Speculative Scenarios

Is there a way to use and sustain our planet?

by John Cairns, Jr.

> *The great fault of all ethics hitherto has been that they believed themselves to have to deal only with the relation of man to man.*
> —Albert Schweitzer
> (as quoted in Wallace, 1998, p. 412)

> *The nations of the region will act rationally once they've run out of all other possibilities.*
> —Abba Eban
> (as quoted in Postel, 1999, p. 133)

Literature on sustainable use of the planet is beginning to accumulate at a fairly rapid rate, although the general public and politicians, with some notable exceptions, have given the issue little or no thought. On a finite planet, human population size is clearly a central issue, yet most countries have no population policy and some use tax breaks to subsidize large families. Arguably, quality of life is an equally important issue, but is discussed mostly in economic and material terms. In addition, industries that are harmful to human health and the environment will fight vigorously to continue their present practices. Exponential growth of all kinds (economic, technological, urban, etc.) produces problems at a rate for which the social system is woefully unprepared. Finally, individual interest in any problem is markedly diminished if it is perceived as distant in time or space or both. Still, humans have proven amazingly adaptable when the consequences of not showing an interest in a problem so are made clear. However, history shows that such a recognition does not often happen in time to prevent major human suffering. I remain optimistic about what could be done to achieve sustainable use of the planet, which is why the first scenario discussed here is a "soft landing" — regrettably a paradigm shift rarely occurs without devastating consequences preceding it. Therefore, I remain pessimistic about will be done, as is evident from the other five scenarios.

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Scenario #1: The Soft Landing

One might easily justify a view of gloom when speculating about the future of human society. Much of the developed world has a large number of elderly compared to productive workers (e.g., Longman, 1999). Economic news from most of the world is not good; terrorism is increasing, as are the devices used by terrorists; ethnic strife is rampant. Even in this setting, Brown (1999) makes a persuasive case for an environmental awakening. Fossil fuel subsidies in developing and former eastern bloc countries have dropped from $202 billion in 1990-1991 to $84 billion in 1995-1996. Global average price for wind power has dropped from $2,600 per kilowatt in 1981 to $800 per kilowatt in 1998. World production of ozone-depleting chlorofluorocarbons was 1,260,000 tons in the peak year of 1998 and only 141 tons (excluding black market) in 1996 (all the examples are from Brown et al., 1999). Despite biotic impoverishment, continuing global deforestation, water shortages, and the like, human society might find enough of the natural world remaining to rehabilitate it to some semblance of its former integrity.

In the soft landing scenario, Earth's carrying capacity is exceeded but the duration is short; natural systems have not lost their resilience and human-assisted ecological restoration is remarkably successful. Brown (1999) sees signs that the world may be approaching the threshold of a sweeping change in the way society responds to environmental threats. He believes that this social threshold, once crossed, could change the outlook as profoundly as the one, which in 1989-1990, led to a political restructuring in Eastern Europe. Having worked with toxicological and ecological thresholds for a half century (e.g., Cairns, 1992), I am cautious in both determining thresholds and extrapolating the results. Still, compelling evidence shows that thresholds exist and are

useful in making a variety of decisions despite both false negatives and false positives (e.g., Cairns, 1999).

One practical consideration in using thresholds is that their existence is often not known until they have been crossed (e.g., Cairns, 1998). What if human society crosses the threshold but gets back to the right side in time — then what? Society must realize that it cannot jump back and forth across the threshold. The first "then what?" would be an early warning system. Society should become acutely aware of when the threshold is too close, and retreating to more sustainable practices should become automatic. Sustainable practices should not have to be the consequence of losing a legal battle.

The second "then what?" should prompt society to recognize that environmental thresholds oscillate, and society should become aware of why and when thresholds change. The third "then what?" is the hardest! Human society must acknowledge dependence upon an ecological life support system and alter human practices and behaviors to protect the life support system's integrity. Carrying capacity — the maximum number of organisms of a given species that can be supported in a given habitat or geographic area — is a crucial limit or threshold. The quest for sustainable use of the planet is focused on the "cost" of maintaining healthy ecosystems and the services they provide in the context of the costs of growth in human population size and per capita level of affluence. The assumption of ecological limits is a *sine qua non*.

