

SUSTAINABLE DEVELOPMENT: THE TWO DECADE MILESTONE

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One thing is clear to me now, . . . our values must be compatible with the exigencies [urgent needs] of the natural world we live in and depend upon. They must implicitly recognise the laws of thermodynamics, energy's role in our survival, the dangers of certain kinds of connectivity, and the nonlinear behaviour of natural systems like the climate. The endless material growth of our economies is fundamentally inconsistent with these physical facts of life. Period. End of story. And a value system that makes endless growth the primary source of our social stability and spiritual well-being will destroy us.

Thomas Homer-Dixon
The Upside of Down (2006)

In 1987, a colleague kindly sent me a copy of the United Nations World Commission on Environment and Development Report (1987; often referred to as the Brundtland Report after the chair). The report states: *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.* This statement seemed congruent with my mentor's (Ruth Patrick) 1948 goal of "use without abuse of natural systems." In fact, in my autobiography (online at www.johncairns.net), I describe in detail what appeared to be a continuum. In July 2007, I added Chapter 25 ("Postponing the Quest for Sustainability: Survival First – Then Sustainability") to my autobiography. I concluded that the global environmental crisis is now so severe that the survival of *Homo sapiens* is currently in doubt and should have the highest priority. I still believe sustainable use of the planet is feasible and could be a goal a few centuries from now. Development, as currently practiced, has been a disaster and is simply not sustainable.

Kanter (2007) summarizes some important findings from the United Nations World Commission on Environment and Development Report.

(1) The human population is living far beyond its means and is inflicting damage on the environment that could pass points of no return. Ecological overshoot (i.e., using resources faster than natural systems can regenerate them) is not sustainable, and any individual who fails to do something about this issue is a "feel good environmentalist" and is not engaged in a true quest for sustainable use of the planet!

(2) Climate change, the rate of extinction of species, and the challenge of feeding a growing population are among the threats placing humanity at risk. Human activities, such as ceaseless economic growth, are severely damaging the biospheric life support system that maintains atmospheric gas balance and other conditions necessary for humans to exist. Conditions on Earth have not always been favorable for the human species, and severe damage to the biospheric life support system will probably result in a new equilibrium condition favorable to some forms of life, but probably not *Homo sapiens*. Recently, when commenting on the severe drought in the US state of Georgia, lawmakers proposed lifting species protections in the drought. Rep. Lynn Westmoreland, a

Grantville Republican, stated: “But we’re united in this crisis to put our people before sturgeon and mussels” (as quoted by Kemper 2007). However, in the aggregate, those other species constitute the biospheric life support system that makes Earth suitable for human habitation. Putting “people first” means protecting their life support system first rather than fearing, with politicians eyeing elections about a year away, to ask constituents to use less resources (e.g., water). Humankind cannot eliminate risk (e.g., a large object from outer space colliding with Earth), but risks can be reduced.

(3) The human population is now so large that the amount of resources needed to sustain it exceeds what is available at current consumption patterns. If humankind does not stabilize its population size to stay within Earth’s carrying capacity for humans, nature will do so – using famine, disease, and death, which are not pleasant to contemplate. The human population will be reduced to match carrying capacity. The only question is how!

(4) Since *Our Common Future* was published, the human population has increased almost 34%, from 5 billion to nearly 6.7 billion, and the financial wealth of the planet has soared by about one-third (economic growth). However, the land available to each person had shrunk by 2005 to 2.02 hectares from 7.91 hectares in 1900 and is projected to drop to 1.63 hectares for each person by 2050. Humankind exists on a finite planet with limits to exponential growth. Obviously, this exponential growth severely stresses the environment and biospheric life support system.

(5) The executive director of the UN Environmental Program, Achim Steiner, has stated that the demand for resources is close to 22 hectares per person, a figure that would have to be cut to between 15 and 16 hectares per person to remain within existing, sustainable limits. In my opinion, this reduction is far too modest because climate change is already reducing the water availability for agriculture, and arable land is being lost to desertification and development (e.g., housing, roads, shopping malls).

