CHAPTER 10

Redistribution of Earth's Resources by Global Policy or Laws of Nature?

Forced to choose, the poor like the rich love money more than political liberty, and the only political freedom capable of enduring is one that is so pruned as to keep the rich from denuding the poor by ability or subtlety and the poor from robbing the rich by violence or votes. Will Durant

The things that will destroy us are: politics without principle, pleasure without conscience, wealth without work, knowledge without character, business without morality, science without humanity, and worship without sacrifice. Mahatma Mohandas K. Gandhi

For most Americans, economic growth is a spectator sport. Paul Krugman

All life on Earth is governed by resource availability. All eight interactive global crises (Chapter 2 in this volume) affect and are affected by resource availability, or lack thereof, on a finite planet. In the human economy, money is used to acquire resources either in raw form (e.g., grain) or in processed form (e.g., bread). Money can also be used to acquire land and water resources originally used by other species. Economic growth would be impossible without resources. Consequently, on a finite planet with finite resources, limits exist to all kinds of growth except in knowledge and wisdom.

Resource wars (e.g., World War II) are based on attempts to acquire more resources that exist within a nation's political boundaries — for example, in World War II, Germany wanted more *lebensraum* – the territory believed needed for a nation's natural development (*Merriam-Webster Dictionary*). Japan, with practically no resources (e.g., oil, minerals, wood, etc.), wanted the resources of nations in or bordering the Pacific Ocean. Resource wars will almost certainly intensify as Earth's human population increases from 7 to 10 billion in the 21st century. Ironically, all wars are profligate wasters of resources. However, the ultimate irony is that, in the quest for perpetual economic growth, *Homo sapiens* is taking resources from other species that collectively constitute Earth's biospheric life support system upon which both human life and the human economy depend. Even more ironically, the intensity of focus on economic growth is so great that the biospheric life support system gets little or no attention.

Biospheric Collapse

Throughout this volume, numerous references have been made to the collapse (great extinction number six) of the present biosphere. The world's oceans represent approximately 71% of Earth's surface, and they are already in great peril. The terrestrial portion, at about 29% of Earth's surface, is also being seriously degraded. Predicting when a tipping point will be reached is not possible, but passing one probably results in irreversible changes. Biotic impoverishment is a sound indication of irreversible effects, but will not indicate precisely when a tipping point is reached.

Climate change has already had serious deleterious effects upon the Biosphere, including reduced agricultural productivity that diminishes food security and increases food prices. Hazardous chemicals produce a variety of stresses on the Biosphere: "Trees and plants are extremely susceptible to damage by chemical pollutants, yet the kind of damage that occurs is not easily predictable. Air, water and soil interact in complex ways, depending upon the chemical – or chemicals – involved, the kind of vegetative cover, atmospheric conditions and soil types. The control of chemical pollutants and their effects requires not only more knowledge but more extensive international planning and cooperation" (Kabata-Pendias 2011).

> *A sustainable economy is one in which:*
>
> *a. the total throughput of renewable resources is no greater than the net primary production of the ecosystem, and*

b. the total extraction of non-renewable resources is no faster than the rate at which alternative resources can be discovered (Porter 2011).

What is termed *sustainable use of the planet* does not even come near meeting these conditions. Humankind produces wastes that do not even serve as resources for the natural systems of the Biosphere.

Ecosystem Simplification

The previous five mass extinctions have demonstrated that nature always tends toward a rich biodiversity, which may originate from a very few species. The Agricultural Revolution was the result of simplifying an ecosystem by replacing it with domesticated plants and animals that provided an abundance of food with less ecosystem literacy than hunting and gathering, which was the method that *Homo sapiens* used to acquire food for most its time on Earth. Diamond (1987) believes that agricultural abundance was not the blessing it was once thought to be: "Now archaeology is demolishing another sacred belief: that human history over the past million years has been a long tale of progress. In particular, recent discoveries suggest that the adoption of agriculture, supposedly our most decisive step toward a better life, was in many ways a catastrophe from which we have never recovered. With agriculture came the gross social and sexual inequality, the disease and despotism, that curse our existence."

Many people believe Thomas Hobbes' description of life before the Agricultural Revolution as "solitary, poor, nasty, brutish, and short" (http://www.phrases.org.uk/meanings/254050.html). But Diamond (1987) describes modern hunters and gatherers: "It turns out that these people have plenty of leisure time, sleep a good deal, and work less hard than their farming neighbors. For instance, the average time devoted each week to obtaining food is only 12 to 19 hours for one group of Bushmen, 14 hours or less for the Hadza nomads of Tanzania. One Bushman, when asked why he hadn't emulated neighboring tribes by adopting agriculture, replied, 'Why should we, when there are so many mongongo nuts in the world?'" Milton (2000) notes: "Finally, all the hunter-gatherers that were included in the Atlas were modern-day humans with a rich variety of social and economic patterns and were not 'survivors from the primitive condition of all mankind.'"