Discussions of limits to growth are described by detractors as "gloom and doom" prophecies. However, science makes no moral or ethical judgments since scientists merely report evidence on the probable consequences of a particular set of circumstances. One rarely hears gloom and doom accusations about carrying capacity signs on elevators, airplanes, bridges, and the like. Ecological systems are continually adjusting to the chemical/ physical/ biological limits they encounter. Is it asking too much of human society to do so as well? Unless adjustments are made, a "soft landing" seems quite unlikely. Human society should not behave as if the survival of *Homo sapiens* has been preordained. Individuals who do not value a comparable quality of life for their descendants and the descendants of others are unlikely to devote time, resources, and energy to the quest for sustainability.

Scenario #2: The Hard Landing

All species have an upper limit or threshold on population size that is determined by resources, space, predators, disease, and competition from other species. Technology has enabled humans to modify the factors that govern population growth, but not abolish them. In the absence of predators, herbivorous mammals will overexploit resources. They will first rise to an extraordinary population size and then crash to well below previous levels as a consequence of damaging the integrity of the resource base. How large might the crash be? Individuals with poverty level incomes are not economically situated to meet major emergencies, and this segment of society constitutes a sizable portion of the approximately 6 billion people now on the planet. Adding 4 billion people in the next century will definitely worsen the situation. However, barring a major nuclear exchange, extinction of the human species seems unlikely since small groups of hunters/gatherers still exist in various parts of the world. These people could probably adjust to living off the natural systems since they are already fairly adept at doing so. Even if the carrying capacity of the region is temporarily reduced, sustainable practices will almost certainly increase it over time spans that may not benefit the individual but should benefit the species.

The book *Beyond the Limits* (Meadows et al., 1992) estimates a world human population crash about 2030. Such a crash has happened before on a smaller scale on Easter Island, Mangareva Island, and a number of other areas of the world. I find the island examples particularly forceful since the inhabitants were intimately associated with their resource base and could personally witness its use by the people dependent upon it. Is an unexpected crash more or less likely in a situation where inhabitants are more removed from witnessing the sources of their food, energy, etc.? If a hard landing occurs, it will almost certainly be due to a number of factors rather than a single major cause. A few illustrative factors follow.

(1) Failure to grasp the rate at which exponential growth changes circumstances from acceptable to unacceptable.

(2) Attempts to get just a bit more profit before the system collapses (e.g., ocean fisheries).

(3) Overexploitation of resources by countries or corporations with headquarters well outside the area being damaged (e.g., chip mills).

(4) Denial or distortion of the evidence by those engaged in unsustainable practices (e.g., production of greenhouse gases).

(5) Cumulative effects of a series of actions seemingly harmless individually but disastrous in the aggregate (e.g., loss of wetlands and forests exacerbating the damaging effects of floods).

(6) Attempts to resolve scientific issues within a legal system unsuited for this purpose (e.g., are the scientists who testify in the judicial system qualified to serve on a National Research Council scientific evaluation committee?).

Any reader who doubts that society is too clever to make a series of foolish judgments should read Will Rogers' column "No Tax on Optimism — Yet" (pp. 408-410 in Sterling and Sterling, 1982). As usual, Rogers goes unerringly to the truth and even makes it humorous.

Scenario #3: Selective Soft and Hard Landings

As Wallace (1998) notes, Blacksburg, Virginia, U.S.A., a town of 30,000 persons, maintains 400 miles of streets — about 2,500 acres of asphalt pavement; Beaune, France, a city of 20,000 persons, is smaller than 500 acres, including *houses, shops and streets* (emphasis mine). Which of these cities has the smallest "ecological footprint" and is thus able to maintain a quality life on fewer resources? Kerala (a state in India) has a very small per capita ecological footprint, yet it compares well in attributes, such as life expectancy, with areas that have large per capita ecological footprints (United States and Canada). Clearly, it is unreasonable to expect Kerala to assist areas with large per capita ecological footprints to make the adjustment to resource limitations. What about the relationship between, for example, the United States and Haiti? The former has a large per capita ecological footprint and the latter a small one. Should the United States, as a matter of policy, reduce per capita ecological footprint size and send more aid to Haiti, even if this results in further population growth in Haiti without concomitant growth in resources? Haiti now has 42.6 percent of its population under age 15 and only 4.1 percent at 65+ (New York Times, *The World Almanac 1999*, p. 795). Major shifts in Haitian societal practices will be needed to achieve sustainability.

