperately needed and desired by the poorer peoples of the world, but much of it will be in the form of material and energy transformations that are environmentally degrading and resource-depleting.

At the same time, globalization facilitates both the creation and the diffusion of *technologies* that lessen the need for energy and materials per unit

Table 6-7. Globalization's Impacts on Preserving Life-Support Systems.

Causal Element	*HELP*	*HINDER*
Population	++	
Consumption		++++
Technology	+++	+
Ideas	+++	++
Governance	++	++

of production or consumption, that create fewer toxics and pollutants, or that substitute information for energy and material use. Countering these helpful technologies are trickle-down technologies that export second-hand or second-rate technologies, buildings, and toxic or polluting processes to regions heretofore relatively free of degrading or depleting activities.

In the realm of *ideas,* there are also dual impacts. Development is seen as a good to be pursued, with environmental concerns a luxury that developing countries cannot readily afford. Countering this has been the rapid spread of the major environmental ideas of planetary and risk management and sustainable development, to the extent that while rhetoric persists as to differences between the north and the south, international surveys show little difference in the high environmental aspirations among the people of both north and south.

As to *governance,* while there are some 180 international environmental treaties in force to date, they are insufficient to counter the major threats to the atmosphere, oceans, and biota, with the possible exception of the Montreal protocol on ozone depletion. But as Clark notes, governance is greater than governments, and the governance activities of advocacy coalitions and the discourses between transnational corporations and international environmental groups can be very substantial in helping to maintain the planet's life-support system. Indeed, it is often the ability to draw global attention to some local threat that leads to mitigative or preventive actions. All of these forms of governance will grow with globalization. Substantially countering these forms are the notions of free trade unhindered by environmental constraint or regulation currently ensconced in the operation of the World Trade Organization and in various regional trade treaties.

Globalization and Two-Armed Scientists

The Maine version of a well-known story has Senator Edmund Muskie listening to testimony on the need for clean-air legislation. After a series of cautious scientific testimonies by scientists, he asks whether anyone in the room is a "one-armed scientist" who can testify without the endless academic qualifications of "on the one hand . . . then on the other hand . . ."

It is obvious that I must plead guilty to being a two-armed scientist. But it is difficult for anyone thoughtfully confronting globalization not to be. Indeed, whether you sing paeans to globalization as Tom Friedman

(2000) does or fear "the manic logic of global capitalism" as Bill Grieder (1997) does, the other hand, whichever it might be, is always present. What may separate the two more is that Friedman thinks that globalization itself will in time deal with its many harms, whereas Grieder believes in the need for radical revision and strong local to international action.

So, what can the two-armed scientist conclude from this first, tentative attempt to assess the impact of globalization on a sustainability transition: meeting human needs, reducing hunger and poverty, preserving the life-support systems of the planet? In this brief assessment I have focused on how globalization has affected the reduction of hunger and meeting the human needs for food and nurture and on the driving forces of global environmental change.

In sum, globalization to date has not helped reduce the numbers of chronically hungry in the world, although the proportion decreases as population grows. The shifts in investment, income, and job opportunities in some parts of the world are matched by the growth of hunger elsewhere. Episodic and special-needs hunger have benefited more as globalized public and private programs have expanded to respond rapidly to famine, to the special needs of children, and to two of the three major micronutrient diseases. Finally, the increase in hunger from globalized financial crises and policy decisions argues for new sources of instability for the fragile existence of the poorest of the poor. Short-run and long-run simulations of halving hunger argue for these trends to persist.

In preserving the life-support systems, the crucial issue is globalization's impact on current and projected production and consumption of energy and materials that are environmentally degrading and resource depleting. To date, despite major gains in technologies that reduce the use of energy and materials per unit of production, the absolute growth in consumption overwhelms the steady global technological progress. The globalization of environmental ideas has been truly remarkable, and these, along with feminism and human rights, constitute the major ideological revolutions of the contemporary period of globalization. The spread of these ideas has been well facilitated by global interconnections. Similarly, the rise of environmental governance writ large to include corporate behavior and local and international popular initiatives is facilitated by the interconnectedness of globalization and is a great portent for the future. But to date, these have all been insufficient to counter the major threats to the life-support systems, and when projected to address the extraordinary increases in the consumption of the future, such helpful developments may fail as well.