(6) Persistent problems identified by the report include a rapid rise of so-called dead zones where marine life can no longer be supported because of depletion of oxygen caused by pollutants such as fertilizers. Also noted was the resurgence of diseases linked with environmental degradation.

(7) The report noted that 250% more fish are being caught than the oceans can produce in a sustainable manner and that the number of fish stocks classed as collapsed had roughly doubled to 30% globally over the past 20 years (i.e., since the first report was published).

(8) The report stated that current reductions in biodiversity were the fastest in human history, with species becoming extinct a hundred times faster than the rate in the fossil record. Collectively, these species constitute the biospheric life support system that has maintained atmospheric and other conditions that are favorable to humans.

(9) One of the most distressing sections of the report was that annual emissions of carbon dioxide from fossil fuels have risen by about one-third since 1987. The threat from climate change is now so urgent that only very large cuts in greenhouse gases of 60 to 80% could stop irreversible change.

Dominant Influence of Humans

Many climate scientists and environmental biologists now believe that human activities have become a dominant influence on both the planet’s ecosystems and climate. Indeed, finding any part of the planet free from the effects of human activities is difficult. However, no consensus exists on how much stress the biospheric life support system can endure before it reaches a tipping point and tips into disequilibrium. Ecological tipping points are not observable until they have been reached or passed, and then the system goes into disequilibrium. The history of past disequilibrium conditions reveals major biotic extinctions followed by the appearance of new species over evolutionary time and eventually a new set of dynamic equilibrium conditions. One can only speculate about the new conditions and whether they will favor *Homo sapiens*. Since robust evidence exists on what conditions stress present ecosystems, prudence dictates that these stresses be reduced because the human economy depends upon human health and well being, which depend upon a healthy biospheric life support system.

The Poster Continents for Global Heating

Although distressing stories come from the entire planet on the adverse effects of global heating and other types of climate change, Australia and Africa are good “poster” continents. Australia is comparatively well off financially, but is still having difficulty coping with the effects of climate change that have already occurred. Africa is predominately poor and is also having trouble coping with adverse effects of climate change that have already occurred. Neither is a large emitter of greenhouse gases, but both are suffering disproportionately from the consequences of increased global greenhouse gases.

Sohn (2007) states:

Australia is locked in a drought of drastic proportions. In recent years, rivers have reached record lows. Temperatures have spiked to record highs. Cities are running out of water. Wildfires are burning. Ecosystems are suffering. And climate models are projecting more of the same and worse for many years to come.

Sohn (2007) also quotes Hamish McGowan, a climatologist at the University of Queensland at Brisbane, as stating: “All of a sudden, the desert has come to town.” Mike Young, professor of water economics and management at the University of Adelaide, has stated: “We haven’t prepared ourselves for a massive [climate] shift.” David Jones, head of climate analysis at the Australian Bureau of Meteorology’s National Climate Centre in Melbourne, has stated: “What’s more, every 10 percent decline in precipitation leads to a 30 to 40 percent decline in water that runs off land into rivers and streams.” Jones also notes that the runoff recession has greatly reduced the amount of usable water ending up in catchments, reservoirs, and dammed lakes. All these circumstances mean that water supplies are becoming less dependable. Gregory Webb, a geologist at the Queensland University of Technology in Brisbane, has stated: “The scary thing . . . is that [Australia is] much dryer during this interglacial period than during the last interglacial period.” Nationwide, the population of Australia has increased by nearly 25% since 1990, which will exacerbate the sizable reduction in water supplies. Some reassuring news is that, although wildlife is suffering from the changes just described, Australia’s fauna has evolved to cope with long, dry spells. For example, many birds and mammals extract all the moisture they need from leaves. Also, a pregnant kangaroo can delay the birth of her young for months in case drought strikes. On the down side, development has drastically reduced animal population sizes and habitat buffers that helped animals survive droughts in the past. Koalas have been placed in a difficult situation since the drought is killing off several species of eucalyptus trees, which the Koalas use for food. As always, determining how the ecosystems and their biota will cope with an increasingly dry future is extremely difficult. About 45,000 years ago, 90% of Australia’s large animals disappeared, including carnivorous, 200-kilogram kangaroos, marsupial lions, and flightless birds that weighed more than a ton. Some evidence connects this rapid, continent-wide, megafauna extinction with the arrival of humans, but scientists have also proposed that a major drought might have caused the die-off. However, data show a long, gradual decline of both large and small animals, with no signs of hunting. Sohn (2007) states: “Australians are rising to the challenge of living with less water, but they continue to grapple with an environment they don’t recognize any more.”