In addition, Haiti has no significant military capability. What happens if some country with military capabilities experiences a population collapse as a consequence of exceeding some resource threshold? Acquisition of additional resources by military means will undoubtedly occur to some political leader as it has to others in the past. War, of course, lowers carrying capacity through both diversion and destruction of resources.

Exemptionalism

Both Scenario #2 and #3 are likely to result from excessive optimism about "exemptionalism" — the belief that humans are exempt from the laws of nature that limit population growth and per capita affluence of other species because of their creativity, technology, and ingenuity. If resources are infinitely substitutable, they are not limiting and the human population can continue to grow in both numbers and affluence far into the future (Simon, 1981). Others (environmentalists) believe that there are limits to growth on a finite planet, although science and technology have increased Earth's carrying capacity for humans beyond the limits identified by Malthus over 200 years ago. Arguably, the best single point-counterpoint debate on this topic is the Myers and Simon (1994) book, now regrettably out of print but available in many major libraries.

Wilson (1998) notes that, for the committed exemptionalist, *Homo sapiens* has in effect become a new species. Wilson even provides a new name — *Homo proteus* or *shapechanger man* — with the following description (p. 278) of this hypothetical species:

> *Cultural. Indeterminately flexible, with vast potential. Wired and information-driven. Can travel almost anywhere, adapt to any environment. Restless, getting crowded. Thinking about the colonization of space. Regrets the current loss of Nature and all those vanishing species, but it's the price of progress and has little to do with our future anyway.*

Cairns (1998) has discussed some aspects of the risk/uncertainty paradox regarding exemptionalism and some illustrative ethical considerations (Cairns, 1999) regarding our relationship with other species if the exemptionalist's assumptions proved robust.

However, another important consideration is the devastating effect that reliance on exemptionalism might have on human behavior. For example, belief in infinite substitutability of resources might cause humans to

become even less sensitive to the limiting effects of resource depletion on other species. It is already abundantly clear that other species have neither the technology or ingenuity to replace their exhausted resources. Their only hope is that human society will become more compassionate with respect to their needs or, alternatively, they will disappear.

The "point of no return" is an important planning strategy for explorers, airplanes, ships, and other situations where resources are finite and cannot be replaced without returning to a supply or resource base. Earth is transporting human society through space, but there is no supply base to replenish resources when they are depleted. Human society's point of no return is when the natural capital that renews resources has been so degraded that it can no longer do so at an adequate rate. There is no reliable gauge to measure this endpoint as there is for a fuel supply. Undoubtedly, those engaged in reckless exploitation of Earth's resources are unaware of the exemptionalist hypothesis or of infinite substitutability of resources. These reckless individuals deserve far less respect than the exemptionalists who have considered the resource base for future generations, despite a total disregard for the factors that limit other species and, arguably, humans even if to a lesser degree. The point of no return must permit some testing of the exemptionalist hypothesis while permitting a shift to sustainable use of finite resources if the exemptionalist hypothesis proves invalid.

It is regrettable that neither exemptionalists nor ecologists have given serious consideration regarding their course of action if the other side is correct. The Myers/Simon debate (1994) clearly shows the polarization that exists. The public is unaware of the reasoning supporting each viewpoint, although the profligate use of resources might suggest, to uncritical people, that there is stronger support for the exemptionalist position than may actually exist. Until a public debate occurs that goes beyond slogans and platitudes from both sides we can only speculate about public views. One hopes that this debate will occur before a point of no return has been passed.

Alteration of the First Three Scenarios by Episodic Events

There is a persistent tale about a plane that experiences "mechanical difficulties." As it descends for an unscheduled emergency landing, one passenger remarks "And I gave up smoking last month!" Other versions of the same philosophy are "When on the Titanic, you might as well go First Class," or "In the long run, we are all dead." Along the same lines, a large object from outer space could collide with Earth and cause mass extinctions or the Antarctic ice cap could shrink as a result of natural cyclic events or through anthropogenic effects or both.