Civilizing Globalization

If the goods of globalization are to be realized for most of the world's peoples, and if its ills are to be reduced for those people and natural systems most vulnerable, then globalization itself must change in significant ways. Gerry Helleiner (2000), the Canadian economist, as well as Held et al. (1999), call this process "civilizing" globalization. All of them focus on changing governance. Helleiner asks, "Can the global economy be civilized?" "Globalized markets," he argues "operate within politically defined rules and governance institutions. The current global rules and economic governance institutions are in need of repair, updating and relegitimization," and he goes on to suggest some of those initiatives.

Held et al. (1999) focus not on economy but on politics and three major approaches to civilizing and democratizing contemporary globalization: a liberal-internationalism approach to reform global governance; a cosmopolitan, democratic approach to reconstruct global governance; and a radical republican approach to create alternative structures of governance. Exploring these issues are well beyond the scope of this chapter, but I conclude with my own thoughts on the efforts to "civilize" globalization.

Civilizing U.S Capitalism: 100 Years

As I contemplate the varied efforts to understand globalization and how to reform or reconstruct it, I am struck by the similarity of contemporary globalization to an earlier period of American history. I perceive an analog to the current global situation in the U.S. economic history of the post–Civil War era. At that time, a truly integrated and nationalized industrial capitalism was created, spurred by the growth of interconnections of railroad and telegraph. Reading of this age of "robber-baron" capitalism, I am struck by the parallels with current globalization; for example, the great uncertainty at the time, even by the major participants, in understanding the new and different systems that had emerged.

Whatever emerged from the fierce competition and growing monopolization of economic power was initially marred by an absence of law and regulation. Much early regulatory effort was needed around what today are called "rule of law" and "transparency" issues, such as those that make contracts enforceable or stock certificates verifiable. These initial efforts were followed by numerous attempts to control monopoly power and maintain genuine competitiveness.

Almost parallel to these efforts, but much slower, were those that rec-

ognized the victims, harms, inequities, and externalities generated by the new integrated industrial system. The initial focus, as it is currently, was on child labor, followed by other working conditions, and then the essentials of a social safety net including disability insurance, unemployment insurance, pensions, and the like. Efforts to gain workers' rights began early and were repeatedly rebuffed, and it was not until 1935 that they were basically recognized. Finally, environmental issues were not really recognized until Earth Day 1970, thus capping a century of effort to civilize U.S. capitalism. Throughout this whole period the individual states of the United States served as the focus for innovative leadership and the testing ground for appropriate regulation that only later was emulated or taken over by the federal government.

The challenge for civilizing globalization is to reduce this century-long effort to, at most, two decades. The good news is that this effort is well under way, again with a push for "humanizing globalization" or "globalization from the bottom." I illustrate with Bangor, Maine, population 35,000.

Civilizing Globalization: In Bangor, Maine

Beginning in 1991, Bangor became a sister-city to Carasque, a small village in the highlands of El Salvador, as part of a group of twenty-nine such sister-cities all trying to support returned populations who had been refugees from the civil war. From Bangor, Carasque has received a rebuilt truck, pedal sewing machines, school and health materials, and, when needed, support for human and economic rights in the form of communications expressed to both the U.S. and El Salvador governments. From Carasque, Bangor has received an opportunity to learn of the realities of poor people in the developing world, a model of how young people can exercise leadership in their own communities, and instructive experience as to what alternative schooling might provide.

Trying to find an issue in common to both communities, people in Bangor identified sweatshop- or *maquiladora*-made clothes, the making of which takes jobs from Mainers and exploits Salvadorans. Today, there are a thousand consumers and thirty businesses in Bangor displaying the "clean clothes" sweatshop-free logo, and four Maine communities are now committed to selective sweatshop-free city purchasing. This has led to a statewide selective purchasing act for textiles and footwear that is now being implemented. The "clean clothes" criteria for such selective purchasing—protecting children and workers, providing a living wage, and giving workers rights to bargain—is an agenda for civilizing globalization. Finally,

many of the same Mainers recently took a five-hour trip to Quebec City, Canada, for the so-called Americas Summit to protest a free trade area until it incorporates children's, workers', and environmental concerns.

Globalization and a Transition toward Sustainability

The very notion of a transition toward sustainability, and the concept of sustainable development from which it derives, are products of the widening, deepening, and speeding up of the interconnectedness that characterizes globalization. To think of humankind as a whole, to see its links to the fate of the blue planet, has been an essential part of the globalization process. Thus, those of us who aspire to a transition toward sustainability, to meet human needs while preserving the life support of the planet, cannot be "against globalization." But what we can say (and are saying) is that for globalization to continue to encourage such a transition, it will need to redouble those aspects of this complex movement in our collective lives that help a sustainability transition and to dampen those that hinder such a transition. It is this nexus that will make real the promise of the Neem tree.

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