Human Modified Ecosystems

Human modification of ecosystems is an existential risk that humans have not previously experienced because approximately 10,000 years is not long in evolutionary time. "Human-modified ecosystems are shaped by our activities and their side effects. They share a common set of traits including simplified food webs, landscape homogenization, and high nutrient and energy inputs. Ecosystem simplification is the ecological landmark of humanity and the reason for our evolutionary success. However, the side effects of our profligacy and our poor resource practices are now so pervasive as to threaten our future no less than that of biodiversity itself" (Western 2011). Clearly, the Biosphere is being altered and the consequences will be catastrophic for humankind, which flourished and evolved in the present Biosphere.

Domestication of Species

"Artificial selection is the selection of advantageous natural variation for human ends and is the mechanism by which most domestic species evolved. Most domesticates have their origin in one of a few historic centers of domestication" (Driscoll et al. 2009). Artificial selection for human goals obviously differs from natural selection. Domesticated species represent only a tiny fraction of the total species in natural ecosystems, and the performance of either group is difficult to predict if climate change proceeds at its present rate. In the 21st century, food riots have occurred in some parts of the world, and, since domesticated animals do not forage for their own food, they are, in a sense, competing with humans for grain and water. When domesticated animals are concentrated in feed lots, waste disposal becomes a problem. Hunters/gatherers were intimately associated with natural systems and required an encyclopedic knowledge of natural ecosystems to survive. Working with domesticated species does not require this knowledge. The Agricultural Revolution diminished the association of humans with natural systems and, therefore, the ability to survive in them if the agricultural system declines. Natural systems, collectively, are the Biosphere.

Water

Of the total water on Earth, oceans comprise 96.5% and freshwater only 2.5%. Of the 2.5%, groundwater is 30.1%; glaciers and icecaps are 68.6%; surface water and other freshwater are 1.3%. Of the 1.3% surface and freshwater, lakes comprise 20.1% and ice and snow comprise 73.1% ((http://ga.water.usgs.gove/edu/earthwherewater.html).

Humans only drink a few liters of water per day, but large amounts are essential for the production of food. The "most agriculturally productive regions of the world are all regions where natural rainfall is sufficient to allow rain-fed agriculture to flourish; . . . For example, in the United States, corn is a productive grain that typically yields over 100

bushes per acre, but requires a climate where rainfall is at least 76 centimeters (30 inches) per year" (Water Encyclopedia 2011). A useful approximation is that 1 ton of grain requires 1,000 tons of water to produce.

Much of the world's grain and other crops is produced by irrigation. "In the twentieth century, the practice of irrigation was greatly increased to provide food for the world's growing population. Globally, irrigation now accounts for 69 percent of the 3,240 cubic kilometers (772 cubic miles) of water withdrawn for human use, and 87 percent of all water consumed" (Water Encyclopedia 2011). In this context, the term *consumed* means not usable for other purposes.

"Many countries are facing dangerous water shortages. As world demand for food has soared, millions of farmers have drilled too many irrigation wells in efforts to expand their harvests. As a result, water tables are falling and wells are going dry in some 20 countries containing half the world's people. The overpumping of aquifers for irrigation temporarily inflates food production, creating a food production bubble that bursts when the aquifer is depleted" (Brown 2011).

" . . . in the Middle East, where populations are growing fast, the world is seeing the first collision between population growth and water supply at the regional level. . . . In Mexico, home to 111 million people, the demand for water is outstripping supply. In the agricultural state of Guanajuato, the water table is falling by 6 feet or more a year" (Brown 2011). In the United States, "The average natural flow of the Colorado River as measured at Lees Ferry will decrease by approximately 9 percent over the next 50 years, . . . In addition, the average yield of the river could be reduced by 10 to 20 percent due to climate change" (Gallup Independent 2011).

"For 10,000 years, the Nisqually Indians have relied on Chinook salmon for their very existence, but soon those roles are expected to reverse. Based on current warming trends, climate scientists anticipate that in the next 100 years the Nisqually River will become shallower and much warmer. Annual snowpack will decline on average by half. The glacier that feeds the river, already shrunken considerably, will continue to recede" (Kaufman 2011). The universal laws of biology, chemistry, and physics will prevail. The risks are at the biospheric level, and no ecosystem component will survive in a hostile biosphere. When complex ecosystems, such as the biosphere or its component ecosystems, pass a tipping point, change is swift and irreversible — not ideal for adaptation.

Power Plants

"Cooling power plants requires the single largest share of U.S. freshwater withdrawals: 41 percent. . . . As for water quality, coal and nuclear plants discharge water in the summer at an average temperature of 17°F warmer than when it entered the plant. . . . When adequate cooling water is not available to fossil fuel, nuclear, and other steam-generating plants due, for example, to prolonged drought or high water temperatures caused by a heat wave, the plants have to cut back power production or even shut down. . . . Hydropower facilities face the same fate when water levels drop too low for power production" (Union of Concerned Scientists 2011a).