A major catastrophe might not occur, and human society could still suffer enormously as a cumulative result of a an extended series of "small" decisions that in isolation seem beneficial. Or, as some of my friends have noted, "It makes no sense for a person who is 76 years old to be concerned about these things!" But, surely, it is comforting to envision that others will have the opportunity to experience the things that gave us pleasure! One must ensure that the precautionary principle is involved, which espouses the imposition of controls to protect the environment even when there is an incomplete understanding of the relationship between anthropogenic practices and their effect on the environment. Inevitably, some precautions will subsequently prove unnecessary, and others will be negated by events beyond the control of society. However, many of the principles will work, and some will have unexpected benefits. Carefully studied and effectively communicated efforts to help others benefit both giver and receiver and should bring joy to both.

Scenario #4: For Humans There Are No Limits or Thresholds

Although ecology and economics are related (both refer to the home — eco-logy is the study of the home and eco-nomics is the study of its management), a casual observer might assume they have no relation. Nowhere is this more apparent than in the debate between Myers and Simon (1994): Myers believes in carrying capacity for humans while Simon did not. If human ingenuity and technology can free the human species from the thresholds and limits that affect other species, sustainable use of the planet by humans has been achieved! However, much environmental damage is done under the economic growth banner and usually no other justification is needed. Many people who ravage the environment claim they are environmentalists. Every special interest group, from logging to highway construction, declares that its practices are sustainable. So where is the problem?

One big problem remains: What is the ethical and moral obligation to other species? Elsewhere (Cairns, in press), I have discussed this issue in more detail, but it can be summarized briefly: do humans drive other species to extinction just because they are not needed? This question leads to the next scenario.

Scenario #5: Humans Are Subjugated on Earth by a Technologically Advanced Species from Elsewhere

In the United States, the idea of humans being subjugated to an alien species was brought to national attention by a famous radio drama. The plot of the drama is that extraterrestrial invaders with vastly superior technology quickly subdue and enslave humans. The invaders are superior to humans in ways that permit dominance, and they have no compassion for "lower life forms." Ultimately, a lower life form saves the humans by infecting and killing the invaders. But, what if this result were not the ending of the drama? Humans do not enjoy this drama or premise because another species has views similar to humans toward "lower" forms of life.

Scenario #6: Sustainability is Achieved Because the Little Creatures that Have Always Run the World Take Full Charge

It seems unlikely that humans could destroy all life on Earth. Forms of life similar to those that preceded humans billions of years ago could take full charge again and the planet would operate sustainably. Of course, music, art, theater, radio talk shows, war, and other activities associated with humans would vanish. If humans damage their ecological life support system, intelligence (as humans define it) will join the long list of other evolutionary failures. This disaster does not mean the end of life on Earth — just the extinction of another species (humans).

Concluding Statement

A particularly encouraging sign for sustainable use of the planet is the significant shift in the viewpoints of theology and "hard science" in recent years. This shift has resulted in a substantive degree of consilience between the two. The often bitter disputes of the past are diminishing somewhat, and a few interactions may even approach camaraderie. Even physics has evolved from a deterministic view to the non-deterministic perspective of quantum theory and uncertainty. In the larger scientific community, there is increased willingness to accept some principles where hard data are difficult to generate on the basis of consilience with related hypotheses with more robust data. On the other side of the narrowing divide, theologians are using scientific evidence when reexamining their doctrines and religious affirmations. Arguably, the most important shift is the acceptance of limits to what their theologies can accomplish.

Scientists can now speak more freely of compassion and theologians of biotic impoverishment. Surely, this is a promising trend, albeit not without risks to both groups!