Africa as a continent is much poorer than Australia, has a major problem with AIDS, has both housing and crop loss due to floods, and has a major refugee problem, in some areas due to both drought and armed conflict. Sub-Saharan Africa is particularly vulnerable to hunger problems. India, Yemen, Mexico, Burkina Faso, and several other countries have had, or been close to, food riots in the last year, a situation not seen in decades of low global food commodity prices (Vidal 2007). Ali Gurkan, head of FAO’s Food Outlook Programme, has stated that cereal stocks have been declining for more than a decade, but now stands at around 57 days, which makes global food supplies vulnerable to an international crisis or big natural disaster such as a drought or flood (Vidal 2007). According to the UN’s World Food Programme, 57 countries, including 29 in Africa, have been hit by catastrophic floods.

Australians might move lower on the food chain, conserve energy and water, and make do with less material possessions, etc. However, Australians may be facing a permanent drought because of an accelerating vortex of winds whipping around the Antarctic that threatens to disrupt rainfall (Byrnes 2003). Predictions of a permanent drought have been confirmed, but increased greenhouse gas emissions, especially when new coal-fired electric power plants now under construction go on line, may change the climate to something different.

Conclusions

In the 20 years since *Our Common Future* was published, the human population has grown exponentially, greenhouse gas emissions have increased markedly, hazardous materials increases threaten all life forms, the era of cheap petroleum has ended, many species are threatened with extinction, and the number of starving and malnourished humans has increased markedly. Climate change threatens food and water supplies. The era of mass numbers of environmental refugees appears to be underway. Ecological overshoot continues and is worsening. How could this situation have occurred when nations promised, in 1987, that the common goal was to leave a habitable planet for posterity?

One could blame semantics. *Sustainable* has been used to define the noun *development*, and *development* was defined as *economic growth*, which has greatly depleted natural resources and diminished the services they provide. The best metric for sustainable use of the planet is ecological overshoot. At present, humankind is using planetary resources 30% faster than they can be regenerated. This situation is clearly unsatisfactory, and the pledge to one's children, grandchildren, and great-grandchildren to leave resources to meet their needs has been shockingly violated. Humankind's mission should be to take steps to ensure that as many future generations as possible survive the catastrophes that are now occurring and will probably occur in the remainder of the 21st century. Such a mission will require both personal and societal sacrifices that everyone should be willing, even eager, to make. After all, the present generation permitted ecological overshoot, which, if it continues, will eliminate the possibility that posterity will enjoy a quality life.

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LITERATURE CITED

- Byrnes, M. 2003. Scientists see Antarctic vortex as drought maker. Reuters News Service 24Sept
<http://www.southbaymobilization.org/newsroom/earth/articles/03.0924.ScientistsSeeAntarcticVortexAsDroughtMaker.htm>.
- Kanter, J. 2007. UN issues "final wake-up call" on population and environment. International Herald Tribune 26Oct <http://www.ihrt.com/articles/2007/10/25/europe/enviro.php>.
- Kemper, B. 2007. Lawmakers propose lifting species protections in drought. Atlanta Journal-Constitution 16Oct
http://www.ajc.com/metro/content/metro/stories/2007/10/16/waterbill_1017.html.
- Sohn, E. 2007. The big dry: prolonged drought threatens Australia's people, wildlife, and economy. Science News Online 27Oct
- United Nations World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press, Oxford, England.
- Vidal, J. 2007. Global food crisis looms as climate change and fuel shortages bite. The Guardian 3Nov <http://www.guardian.co.uk/environment/2007/nov/03/food.climatechange>.