Although massive earthquakes and tsunamis may not threaten most nuclear power plants, the Fukushima catastrophe in Japan did cause questions to be raised about nuclear plant safety. ". . . the result at the Fukushima Daiichi plant — a 'station blackout,' or loss of power from both the electrical grid and backup diesel generators — could similarly occur at U.S. plants in areas subject to earthquakes, hurricanes, tornados, ice storms, or even falling trees. . . . If the flow of cooling water into the pools is interrupted for a prolonged period of time, as it was at the Fukushima plant, the fuel will begin to overheat and melt, just as in a reactor core meltdown" (Union of Concerned Scientists 2011b). Under such circumstances, radioactive material can intrude into the environment (Union of Concerned Scientists 2011b).

Enter the Next Biosphere

"We tend to believe that all human beings use the same modes of thinking. We assume that the natural world is ultimately knowable, that by rational thought human beings can ferret out the underlying structure of the universe. This impulse governed the thinking of the ancient Greeks and it certainly affects all of us living in an increasingly scientific and technological world. Many cultures outside the west put greater emphasis upon the particular and the aesthetic, rather than on the abstract and the logical. Some scholars who work in comparative cultures have said that our belief in the universality of rational thought is perniciously provincial. One has even gone so far as to say that we in the modern west are among the most dogmatically ethnocentric people on earth!" (Mohrman 1999). In the 21st century, humankind is faced with at least eight interactive global crises and is beginning, reluctantly, to realize that nature's laws can neither be ignored nor circumvented by technology.

The Ultimate Irony

Nature, once perceived as an assortment of species without structure, is, in fact, a very orderly system governed by a universal set of laws. Because nature is dynamic, the order is not apparent unless one has what Aristotle termed *an instructed mind*. The order that humans have attempted to create is also subject to nature's laws, which are not influenced by human constructs — for example, the "free market" was once assumed to be self

regulating, but is was not, and the belief that available resources did not limit growth (e.g., Simon 1998) has been falsified by water, food, and other resource scarcities in the 21st century.

Profligate use of fossil fuels to spur economic growth is changing Earth's climate and many, probably most, changes will be irreversible. The Biosphere has already suffered major biotic damage, and most changes are not favorable to *Homo sapiens*. Biospheric collapse will make survival difficult for many species, including humans. Most complex systems collapse swiftly after passing a tipping point, and little or no time will be available for extended conferences that produce little action on crises such as climate change.

Conclusions

Kurt Vonnegut's (2005) poem "Requiem" has these closing lines:

When the last living thing
has died on account of us,
how poetical it would be
if Earth could say,
in a voice floating up
perhaps
from the floor
of the Grand Canyon,
"It is done."
People did not like it here.

Acknowledgments. I am indebted to Darla Donald for transcribing the handwritten draft and for editorial assistance in preparation for publication and to Karen Cairns, Paula Kullberg, Paul Ehrlich, and Peter Leigh for calling useful references to my attention.

LITERATURE CITED

Brown, L. R. 2011. Growing water deficit threatening grain harvests. Earth Policy Institute 20July http://www.earth-policy.org/book_bytes/2011/wotech2_ss2.

Diamond, J. 1987. The worst mistake in the history of the human race. *Discover Magazine* May:64-66.

Driscoll, C. A., D. W. Macdonald, and S. J. O'Brien. 2009. From wild animals to domesticated pets; an evolutionary view of domestication. *Proceedings of the National Academy of Sciences* 106:9971-9978.

Gallup Independent. 2011. 9 percent decrease in Colorado River flow projected. 29June http://forgottennavajopeople.org/blog/?p=1256.

Kabata-Pendias, A. 2011. Chemical stress on the biosphere . . . Food and Agricultural Organization, Corporate Depository http://www.fao.org/docrep/q2570E/q2570e01.htm#chemical%20stress%20on%20the%20biosphere.

Kaufman, L. 2011. Seeing trends, coalition works to help a river adapt. New York Times 20July http://www.nytimes.com/2011/07/21/science/earth/21river.html?pagewanted=all.

Milton, K. 2000. Editorial: Hunter-gatherer diets – a different perspective? *The American Journal of Clinical Nutrition* 71:665-667.

Mohrman, K. 1999. Order and chaos; welcome to new students at Colorado College. http://www.coloradocollege.edu/publications/OrderandChaos/OrderChaos.html#Mohrman.

Porter, G. 2011. Economic systems – natural and human. http://www.apc.org.nz/pirm/eco_sys.htm.

Simon, J. 1998. *The Ultimate Resource*. Princeton University Press, Princeton, NJ.

Union of Concerned Scientists. 2011a. Power and water at risk. The Catalyst 21July http://www.ucsusa.org/publications/catalyst/member-issue/summer11-newsroom.html.

Union of Concerned Scientists. 2011b. Can it happen here? The Catalyst 21July http://www.ucsusa.org/publications/catalyst/member-issue/su11-can-it-happen-here.html.

Vonnegut, K. 2005. *A Man Without a Country*. Seven Stories Press, New York.

Water Encyclopedia. 2011. Agriculture and water: science and issues. http://www.waterencyclopedia.com/A-Bi/Agriculture-and-Water.html.

Western, D. 2011. Human-modified ecosystems and future evolution. *Proceedings of the National Academy of Sciences* 98:5458-5465.