However, as Dobzhansky (1945) notes:

> *We like to believe that if we secure adequate data bearing on a scientific problem, then anybody with normal intelligence who takes the trouble to become acquainted with these data will necessarily arrive at the same conclusion regarding the problem in question. We like to speak of conclusions demonstrated, settled, proved and established. It appears, however, that no evidence is powerful enough to force acceptance of a conclusion that is emotionally distasteful.*

This makes Scenario #1, the soft landing, less likely than it would be if the evidence for limits to growth on a finite planet could cause the paradigm shift toward sustainable practices more rapidly. Most of us who share Dobzhansky's view would welcome being proved wrong. But, even optimists can be wrong so there should be plans B and C for coping with Scenarios #1 and #2.

Sustainable development is often described in terms that suggest a stable framework of practices will ensure success. For example, Murray and Powell (1999, p. 2) state:

> *Sustainable development is a concept in which communities seek economic development approaches that also benefit the local environment and quality of life. Sustainable development provides a framework under which communities can use resources efficiently, create efficient infrastructures, protect and enhance the environment and quality of life, and create new business to*

> *strengthen their economies. Where traditional approaches can lead to congestion, sprawl, pollution and resource overconsumption, sustainable development offers real, lasting solutions that will strengthen our future.*

Note the words *lasting solutions* (emphasis mine) in the final sentence. This implies a stable, biospheric environment, which is unlikely. A more realistic view is given by Odum et al. (1995):

> *While the steady state is often seen as the final result of development in nature, a more realistic concept may be that nature pulses regularly to make a pulsating, steady state — a new paradigm gaining acceptance in ecology and many other fields.*

A harmonious relationship with a pulsing system requires constant monitoring of the system's condition. Nothing less will make sustainable use of the planet possible! Yet, while every change in the economic system is given much attention and is widely reported in the news media, the condition of the ecological life support system is almost ignored. Until this situation changes dramatically, Scenarios #2 and #3 are highly probable, and Scenario #1, which is most attractive, is highly improbable unless human society becomes: (a) less recklessly opportunistic in the use of natural resources, (b) more concerned about the world left for future generations, and (c) more concerned about biospheric health and its corollary — not damaging ecosystems to achieve temporary competitive economic advantage. Our economic system may have once favored individuals that were recklessly opportunistic, but it has not produced many practices that are sustainable over large temporal or spatial spans. Sustainable use of the planet, as it is usually envisioned for humans, requires more long-range planning to avoid the societal disruptions and discontinuities that result from the aggregate tyranny of spur of the moment decisions.

What Are Some of the Steps that Can Be Taken?

There is persuasive evidence to justify optimism that there is much society can do to achieve a soft landing in the transition to sustainable use of the planet (e.g., Myers and Kent, 1998). There are many steps that would markedly enhance the possibility of a soft landing. These are easy to state — difficult to implement. Some illustrative examples follow.

1. Stabilize human population size until there is robust evidence that further expansion is possible without diminishing quality of life for humans and having even more adverse effects upon the ecological life support system.

2. Require solutions for each local environment that enhance both local and global sustainability. In short, solutions must be consilient with a mosaic of other local sustainability initiatives.

3. Become aware that each local sustainability initiative can have either beneficial or adverse effects upon other components of the sustainability effort. Mass movements of people to new regions of residence does not facilitate the sense of place or of community needed for exemplary local sustainability projects. On the other hand, ecotourism (at its best) should enhance an awareness of global sustainability needs as well as a global environmental ethos.

4. Have a sense of equity and fairness in resource distribution so that the enormous disparity in per capita ecological footprint size (e.g., Rees, 1996) can be reduced. The citizens of Kerala (a state in India) have a tiny ecological footprint compared to citizens of the United States and Canada, but their life expectancy is not greatly different. Menzel (1994) depicts material differences with a series of memorable photographs and demonstrates that material wealth is not essential to a quality life. Disparities in resource consumption produce social unrest, and this disruption is not conducive to sustainable use of the planet.

5. Allocate more space to other species so that future generations will remember what was preserved rather than what was destroyed. Sustainability is achieved by "leavers" rather than "takers."

These and other steps to enhance the prospects for sustainable use of the planet should foster a great sense of community. Societies that neglect to leave a habitable environment for future generations decay or perish. Intergenerational connectedness as well as a feeling of kinship with nature are powerful contributors to personal well being. This scenario is truly a win-win opportunity!

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